

**Evaluation of the Business Case  
for Quality, Phase II: Alameda-  
CHRCO Case Study**

May 2013

Mathematica:  
Kristin Andrews  
Dominick Esposito  
Erin Taylor  
Keith Kranker

University of North Carolina, Chapel Hill:  
Sandra Greene  
Kristin Reiter  
Charlotte Williams  
Stephanie Pierson



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Submitted to:  
Center for Health Care Strategies  
200 American Metro Blvd. Suite  
119  
Hamilton, NJ 08619

Project Officer: Allison Hamblin

Submitted by:  
Mathematica Policy Research  
P.O. Box 2393  
Princeton, NJ 08543-2393  
Telephone: (609) 799-3535  
Facsimile: (609) 799-0005  
Project Director: Dominick  
Esposito

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## UNDERSTANDING THE BUSINESS CASE FOR IMPROVING PEDIATRIC ASTHMA CARE: THE ALAMEDA ALLIANCE-CHRCO ATTACK CLINIC

### *The Case Study at a Glance*

The *Asthma Tools and Training Advancing Community Knowledge* (ATTACK) clinic intervention, initiated by the Children's Hospital and Research Center at Oakland (CHRCO) and the Alameda Alliance for Health (a Medicaid health plan), sought to reduce the rate of emergency department (ED) visits for children with asthma by providing asthma education to children and their families with an one-time visit to the ATTACK clinic.

*The Intervention:* ATTACK clinic staff educated children and their families on how asthma affects a person's breathing, how to use asthma medications properly, and how to recognize asthma triggers. Staff also referred children whose home environments might exacerbate their asthma to case management services available in Alameda County and made follow-up primary care appointments for all children who visited the clinic. The trigger to motivate children and their families to visit was an ED visit for asthma. Thus, all children eligible to visit would have had an ED visit for asthma and were potentially at high risk for a return ED visit.

*The Business Case:* Primary care providers are not reimbursed for asthma education in Alameda County. By offering education, CHRCO is filling a gap in the delivery system and attempting to demonstrate to payers the potential for a return on investment (ROI) in asthma education.

*The Evaluation:* We first identified children who visited the ED for asthma; then we compared the return ED visit rate between randomly assigned treatment and control groups (based on the calendar day of the ED visit), whether or not they visited the ATTACK clinic. This intent-to-treat strategy reflects a recognition that treatment effectiveness involves not just how well the treatment is provided but also whether the intended population is reached. Because many children who were referred to the clinic did not meet eligibility criteria for the treatment group, we also compared outcomes for those children (which include all who visited the clinic) to a nonexperimental comparison group (based on a propensity score approach).

*Findings from the Evaluation of the Pilot Program:* Children who visited the clinic were generally younger than 10 and did not have well-controlled asthma; about half of all children were referred to further asthma case management. The ATTACK clinic intervention did not have an impact on the return ED visit rate or other health care use (office visits, prescription drug use, or inpatient use) of children randomly assigned to the treatment group. The intervention also did not generate a positive ROI from either the perspective of the Alliance or CHRCO during the BCQII intervention period. The ability to identify an impact on the return ED visit rate and generate a positive ROI was likely compromised by the low participation rate (about 13 percent) among children in the eligible population.

*Implications for the Business Case in Medicaid:* The ATTACK intervention highlights not only the need for asthma education in Medicaid populations but also the importance of aligning financial incentives. The lack of positive ROI is likely attributable to the fact that this program was built from the ground up and the participation rate among eligible children was low. Findings from the evaluation hold lessons for identifying the right intervention intensity, targeting high-risk patient populations, identifying strategies to overcome recruitment and participation barriers, and engaging providers actively in intervention activities.

The Business Case for Quality, Phase II (BCQII) initiative sought to develop targeted, rigorous, and actionable evidence on the return on investment (ROI) for improving the quality of care for Medicaid beneficiaries and to identify financing misalignments that impede investments in quality, as well as strategies for correcting them from the perspectives of multiple stakeholders. Sponsored by the Center for Health Care Strategies, BCQII was funded by the Robert Wood Johnson Foundation and the Commonwealth Fund. Unlike the initial BCQ initiative, which examined ROI for a variety of medical conditions and Medicaid populations, BCQII grantees focused on children with asthma.

This case study describes the *Asthma Tools and Training Advancing Community Knowledge* (ATTACK) clinic intervention, its business case, and findings from its evaluation based on interviews with program staff and analysis of grantee-reported process measures and cost data, ED and inpatient visit data, and outpatient and prescription drug claims data. The ATTACK clinic was led by the partnership of the Alameda Alliance for Health (the Alliance, a nonprofit Medicaid health plan) and the Children's Hospital and Research Center at Oakland (CHRCO) in Alameda County, California, and operated from mid-July 2008 through the end of June 2011. Afterward, the ATTACK clinic continued operations as a part of the CHRCO primary care clinic.

## I. The ATTACK Clinic

The ATTACK clinic offered free, in-person asthma education for children and their families who visited the CHRCO emergency department (ED) for asthma. The clinic was held on Thursday afternoons (through the early evening) starting at 3:30 in offices in the neurology department, the only space available at the time. The goal of the ATTACK clinic was to reduce the return ED visit rate among children with asthma by providing education on the nature of asthma and asthma-management skills to children and their families. From 2007 to 2011, 13 to 16 percent of CHRCO ED visits were for asthma, acute respiratory infections, or other respiratory symptoms. In all four years, these were the most common reasons for ED visits, beyond visits for general symptoms.

The motivation for developing the ATTACK clinic was threefold. First, as reported by CHRCO and Alameda Alliance staff, many children and their families do not have a strong understanding of asthma or the medications to treat it. For example, an ED doctor estimated (based on her experience) that as many as half of all children with asthma have controllers at home but do not use them properly. Second, ATTACK clinic staff reported that Alameda County is home to many asthma triggers, particularly mold. Moreover, because a large proportion of the children with asthma reside in low-income households, they are more likely to be exposed to asthma triggers, including cigarette smoke, mold, insects, and dust (Bryant-Stephens 2009). Third, at the start, CHRCO was motivated to reduce its return ED visit rate (40 percent in the 12 months before July 2007), because payments from the Alliance (whose enrollees account for a third of all ED visits) were capitated annually.

ATTACK clinic staff educated children and their families on how asthma affects a person's breathing, how to use asthma medications properly, and how to recognize environmental triggers of asthma attacks. Staff also referred children whose home environments might exacerbate their asthma to further case management available in Alameda County and made follow-up primary care appointments for all children who visited the clinic. A logic model that describes the ATTACK clinic activities and how they were intended to meet its ultimate objectives is included at the end of this document (Figure 1).

## A. Intervention Details

### *Staff and Their Responsibilities*

The multidisciplinary ATTACK clinic team worked either for the hospital or for its primary care clinic. This team was led by an ED physician who was an ATTACK clinic co-director. Other staff included an asthma coordinator, asthma educators, and a nurse practitioner. The asthma coordinator (a registered nurse) and the asthma educators (current or former AmeriCorps volunteers) all worked for the primary care clinic full time. The nurse practitioner has worked at CHRCO for more than 30 years. The team's other co-director, CHRCO's asthma program manager, worked closely with all clinic staff and was the liaison between the ATTACK clinic and the hospital.

Team members had various responsibilities on the days the clinic was held and during the week leading up to it. For example, asthma coordinators provided asthma education and instructed children and families how to use asthma-related medical devices and also helped to schedule visits. Asthma educators assisted with recruiting by calling families of children with asthma, provided education during the clinic visit, and conducted follow-up activities after the visit to asthma referral services or children's primary care physicians. The clinicians conducted physical exams, provided asthma education, and made referrals to case management. The providers also coordinated care with the asthma coordinator and educators, discussing each child's individual case.

### *Recruitment*

Patient recruitment began when a child visited the ED for asthma. To facilitate evaluation, each calendar day during the intervention period (July 11, 2008, to June 30, 2011) was randomly assigned to "treatment" or "control" status (in a 4-to-3 treatment-to-control ratio). Children who visited the ED for asthma on treatment days could be referred to the clinic, while those who visited on control days were treated according to the existing standard of care (that is, recommended follow-up with their primary care physician) but were not supposed to be referred to the ATTACK clinic.

In its first three months of operations, the ATTACK clinic relied on referrals from ED physicians. A binder in the ED identified each day as either a treatment or a control day and included clinic appointment cards. Having ED physicians refer children and their families proved challenging, because doctors were often too busy to remember to do so, and some disagreed with the notion of randomly assigned treatment and control days. It was particularly challenging for ED staff to remember to refer children during busy days. One ED doctor noted that if "it is a really crazy day, it is hard to remember to refer kids"; on these days, families might wait 4 to 5 hours to be seen, which would make it "not always possible to refer kids to ATTACK on these days."

*Because of early recruitment challenges, ATTACK clinic staff employed a number of strategies to boost the rate of referral and participation by children who visited the ED on a treatment day.* First, an asthma educator reminded ED staff to refer children with asthma on treatment days. The team reminded respiratory therapists in particular, because they interact with children and their families prior to discharge. Second, ATTACK clinic staff reviewed the ED census once a week, identified children with asthma who visited on treatment days, and made calls to their families to encourage them to visit. Third, one week of the hospital's second-year residents' community advocacy program was devoted to asthma. Among other activities, residents visited the ATTACK clinic and shadowed clinicians and asthma educators. Through these strategies, the referral rate among children eligible for the treatment group

rose from less than 25 percent in the first 12 months to 37 percent in the last 12 months. Likewise, the participation rate among the referred rose from 35 percent to 45 percent in those two periods.

### *The ATTACK Clinic Visit*

The ATTACK clinic visit, which usually lasted 30 to 60 minutes, included an initial assessment, asthma education, and a medical exam. So that children would have as much of a support system as possible, their family members were encouraged to participate in the visit. The initial assessment included a review of basic vital signs (height, weight, and blood pressure) and an asthma assessment. An asthma educator asked about the child's asthma symptoms (for example, whether the child coughs at night) and about potential triggers in the home (such as pets, smoking, carpets, or mold). After the assessment, educators began education on the nature of asthma; what medicines and devices are used to treat asthma and how to use them; and asthma triggers, including how to mitigate them at both home and school. ATTACK clinic staff reported that most families are more comfortable speaking with an asthma educator than a physician because they find the educator more approachable and generally do not expect physicians to spend much time on education.

The asthma education session provided to children and their families was individualized to their specific situation. Through the assessment, educators identified the triggers likely to affect the child and then personalized the education so that the family understood how their home environment exacerbates the child's asthma and how asthma triggers can be avoided. Educators also tailored information to the families' level of understanding and the spoken language with which they are most comfortable. For example, educators would not use the term "reactive airway disease," but rather would say that there is "something blocking the airway in your child's lungs." In addition, three of the five clinic staff speak either fluent or conversational Spanish, which enables them to better communicate with those families for whom English is not the primary language (about one-third of ATTACK participants). Although interpreter support is available via a telephone service, ATTACK staff reported that this method is not preferred because it is perceived as impersonal.

Education on asthma medications was a key component of the visit. The ATTACK clinic is one of the few opportunities parents have to receive hands-on education from a health care professional. Educators explained the need to use controller and rescue medications and, often, alleviated parents' fears about having their children take medications daily as well as dispelled misconceptions about corticosteroids being similar to performance-enhancing drugs used by athletes. If the child required a nebulizer or spacer, educators taught both the child and the family how to use these devices. The ATTACK clinic maintained a supply of free asthma medications and spacers, donated by a pharmaceutical company, which it provided to families.<sup>1</sup>

After the education session, the educator discussed the child's case with the doctor or nurse practitioner assigned to conduct the physical exam. The role of the clinician was to describe differences between medication types, explain asthma triggers, make referrals to case management, and answer questions from the children or families. This clinical staff member would also offer the

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<sup>1</sup> The CHRCO primary care clinic administrator also noted that the only type of drug samples the primary care clinic stores are asthma medications.

family a free home-based case management referral conducted by AsthmaStart,<sup>2</sup> an Alameda County program. If necessary, the clinician also dispensed free medications and offered prescriptions for smoking cessation patches or nicotine gum to family members who smoke, as these items are covered by the Medi-Cal pharmacy benefit. At the end of the visit, children and their families were given a folder of materials, including a 15-page asthma tool kit that contained information on asthma symptoms, triggers, and warning signs; asthma medications; instructions on how to use peak flow meters, spacers, metered dose inhalers, a diskus, nebulizers; and other resources.

#### *After the ATTACK Visit*

Staff members conducted follow-up activities for families after the ATTACK clinic visit and attempted to call families to confirm that these activities have been completed. For example, staff made primary care appointments for families, and also faxed information on the child to his or her primary care physician. Staff also followed up with families whose child was prescribed a nebulizer, to make sure they received it. For families who agreed to a visit from AsthmaStart, staff faxed information to the program office and later called to confirm that the families had received a visit. About half the families who visited the clinic accepted the offer, and among those who accepted, about half ultimately received a visit; the rest declined the visit or could not be reached.

### **B. Other Asthma Services at CHRCO and the Alliance**

The ATTACK clinic is one part of the hospital's overall asthma education program. Its primary care clinic also maintains an asthma clinic that provides asthma education to children. However, the primary care clinic provides these services only to children for whom it is the primary care provider, not to all children who visit the ED. Therefore, ATTACK reaches a larger group of children relative to the primary care clinic. Other CHRCO services that are asthma-related include asthma education for hospitalized patients and a program to address family tobacco use. In addition, CHRCO coordinates an annual summer camp for children with asthma where they learn asthma management skills. The hospital's research institute also conducts asthma research.<sup>3</sup>

The Alliance's past asthma activities also demonstrate its commitment to combating the disease in the community.<sup>4</sup> For example, it participated in the California Asthma Collaborative, a quality improvement initiative of Medi-Cal officials, health plans, providers, and community-based organizations that developed and implemented clinical and administrative strategies to improve asthma care for Medi-Cal enrollees.<sup>5</sup> The goals of the collaborative were to establish practices that

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<sup>2</sup> The AsthmaStart home visit, available free to anyone residing in Alameda County, provides education in the family's home. AsthmaStart case managers get the chance to inspect the home for potential asthma triggers and can recommend environmental changes while on the premises. Although this program reviews many of the topics covered by ATTACK educators, clinic staff indicate that it is valuable for families to receive this repetition, because they cannot absorb everything covered during the ATTACK clinic visit.

<sup>3</sup> The Study of African Americans, Genes, and the Environment and Genes-Ambiente Mezcla en Latinos Asmaticos seek to identify genetic and environmental risk factors for asthma among African American and Latino populations, respectively. CHRCO also participates in the NIH-funded AsthmaNet clinical network, which develops and conducts clinical trials to address asthma management questions and new treatment approaches.

<sup>4</sup> See the Alameda Alliance for Health Community Report 2009-2010.

<sup>5</sup> See [http://www.chcs.org/info-url\\_nocat3961/info-url\\_nocat\\_show.htm?doc\\_id=508546](http://www.chcs.org/info-url_nocat3961/info-url_nocat_show.htm?doc_id=508546).

improve clinical quality for enrollees with asthma via coordinated interventions and shared information across stakeholders. In 2006, the Alliance also participated in a Medi-Cal quality improvement study to reduce asthma-related ED visits and hospitalizations and improve the use of controller medications.<sup>6</sup> The Alliance is also a sponsor of the CHRCO asthma summer camp.

## II. Making the Business Case for the ATTACK Clinic

The ATTACK clinic holds the potential to affect many stakeholders financially, including CHRCO; the Medicaid managed care organizations whose enrollees were referred to the clinic (the Alliance and Anthem Blue Cross); and the Medi-Cal fee-for-service (FFS) program, whose recipients were also referred to the clinic.<sup>7</sup> The ability of CHRCO staff to persuade families to visit the ATTACK clinic; the intervention's capacity to lower the return ED visit rate; the financing arrangements between payers and CHRCO; and the way Medi-Cal establishes reimbursement rates with the Alliance and Anthem Blue Cross determine who stands to gain or lose financially. In this section, we describe the business case for improving pediatric asthma care from the perspectives of this pilot program's primary partners: CHRCO and the Alliance. Both are nonprofit organizations with an interest in improving quality of care for people in Alameda County and have worked collaboratively in the past on asthma initiatives.

### A. Existing Financial Arrangements and Associated Incentives

Before the ATTACK clinic was founded, most financial arrangements between CHRCO and insurers were on an FFS reimbursement basis (Figure 2, end of this document). The one exception was that the Alliance provided CHRCO an annual capitated payment per member for all ED visits, regardless of actual use. This arrangement ended in February 2011 when the Alliance began to reimburse CHRCO for ED visits on an FFS basis. Before the ATTACK clinic was established, these arrangements did not include financial incentives for asthma education services other than the generic incentive that CHRCO had to reduce the rate of ED visits for Alliance-insured children because it received annual capitated payments for them.

#### *Children's Hospital & Research Center at Oakland*

CHRCO is a safety net hospital for Alameda County and has the only pediatric ED in Northern California, with more than 70 percent of ED visits being made by children insured by Medi-Cal. In recent years, it has operated at a financial loss, a result partly of low insurance reimbursement rates and partly of the economic downturn, which increased the number of families covered by Medi-Cal. Although CHRCO staff view the ATTACK clinic to be aligned with the organization's long-term quality improvement and financial strategies, the hospital cannot implement such a program without demonstrating that it can generate at least enough revenue to cover its costs. BCQII funding enabled CHRCO to study whether the ATTACK clinic could be a viable program.

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<sup>6</sup> See <http://alamedaalliance.org/2.Sept%2006%20Minutes-attachments/6.CMO%20Report.B-4.pdf>.

<sup>7</sup> According to CHRCO ED visit data, on the date each child became eligible for the study, 52 percent were Alliance members, 26.5 percent were Anthem Blue Cross members, and the rest were Medi-Cal FFS members.



According to data provided by CHRCO, total costs of providing asthma services on an FFS basis in the ED and inpatient settings to Medicaid-insured children exceed total revenue. In contrast, total reimbursement for these services from commercial payers is larger than costs incurred. This suggests that if CHRCO is operating at or close to capacity and can reduce ED visits and inpatient stays by Medicaid-insured children and replace those visits with privately insured patients, it could reduce its overall losses, because the revenue from services provided to the latter is higher. Of course, if the hospital is not operating at capacity, forgone revenue from fewer ED visits, assuming that marginal costs are smaller than reimbursement for these visits, is an unfavorable outcome.

### *The Alameda Alliance for Health*

The Alliance is a public nonprofit managed care health plan that provides health care coverage to more than 120,000 children and adults. The vast majority of its members are insured by Medi-Cal (86 percent), and a large proportion are 19 or younger (62 percent). Its membership is ethnically diverse: about a third are Latino, a fourth are African American, and a fourth are Asian.<sup>8</sup> Children insured by the Alliance make up about a third of all children who visit the CHRCO ED for asthma and about 22 percent of those admitted to the hospital for it. Before February 2011, the Alliance reimbursed CHRCO on a capitated basis for ED visits but now reimburses them on an FFS basis, which means that the Alliance is now at full risk for ED utilization. In this new environment of FFS reimbursement for such events, reducing the rate of return ED visits among children with asthma would represent an important cost-saving step for the Alliance, which reports that the typical ED visit costs it anywhere from \$100 to \$150.

A potential change to Medicaid coverage in Alameda County also might influence the ATTACK clinic. For some time, the Alliance has sought to become the sole insurer for Medicaid beneficiaries in Alameda County by having the County's Medi-Cal managed care status changed from the current two-plan model to a county-organized health system model.<sup>9</sup> Under this approach, the Alliance would be the managed care plan for all Medi-Cal beneficiaries in Alameda County, rather than the roughly 75 percent of beneficiaries it currently covers. Although it is unclear whether the Alliance would seek to renegotiate reimbursement rates if it ever became a county-organized health system, having all children covered under one plan that already supports the ATTACK clinic would buoy the business case for both the Alliance and CHRCO by limiting the time spent on negotiating reimbursement fees to one organization rather than several.

## **B. Redesigning to Align Incentives: Opportunities to Improve Financial Alignment**

The ATTACK clinic presented an opportunity for payers and providers to align financial incentives to improve quality of care in Medicaid and potentially benefit all stakeholders (Exhibit 1). If ATTACK clinic education was reimbursed by payers and the intervention reduces the rate of ED visits, both CHRCO and payers would benefit financially, and quality of care would be improved. By offering asthma education via the ATTACK clinic, CHRCO filled a quality gap, because primary care physicians are not compensated for providing asthma education.

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<sup>8</sup> See [http://alamedaalliance.org/pdfs/Alliance%20CR\\_2009-10.pdf#zoom=100](http://alamedaalliance.org/pdfs/Alliance%20CR_2009-10.pdf#zoom=100).

<sup>9</sup> Nine other counties in California are organized under this model: Napa, Solano, Yolo, Orange, San Mateo, Santa Barbara, San Luis Obispo, Santa Cruz, and Monterey.

## Exhibit 1. Potential Benefits of the Intervention to ATTACK Clinic Stakeholders

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### Potential Benefits to Payers

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Lower overall health care costs from fewer asthma-related ED and hospital visits, assuming that reimbursement for ATTACK clinic services is less costly than...

- Forgone health care costs **and**
  - Additional costs of preventive care, such as office visits and drugs, that enrollees might utilize more often as a consequence of the intervention
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### Potential Benefits to CHRCO

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Shift in potential caseload mix and increase in revenue if the rate of ED visits falls for Medicaid-insured children because Medicaid reimbursement rates are lower than commercial rates, assuming the hospital is operating close to or at capacity and can replace Medicaid visits with private-payer visits

Higher Medicaid reimbursement rate per visit if the ATTACK clinic is transferred to the CHRCO primary care clinic, given that it is a federally qualified health center (and therefore receives enhanced reimbursement)

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*The Alliance agreed to reimburse CHRCO for asthma education provided through the ATTACK clinic for its members after the BCQII intervention period ended. The health plan agreed to this arrangement in part because of its own data analysis that suggested the ATTACK clinic reduced return ED visits among its children with asthma, but also because the Alliance leadership believes that providing this service to its clients improves quality of care.<sup>10</sup> However, other payers might not agree to reimburse CHRCO for services they might perceive as related to primary care when they already pay fees to children's primary care providers—the financing misalignment that BCQII is attempting to remedy.*

*There are several ways CHRCO could benefit financially from improving quality of care for children with asthma. First, assuming CHRCO's ED and hospital are running at or close to capacity, any freed-up capacity in the ED or hospital due to fewer visits by Medicaid-insured children could potentially be replaced by visits from commercially insured children. Under this scenario, CHRCO benefits because the hospital is reimbursed more per visit (higher revenue) from services provided to these clients than Medicaid-insured clients. Second, a key component of the business case for the ATTACK clinic is whether it is financially sustainable on its own. That is, at a minimum, the costs of the ATTACK clinic must not exceed the clinic's revenue; if the clinic can operate at a profit, it would derive an even greater benefit.*

### *The ATTACK Clinic's Future*

After the BCQII intervention period ended, the ATTACK clinic moved its operations into CHRCO's existing primary care clinic which receives reimbursement at a higher rate from Medi-Cal because of its status as a federally qualified health center. Through this arrangement, primary care providers in the community who treat children enrolled with other insurers (for example, Anthem

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<sup>10</sup> The Alliance examined six years of ED visit data and determined that the long-term trend in the ED visit rate for asthma among its children with asthma had dropped during the three years that the ATTACK clinic operated compared to the prior three years. As described in the evaluation findings section, we did not find that the ATTACK clinic intervention had an impact on the return ED visit rate for Alliance-insured children during the intervention period.

Blue Cross or insurers in Contra Costa County<sup>11</sup>) could refer children with asthma to the ATTACK clinic, and the primary care clinic could seek reimbursement from those insurers for the visit.<sup>12</sup>

*The reimbursement for ATTACK services by the Alliance (and potentially other payers) creates a financial incentive for CHRCO to provide asthma education and offers the potential for a positive ROI for payers.* For example, the Alliance may break even if its future costs for asthma ED visits or hospital admissions drop by at least the amount it pays to CHRCO for ATTACK clinic services. However, the Alliance will also have to consider additional costs. Specifically, after receiving asthma education, children who attend the ATTACK clinic might be more likely to have prescriptions filled for asthma medications and make visits to a primary care physician.

*As the ATTACK clinic continues beyond the BCQII intervention period, the motivations and expectations of potential partners—particularly Medi-Cal and private payers—are also important factors for CHRCO to consider.* Although the Alliance would welcome financial gains, it has also committed resources to this program in the near term, because it supports the idea of improving quality of care for children with asthma. During the BCQII initiative, CHRCO did not get the chance to approach other payers (public or commercial) to discuss potential reimbursement for asthma education services. The move to the CHRCO primary care clinic strengthens the opportunity to demonstrate a business case because of the clinic's status as a federally qualified health center and its established relationship with payers in Alameda County.

### III. Evaluation Findings

To evaluate the impact of the ATTACK clinic, we identified Medicaid-insured children who visited the CHRCO ED for asthma from the start of clinic operations to the end of June 2011. Based on the day (which was randomly assigned to treatment or control status) they visited the ED, we assigned children to either the treatment or the control group and examined their ED, inpatient, and other health care use after their first qualifying ED visit. This intent-to-treat strategy reflects a recognition that treatment effectiveness reflects not just how well the treatment is provided but also whether the intended population is reached. Such a comparison also avoids potential biases introduced by potential differences in the characteristics of children who do and do not seek treatment. We include descriptions of the sample selection process, outcome measures, and methods in Chapter II and Appendix A of the full evaluation report.

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<sup>11</sup> ATTACK clinic staff estimate that about a quarter of the children who visit the ATTACK clinic reside in Contra Costa County.

<sup>12</sup> Because the staff who operate the ATTACK clinic are employed by the hospital in some capacity, the program can be subsumed under the existing primary care clinic's cost center. ATTACK clinic leaders did not pursue this plan from the start, because they were concerned with serving more than just primary care clinic kids, and it was unclear that the clinic would be able to sustain itself in the long term.

## A. Children with Asthma Who Visited the CHRCO Emergency Department

Using data provided by CHRCO, we identified 3,648 Medicaid-insured children with an ED visit for asthma who met eligibility criteria from July 11, 2008, through June 30, 2011 (Appendix Table 1). Of these, 2,115 were classified as treatment group and 1,533 as control group members. We refer to the date each child became eligible for the study as his or her index date. Slightly less than half the children identified had an index date in the first year of the study.

A diverse group of children with asthma visited CHRCO's ED. Slightly more than half were younger than 5, and only about 12 percent were 12 or older. Most children were insured by the Alliance (53 percent) or Anthem Blue Cross (26 percent), and the rest were insured by Medi-Cal FFS. Almost half the children were African-American, slightly more than a third were Latino, and the rest were of Caucasian, Asian/Pacific Islander, or other descent. Differences in these characteristics between the treatment and control groups were not statistically significant.

Children in the study population were heavy users of CHRCO services. In the 12 months before their index dates, more than half of all children had an ED visit for any reason (Appendix Table 2), and nearly a third had two or more (Appendix Table 3). These figures exclude the index visit itself. Thus, more than half the study population had two ED visits when the index visit is included. Thirteen to 14 percent of children had an inpatient admission in the year before index, over three times the national average among all children in 2007.<sup>13</sup> Treatment-control differences in most of these baseline utilization measures were not statistically significant. The only difference that was statistically significant was the baseline rate for asthma-related hospital admissions which was higher for the treatment group compared to the control group (10.6 versus 8.6,  $p = 0.036$ ).

All children in the study population visited CHRCO for asthma, but only a small group had a previous asthma-related ED visit before their index visit (Table 1). Overall, about 10 percent of children had a previous ED visit for asthma. However, among kids with an index date in the first six months of the study period, this figure was 28 percent, and only 6 percent of children with index dates from 2009 onward had a previous ED visit for asthma (not shown). These figures are suggestive of the magnitude of the problem faced by CHRCO in terms of return ED visits for asthma and indicate the potential impact the ATTACK clinic could have. A larger percentage of children in the treatment group had two or more ED visits or one or more hospital admission for asthma in the 12 months before their index date, compared to the control group (12.6 percent versus 10.2 percent).

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<sup>13</sup> The National Center for Health Statistics reports a rate of 358.2 discharges per 10,000 children younger than 15 in 2007, or about 4 percent (Hall et al. *National Hospital Discharge Survey: 2007 Summary*. National health statistics reports; no 29. Hyattsville, MD: National Center for Health Statistics, 2010.)

**Table 1. Emergency Department (ED) Visits and Hospitalizations for Asthma in the 12 Months Before Index ED Visit (percentages)**

	Treatment	Control	Difference	<i>p</i> -value
<b>Number of Children</b>	<b>2,115</b>	<b>1,533</b>		
Only Use Was Index ED Visit	82.1	83.2	-1.0	0.042
1 ED Visit	5.3	6.7	-1.4	
2 or 3 ED Visits or 1 Hospital Admission	10.7	8.3	2.4	
4 or More ED or 2 or More Hospital Visits	1.9	1.9	0.0	

Source: Children's Hospital and Research Center at Oakland ED and hospital data.

Notes: Includes all children with asthma who have an index ED visit from July 11, 2008, to June 30, 2011. On their first day of eligibility, the child must be at least 1 year old and younger than 19, have a primary or secondary diagnosis of asthma (493.xx), be insured by Medi-Cal or a Medicaid managed care organization, and reside in a Bay Area city. To identify an asthma-related ED visit or hospitalization, we used the primary and secondary diagnosis codes on each claim record. The *p*-value is taken from a chi-square test.

Because ATTACK clinic staff encourage families to visit their primary care physician and take appropriate medications, data on office visits and medication use provide critical information on intermediate quality-of-care measures the intervention could potentially affect. These data were available to the evaluation only for Alliance-insured children. About 80 percent of such children in the study population had an office visit in the year before their index date (Appendix Table 4). However, only about half of them had at least one asthma-related office visit, although we cannot determine definitively from claims data what was addressed during one of these visits. A larger percentage of children insured by the Alliance had pharmacy claims for rescue medications (over 75 percent), which are indicated for short-term use, than for controller medications (under 60 percent), which are indicated for long-term use (Appendix Table 5). About half the children who used only controller medications had claims for one to three fills at baseline. On average, children had more fills for rescue medications (4.3) than for controller medication (3.7). About 20 percent had controller medication and 35 percent had rescue medication available for more than half (180 days or more) the baseline year (Appendix Table 6). Although clinical guidelines recommend that children with severe asthma use more controller than rescue medications, we do not have an accurate way to gauge asthma severity with claims data. None of the treatment-control differences in baseline office visit or drug use measures were statistically significant.

## B. Visits to the ATTACK Clinic by Children with Asthma

Among children who were eligible for the evaluation's treatment group (2,115), about 30 percent were referred to the ATTACK clinic, and a total of 267 visited (Table 2).<sup>14</sup> Among the entire eligible study population, 13 percent visited the ATTACK clinic. The participation rate, as a

<sup>14</sup> ATTACK staff had a goal of seeing 10 to 12 children per week and aimed to refer at least 30 children per week, assuming (as estimated by CHRCO staff) that only one-third to one-half of those referred actually would visit the clinic. Medicaid-insured children with asthma (ages 1 to 19) who visited the ED on a treatment day were eligible for ATTACK clinic referral and formed the treatment group; those who visited on a control day were not eligible for referral and formed the control group.

percentage of treatment group children referred to the clinic, rose from 35 percent in the first year to 47 percent in the last two years (Appendix Table 7). The number of Medicaid-covered children who visited the clinic per clinic day was as high as 13 but was often (about 40 percent of the time) as few as 1 to 4. Two-thirds of the time, 6 or fewer children visited the clinic, which was held 132 times from July 2008 to June 2011, for a one- to two-hour session. This was about half as many as ATTACK clinic leaders said they could accommodate at full capacity.

**Table 2. ATTACK Clinic Participation Rate Among Children Eligible for the Treatment Group**

	Children Eligible for the Treatment Group	All Children in the Study Population
Number of Children	2,115	4,176
Referred to ATTACK <sup>a</sup>	631	1,364
Referred as a Percentage of All Children	29.8	32.7
Visited the ATTACK Clinic <sup>b</sup>	267	546
Visited as a Percentage of Referred Children	42.3	40.0
<b>Visited as a Percentage of All Children</b>	<b>12.6</b>	<b>13.1</b>

Source: Data submitted by ATTACK clinic staff and CHRCO emergency department (ED) data.

Note: We identified the number of children in the treatment group based on ED visit data provided by CHRCO. A child was considered a member of the treatment group if he or she visited the ED on a randomly assigned treatment day and met other intervention eligibility criteria on that day.

<sup>a</sup>We identified the number of children referred to the clinic based on data provided by ATTACK clinic staff. A child and his or her family could be referred to the clinic either during a visit to the ED on a treatment day or via a telephone call made by an asthma educator who identified the child from ED visit data.

<sup>b</sup>We identified the number of children who visited the clinic based on data provided by ATTACK clinic staff.

As sometimes happens with randomization in real-world settings, children who were ineligible for the evaluation treatment group nonetheless either were referred to or visited the ATTACK clinic (Appendix Table 8). In total, 1,364 children were referred to and 546 children visited the clinic during its three-year intervention period. These groups represent 37 percent and 15 percent of all children eligible for the treatment or control groups, respectively. Among the referred, about 22 percent had two or more previous ED visits for asthma, compared with only 2 percent of the non-referred. However, we also identified that about a quarter of the referred did not have a previous ED visit for asthma as well.

Because many children who were referred to the clinic were not eligible for the experimental treatment group and some children who were actually eligible for the control group visited the ATTACK clinic, conducting only an analysis of the randomly assigned treatment and control groups would have missed a number of children whom the ATTACK clinic intervention might have affected. Thus, we also examined the return ED visit rate among children referred to the clinic, including those who actually visited the clinic, to a comparison group of other children who visited the CHRCO ED for asthma but never visited the ATTACK clinic. We describe this analysis, which relied on propensity score adjustment, in Appendix A and report its results later.

Children who visited the ATTACK clinic were diverse, young, and in need of further asthma case management services in some cases (Appendix Table 9). About a third of the children spoke Spanish as their primary language, and most were younger than 10. More than 90 percent reported

having a regular primary care provider or stable medical home. About half were referred by clinic staff to AsthmaStart for further case management services. Among children who attended, about 80 percent had a previous ED visit for asthma and about 21 percent had multiple previous ED visits for asthma in the last year.

*According to multiple measures reported by CHRCO, most children who visited the ATTACK clinic did not have well-controlled asthma.* For example, as measured by the Asthma Control Test administered to children 4 or older, three-fourths of children were classified as being not well controlled. Likewise, among all children who visited the clinic, only 15 percent had well-controlled asthma. Similarly, about 20 percent had severe persistent asthma, and about a third had moderate persistent asthma during their ATTACK clinic visit.

*Persuading parents and other family members to visit the ATTACK clinic was often challenging.* Some hospital staff estimated that as many as half the families who come to the ED with a child with asthma are not interested in attending the ATTACK clinic. Specifically, after a multi-hour stay in the ED, many families simply do not want to spend additional time (usually necessitating a return trip to the hospital on a different day) for asthma education, regardless of its potential value to their children. In addition, families often faced a number of barriers to attending, such as inadequate transportation and the inability to obtain time off from work.

To boost participation among children and families referred to the clinic on treatment days, clinic staff used a number of strategies, including telephone calls to all families with children who were eligible for the clinic (as identified from the ED census), posters and flyers advertising the clinic, and reminder calls from the Alliance to the families of eligible children. Once a referred patient has scheduled a visit to the ATTACK clinic, an asthma educator calls the family on the day before the visit as a reminder. ATTACK clinic leaders report that phone calls to eligible patients from their asthma educators have been the most successful means of informing families about the clinic and ensuring their attendance. For example, the percentage of treatment group children referred to the ATTACK clinic rose beginning in July 2009, corresponding to the time when these phone calls began.

### **C. Impacts of the ATTACK Clinic on the Return ED Visit Rate**

During the intervention period, there were small, statistically insignificant differences in the return ED visit rate for asthma between the treatment and control groups. For example, about one in 10 children in both the treatment and the control group had a return asthma-related ED visit in the first three months after their index date (Table 3).<sup>15</sup> Because a small percentage of eligible treatment group children actually visited the ATTACK clinic (267 of 2,115), it is not surprising to find no impacts on asthma-related ED visits in this cohort. The ATTACK clinic intervention also did not affect the return ED visit rate for treatment group children who visited the ED for asthma in either the second or the third year of the intervention (Appendix Table 10).

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<sup>15</sup> Only one comparison was statistically significantly different. ED return rates within six months of the index visit were *higher* in the treatment group (17.7 percent) than the control group (15.1). We suspect that this difference is due more likely to chance than to a program impact.

**Table 3: Percentage of Children with Asthma-Related Emergency Department (ED) Visits**

	Treatment	Control/Comparison	Difference	<i>p</i> -value
<b>Comparing Randomly Assigned Treatment and Control Groups</b>				
Number	2,115	1,533		
Percentage with an asthma-related return ED visit (from initial visit) within:				
30 days	4.7	5.0	-0.3	0.634
60 days	7.2	7.0	0.2	0.854
90 days	10.4	9.5	0.9	0.451
<b>Comparing Nonexperimental Treatment and Comparison Groups</b>				
Number	1,364	2,812		
Percentage with an asthma-related return ED visit (from initial visit) within:				
30 days	3.9	4.2	-0.4	0.559
60 days	6.8	6.2	0.5	0.480
90 days	9.7	8.4	1.3	0.151

Source: Children's Hospital and Research Center at Oakland ED data.

Note: Includes all children who had an ED visit for asthma from July 11, 2008, to June 30, 2011. On his or her index date, the child must be at least 1 year old and younger than 19, have a primary or secondary diagnosis of asthma, be insured by Medi-Cal or a Medicaid managed care organization, and reside in a Bay Area city.

All estimates are regression adjusted. See Appendix A of the final evaluation report for complete details.

From 2007 to 2011, we identified a decline in the percentage of ED visits with a primary diagnosis for asthma and a concurrent increase in the percentage with a primary diagnosis for other respiratory symptoms among all children who visited the CHRCO ED. This might reflect real epidemiological changes, but it could reflect changing practices in the way ED providers diagnose and document respiratory illnesses in children. To be certain that we were not missing return ED visits for non-asthma reasons, we also examined if there were differences in the rates at which children returned to the ED for any reason. Again, differences between the treatment and comparison groups were small and not statistically significant (Appendix Table 11). We also examined an expanded definition of *asthma* to include diagnoses for acute respiratory infections and general respiratory symptoms but found no statistically significant treatment-control differences in the return ED visit rate.

Findings from the nonexperimental regression analysis also did not identify impacts on the return ED visit rate for asthma (Appendix Table 12). The treatment-comparison difference in the 30-day ED visit rate (for any reason) was statistically significant and in the right direction under one of three approaches we used, but this was offset by statistically significant differences in the wrong direction using another approach. Overall, the findings from this analysis suggest that the ATTACK clinic did not affect the return ED visit rate for children who visited the clinic compared to other children with asthma and previous ED use.

#### D. The ATTACK Clinic's Return on Investment

We examined ROI from the perspective of both the Alliance and CHRCO. Using medical claims, pharmacy claims, enrollment data, and cost data, we examined utilization and costs of all treatment and control group members who were also insured by the Alliance. Likewise, with information on the return ED visit rate, the number of kids who visited the ATTACK clinic, and operation costs, we calculated the ROI from the perspective of CHRCO.



The ATTACK clinic intervention did not generate a positive ROI for the Alliance during the BCQII intervention period (Appendix Table 13). Total investment and operating costs incurred by the Alliance were about \$32,000 over the three-year BCQII period. However, the health care utilization costs of treatment group members were about \$100,000 more than those of control group members, resulting in a net present value of -\$129,000 and a benefit-cost ratio of -3.0. The large negative ROI was driven primarily by hospital costs, which make up about one quarter of all Alliance costs, among children in the treatment group compared to the control group. Hospitalization costs rose considerably in the first and third years of the intervention for the treatment group compared to their baseline levels, while control group hospital costs were relatively stable throughout the intervention period. The findings are consistent with the outcomes analysis, where we found that the asthma-related hospitalization rate was higher for children assigned to the treatment group relative to the control group in the 120 and 180 days after their index dates (Appendix Table 14). Nonetheless, the ROI to the Alliance would still have been negative, even if we excluded volatile hospital costs from our analysis.

From the perspective of CHRCO, the ATTACK clinic intervention did not generate a positive ROI (assuming a reimbursement rate of \$175 per ATTACK visit) and would have required a large shift in the return ED visit rate to demonstrate one (Appendix Table 15). Even under the assumption of a large drop in the return ED visit rate for asthma, the only way to generate a positive ROI would be to almost double the average number of children who visited the clinic per week, because it would drive up revenue. In fact, making a business case for the ATTACK clinic was somewhat hindered by its high operating costs during the BCQII initiative. A combination of greater attendance and more revenue, smaller operating costs, and a reduction in the return ED visit rate would provide the potential for a positive ROI.

Implementation challenges encountered during the BCQII intervention period, particularly those related to patient recruitment and participation, likely had an influence on CHRCO's ability to demonstrate a business case for quality. Less than one-fifth of all children eligible for the treatment group visited the ATTACK clinic. CHRCO staff reported that a large proportion of the overall patient population is likely not interested in the education the clinic offers, despite their needs. Moreover, ensuring that physicians refer eligible children to the clinic is challenging, particularly on very busy days in the ED, and receiving physician buy-in to this new clinic was also a challenge. Without adequate numbers of children visiting the ATTACK clinic, it would be difficult to affect the rate of return ED visits. Thus, ensuring successful recruitment of children into the asthma education services is a crucial first step. To make this happen, CHRCO might need additional support staff in the ED to make sure eligible patients are being referred and market the ATTACK clinic to community providers as a way of helping to keep their patients healthy and out of the ED and hospital.

## **E. Impacts of the ATTACK Clinic on Office Visits and Medication Use**

The ATTACK clinic intervention did not affect office visits or medication use among treatment group members insured by the Alliance relative to the control group. The proportions of children with an office visit were similar in the treatment and control groups in the 30 to 60 days after children's index visits to CHRCO (Appendix Table 16). Within 60 days, a little more than half of children in either group had an office visit for any reason, and about a third had one for asthma. There were also no differences for these outcomes in the 90- or 180-day periods. In the six months after their index visit, children filled an average of 1.7 controller medication and 2.1 rescue

medication prescriptions (Appendix Table 17). About 60 percent of children had no controller medications filled, and 40 percent had no rescue medications filled in the six months after their index dates. In the same period, less than 20 percent of children had 90 or more days of controller medication available, and about 30 percent had that much rescue medication available.

## F. Limitations

While the evaluation findings are based on rigorous evaluation methods that included a number of sensitivity checks, some limitations still exist. First, although we examined outcomes for both the randomly assigned treatment and control groups and nonexperimental cohorts, the propensity score analysis used for the latter work is limited by the propensity score algorithm's ability to match children treated by the intervention with available comparison group children not treated. Second, because prescription drug and office visit data were available only for children insured by the Alliance, we were unable to determine if the ATTACK clinic intervention had an impact on medication use or office visits among all children in the treatment group. Changes in these outcomes could be a signal that the intervention was having some positive effect that might translate to fewer ED visits in the future.

## V. Implications for the Business Case in Medicaid

The ATTACK clinic operated at a time when other policy initiatives around children's health care, and health care more broadly, were also taking shape. In particular, under Section 2706 of the Affordable Care Act of 2010, states can allow pediatric health care providers to form accountable care organizations (ACOs) to receive payments tied to savings to Medicaid. The education provided by the ATTACK clinic is one example of an activity that a pediatric ACO might provide if it had a financial incentive to reduce the use of ED and hospital services. A pediatric ACO might use some type of shared savings rule as a mechanism for supporting education and aligning financial incentives between the education provider, other providers, and the insurer. The experience of CHRCO and the Alliance in BCQII might inform the development of models in terms of timing and magnitude of shared savings and the extent of upfront investment required.

Although the ATTACK clinic did not result in a positive ROI for either the Alliance or CHRCO during the BCQII initiative, the experience still offers a number of lessons that might help others establish a business case for quality in Medicaid. In particular, findings from the evaluation hold lessons for implementing quality improvement initiatives in Medicaid, including identifying strategies to overcome recruitment and participation barriers, obtaining provider buy-in and keeping providers engaged throughout the intervention, and building stakeholder support so that the intervention can achieve sustainability. The intervention also offers lessons for achieving a positive ROI, including incorporating ROI considerations into the design phase of the intervention, identifying the right intervention intensity needed to affect patient outcomes, and targeting children most likely to benefit from the intervention (for example, high-risk children with multiple previous ED visits).

### *Lessons for Achieving a Positive ROI*

Identifying the right amount of intervention intensity—how often to interact with members of the target population and for how long—plays a significant role in an intervention's success and ability to affect patient outcomes and ultimately, ROI. For the Alameda-CHRCO team, a single,

intensive education session was chosen as the preferred intervention, partly because of resource limitations but also because it took a lot of staff effort to persuade families to make a single ATTACK clinic visit. Findings from the evaluation suggest that a single education session might not be enough to affect the return ED visit rate for asthma at the population level. Because the vast majority of children who are likely to visit the ATTACK clinic in the future are likely to have asthma that is not well controlled, CHRCO might consider multiple visits in the future with the children and their families to reinforce asthma education or to locate where it might be more convenient for them to visit. Such an approach, of course, requires that children and families be engaged enough to visit the clinic more than once or to actually visit when they commit to do so.

To have an effect on quality or utilization at the population level, it is necessary to identify and engage members of the population who are high utilizers of care and also tend to be high-risk members. It is also necessary for a considerable proportion of the high-risk population to be engaged in quality improvement activities in a meaningful way; otherwise, desired effects are unlikely. For example, while 55 percent of children with two or more previous ED visits for asthma in the Alameda-CHRCO study population were referred to the ATTACK clinic, only 20 percent of the children with two or more such visits actually visited the clinic. Thus, while ATTACK clinic staff attempted to engage higher-risk children, having only a small proportion of them visit was likely a key factor in failing to affect the return ED visit rate for asthma.

Factoring ROI considerations into the design phase of an intervention can help an organization make a realistic assessment of what it will take to achieve a positive ROI. This means estimating the expected operating costs of the intervention, as well as what type of impact the intervention would need to have (in the form of utilization changes) to break even. To demonstrate a business case, the ATTACK clinic, and other initiatives like it, must attract enough families to cover operating costs or, alternatively, reduce operating costs to better correspond to the actual number of children who visit. For example, during the BCQII intervention period, total operating costs were more than \$300,000 for the ATTACK clinic. At the rate of \$175 per visit, about 12 families would have to visit each week (about three times as many as visited per week during BCQII) to cover total operating costs with reimbursement. With the ATTACK clinic being subsumed into the CHRCO primary care clinic, some operating costs might now be covered, but the need to recruit more families and be reimbursed for more visits to break even remains. Being able to contact all children and families going forward (without randomly assigned control days) might also assist in attracting as many children as possible to take up these services and learn how to better manage their asthma.

### *Lessons for Implementing Quality Improvement Initiatives*

Obtaining and maintaining provider buy-in and engagement is critical to the success of an intervention like the ATTACK Clinic. Relying on ED physicians, some of whom were not fully engaged in the intervention, or who did not buy in to the intervention's randomized approach, presented a significant barrier to the ATTACK clinic's success. CHRCO might consider other ways to engage providers actively in this initiative. For example, placing an asthma educator in the ED regularly to engage children with asthma and their families and as a reminder to ED staff might spur stronger engagement and response to the intervention. ATTACK clinic staff might also consider identifying other ED staff, perhaps a respiratory therapist, who could champion the clinic among their colleagues. During the BCQII initiative, staff reported that a key reason some families visited the ATTACK clinic was because the clinic's co-director was also an ED physician who championed the program. Of course, if any strategy considered to enhance engagement adds a potential cost to

the intervention, then this cost must be weighed against the potential benefit to maintain the hope of a positive return.

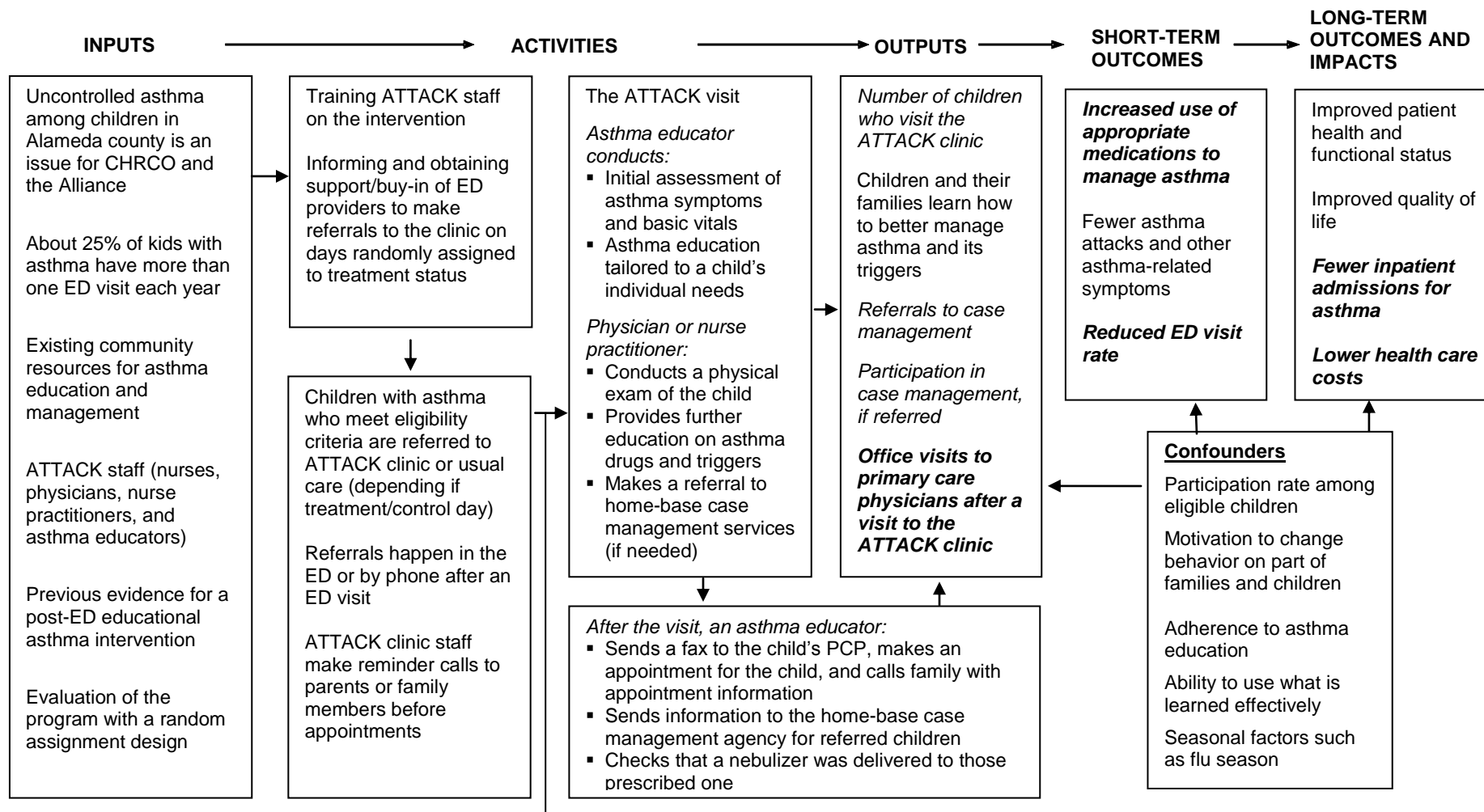
Identifying and implementing strategies to overcome patient engagement and participation barriers is also critical to an intervention like the ATTACK clinic. For patients such as those visiting the CHRCO ED, who have significant challenges in other areas of life, it is important to make the intervention as seamless to obtain as possible. As reported by members of the ATTACK clinic staff, the typical families who visit the clinic do not have sufficient transportation or flexible work schedules. The ATTACK clinic required a follow-up visit on a different day to a different location, thus presenting a challenge even for families who genuinely wanted to obtain ATTACK clinic services. The new location of the ATTACK clinic at the CHRCO primary care clinic might help attract families, since they will not have to travel directly to the hospital (where they might have had to wait some time to be seen) and might enable the ATTACK clinic to have more flexible hours in the future. Further partnership with the Alliance, perhaps in the form of additional reminder calls or targeting, might also spur participation.

Finally, the ATTACK clinic's sustainability highlights the importance of obtaining stakeholder support. Although the ATTACK clinic did not generate improved quality outcomes or a positive ROI when subjected to rigorous evaluation methods, the CHRCO team's successful implementation of the intervention, internal data analysis by the Alameda Alliance on the ED use of its members over a multi-year period (that might have been due to existing trends), and anecdotal evidence that the clinic was improving the lives of children that visited were enough to convince the Alameda Alliance to reimburse CHRCO for ATTACK clinic services, and to get other major insurers interested in doing the same. Engaging stakeholders that may be interested in more than just their bottom line, as the ATTACK clinic team has done, can help make an intervention financially viable or the sponsoring organization even in the absence of robust ROI findings.

## References

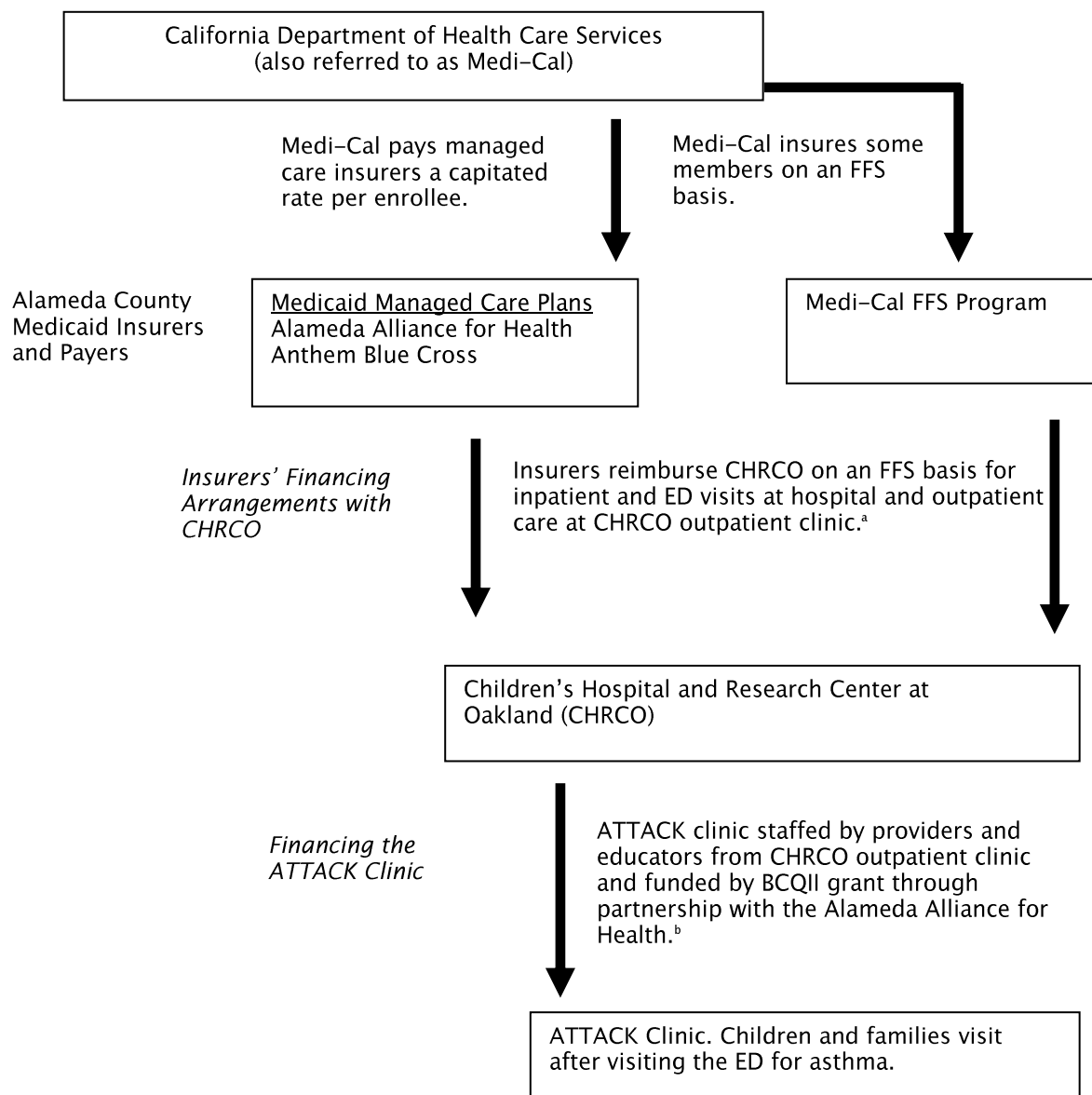
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Figure 1: Logic Model for the Asthma Tools and Training Advancing Community Knowledge (ATTACK) Clinic



Note: Bold text indicates reported process measures. Bold italic text indicates outcome measures to be collected with claims data. CHRCO = Children's Hospital and Research Center at Oakland; the Alliance = the Alameda Alliance for Health; ED = emergency department; PCP = primary care provider.

**Figure 2. Financial Arrangements: Alameda County Medicaid and the ATTACK Clinic**



<sup>a</sup> From July 2008 to February 2011, the Alameda Alliance for Health reimbursed CHRCO on a capitated basis for ED visits for its members. Starting in March 2011, this changed to an FFS basis. All other health plans reimbursed CHRCO on an FFS basis during the intervention period.

<sup>b</sup> After the BCQII intervention period ended, the ATTACK clinic became a permanent part of the CHRCO outpatient clinic and was funded on an FFS basis by Alameda Alliance for Health and other insurers.

## **APPENDIX**

### **ATTACK CLINIC OUTCOMES AND RETURN ON INVESTMENT TABLES**

**Table 1. Demographic Characteristics of Alameda-CHRCO Study Population (percentages)**

	Treatment	Control	Difference	<i>p</i> -value
Number of Beneficiaries	2,115	1,533		
First Date of Eligibility				
Year 1 (July 2008 to June 2009)	46.9	46.4	0.4	0.885
Year 2 (July 2009 to June 2010)	33.0	32.8	0.3	
Year 3 (July 2010 to June 2011)	20.1	20.8	-0.7	
Female	43.1	41.6		0.365
Age				
Younger than 2 years	17.6	18.3	-0.7	0.527
2 to younger than 5 years	33.1	32.6	0.5	
5 to younger than 12 years	37.0	36.7	0.3	
12 to younger than 15 years	6.7	5.7	1.0	
15 to younger than 19 years	5.6	6.7	-1.0	
Medicaid Type <sup>a</sup>				
Alameda Alliance for Health	51.5	52.7	-1.2	0.768
Anthem Blue Cross	26.9	26.0	0.9	
Medi-Cal FFS	21.6	21.3	0.3	
Race/Ethnicity				
Caucasian	2.8	1.9	0.9	0.307
African-American	47.6	46.5	1.1	
Latino	34.0	34.7	-0.7	
Asian/Pacific Islander	3.7	4.5	-0.8	
Other <sup>b</sup>	11.9	12.4	-0.5	
Common Comorbid Conditions <sup>c</sup>				
Acute respiratory infection	30.6	29.8	0.9	0.583
Ear infection (otitis media)	9.9	10.4	-0.6	
Pneumonia	6.4	6.4	0.0	

Source: Children's Hospital and Research Center at Oakland emergency department (ED) and hospital data.

Note: Includes all children with asthma who have an index ED visit from July 11, 2008, to June 30, 2011. On their first day of eligibility, the child must be at least 1 year old and younger than 19, have a primary or secondary diagnosis of asthma (493.xx), be insured by Medi-Cal or a Medicaid managed care organization, and reside in a Bay Area city.

*p*-values are taken from t-tests (for dichotomous variables) and chi-square tests (for categorical variables).

<sup>a</sup> Children were classified as Medicaid enrollees if they had Medi-Cal fee-for-service or a Medicaid managed care organization listed as either a primary or secondary insurer. If Medicaid was both primary and secondary, we used the primary insurer to classify the child.

<sup>b</sup> "Other" includes children who have a value of NAM, OTH, or U for the race variable or are missing a value for the ethnicity variable, as reported by CHRCO.

<sup>c</sup> We identified common comorbid conditions from ED and hospital claims with any diagnosis of acute respiratory infection (460.xx to 466.xx and 786.xx), ear infection (382.xx), and pneumonia (486.xx).

Alameda-CHRCO = Alameda Alliance for Health-Children's Hospital and Research Center at Oakland.



**Table 2. Emergency Department (ED) Visits and Hospitalizations in the 12 Months Before the Index ED Visit (Percentages)**

	Treatment	Control	Difference	<i>p</i> -value
<b>Number of Beneficiaries</b>	<b>2,115</b>	<b>1,533</b>		
<b>ED Visits or Hospitalizations for Any Reason</b>				
Any ED Visit (percentage)	55.3	52.8	2.6	0.128
Mean Number of ED Visits	1.20	1.18	0.02	0.741
Any Hospitalization (percentage)	14.8	13.2	1.5	0.196
Mean Number of Hospitalizations	0.20	0.19	0.01	0.717
<b>ED Visits or Hospitalizations for Asthma (primary or secondary diagnosis)</b>				
Any ED Visit (percentage)	9.9	10.5	-0.6	0.540
Mean Number of ED Visits	0.14	0.15	-0.01	0.501
Any Hospitalization (percentage)	10.6	8.6	2.1	0.036
Mean Number of Hospitalizations	0.13	0.11	0.02	0.145

Source: Children's Hospital and Research Center at Oakland emergency department and hospital data.

Note: Includes all children with asthma who have an index emergency department (ED) visit from July 11, 2008, to June 30, 2011. On their first day of eligibility, the child must be at least 1 year old and younger than 19, have a primary or secondary diagnosis of asthma (493.xx), be insured by Medi-Cal or a Medicaid managed care organization, and reside in a Bay Area city.

To identify an asthma-related ED visit or hospitalization, we used the primary and secondary diagnosis codes on each claim record.

*p*-values are taken from t-tests (for dichotomous and continuous variables).

**Table 3. Distribution of Emergency Department (ED) Visits and Hospitalizations in the 12 Months Before Index the ED Visit (percentages)**

	Treatment	Control	Difference	<i>p</i> -value
Number of Beneficiaries	2,115	1,533		
<b>ED Visits or Hospitalizations for Any Reason</b>				
ED Visits				
0	44.7	47.2	-2.6	0.166
1	26.5	23.9	2.6	
2 or more	28.8	28.8	-0.0	
Hospitalizations				
0	85.3	86.8	-1.5	0.247
1	11.3	9.6	1.7	
2 or more	3.5	3.7	-0.2	
<b>ED Visits or Hospitalizations for Asthma</b>				
ED Visits				
0	90.1	89.5	0.6	0.721
1	7.2	7.9	-0.7	
2 or more	2.7	2.6	0.1	
Hospitalizations				
0	89.4	91.5	-2.1	0.094
1	8.9	7.0	2.0	
2 or more	1.7	1.6	0.1	

Source: Children's Hospital and Research Center at Oakland emergency department and hospital data.

Note: Includes all children with asthma who have an index ED visit from July 11, 2008, to June 30, 2011. On their first day of eligibility, the child must be at least 1 year old and younger than 19, have a primary or secondary diagnosis of asthma (493.xx), be insured by Medi-Cal or a Medicaid managed care organization, and must reside in a Bay Area city. We define an ED visit or hospital admission as being for asthma if any diagnosis code was for asthma.

To identify an asthma-related ED visit or hospitalization, we used the primary and secondary diagnosis codes on each claim record.

*p*-values are taken from chi-square tests.

**Table 4. Office Visits Among Children in the Alameda-CHRCO Study Population in the 12 Months Before the Index Emergency Department (ED) Visit**

	Treatment	Control	Difference	<i>p</i> -value
Number of Beneficiaries	1,072	778		
<b>Visits for Any Reason</b>				
Any Visit (percentage)	78.8	80.0	-1.2	0.538
Mean Annualized Number of Visits	3.6	3.9	-0.3	0.092
<b>Visits for Asthma</b>				
Any Visit (percentage)	43.6	46.6	-3.0	0.211
Mean Annualized Number of Visits	1.2	1.3	-0.1	0.283

Source: Alameda Alliance for Health (Alliance) prescription drug claims and enrollment data and Children's Hospital and Research Center at Oakland ED and hospital data.

Note: Includes all children with asthma who have an index ED visit from July 11, 2008, to June 30, 2011, and are enrolled in the Alliance Medicaid managed care plan for at least one day before the index date and one day after it. On their first day of eligibility, the child must be at least 1 year old and younger than 19, have a primary or secondary diagnosis of asthma (493.xx), be insured by Medi-Cal or a Medicaid managed care organization, and reside in a Bay Area city.

To annualize the count of office visits, we divided the actual number of visits by the number of days enrolled and multiplied by 365. To identify an asthma-related office visit, we used the primary and secondary diagnosis codes on each claim record.

Because sample members might have fewer than 12 months of Alliance enrollment before their index dates, we weight results according to number of days enrolled. We normalize weights so that they sum to the total number of sample members. *p*-values are taken from *t*-tests (for dichotomous and continuous variables).

Alameda-CHRCO = Alameda Alliance for Health-Children's Hospital and Research Center at Oakland; ED = emergency department.

**Table 5. Controller and Rescue Medication Utilization in the 12 Months Before the Index Emergency Department (ED) Visit: Number of Fills**

	Treatment	Control	Difference	<i>p</i> -value
Number of Beneficiaries	1,081	782		
<b>Utilization of Controller Medications</b>				
Mean Number of Fills	3.7	4.0	-0.3	0.493
Percentage with:				
No fills	43.8	40.7	3.0	0.643
1 to 3 fills	26.8	29.9	-3.0	
4 to 6 fills	12.6	12.2	0.4	
7 to 9 fills	5.4	5.2	0.2	
10 or more fills	11.5	12.0	-0.6	
<b>Utilization of Rescue Medications</b>				
Mean Number of Fills	4.3	4.8	-0.5	0.062
Percentage with:				
No fills	23.9	22.0	1.9	0.452
1 to 3 fills	33.4	33.8	-0.4	
4 to 6 fills	21.0	19.7	1.3	
7 to 9 fills	9.8	9.8	0.1	
10 or more fills	11.9	14.7	-2.8	

Source: Alameda Alliance for Health (Alliance) prescription drug claims and enrollment data and Children's Hospital and Research Center at Oakland ED and hospital data.

Note: Includes all children with asthma who have an index ED visit from July 11, 2008, to June 30, 2011, and are enrolled in the Alliance Medicaid managed care plan for at least one day before the index date and one day after it. On their first day of eligibility, the child must be at least 1 year old and younger than 19, have a primary or secondary diagnosis of asthma (493.xx), be insured by Medi-Cal or a Medicaid managed care organization, and reside in a Bay Area city.

We measure use of controller and rescue medications in the 12 months before a treatment or control group member's index date. Controller medications include inhaled corticosteroids (triamcinolone acetonide, beclomethasone dipropionate, flunisolide, fluticasone propionate, beclomethasone dipropionate, budesonide, fluticasone propionate, ciclesonide, and mometasone), leukotriene inhibitors (zafirlukast, montelukast, and zileuton), long-acting bronchodilators (salmeterol, salmeterol xinafoate, and formoterol), and mast-cell stabilizers (cromolyn sodium and nedocromil). Rescue medications include short-acting beta agonists (proventil, ventolin, levalbuterol, pirbuterol, orciprenaline, and terbutaline) and noninhaled corticosteroids (prednisone, methylprednisolone, and prednisolone).

Because sample members might have fewer than 12 months of Alliance enrollment before their index dates, we weight results according to number of days enrolled. We normalize weights so that they sum to the total number of sample members. *p*-values are taken from *t*-tests (for continuous variables) and chi-square tests (for categorical variables).

**Table 6. Controller and Rescue Medication Utilization in the 12 Months Before the Index Emergency Department (ED) Visit: Days of Medication Available and Percentage of Days Covered**

	Treatment	Control	Difference	<i>p</i> -value
Number of Beneficiaries	1,081	782		
<b>Utilization of Controller Medications</b>				
Mean Days of Medication Available (DMA) <sup>a</sup>	132.0	142.3	-10.3	0.507
Percentage with:				
No DMA	43.8	40.7	3.0	0.721
More than 0 and up to 90	28.0	29.0	-0.9	
More than 90 and up to 180	8.7	9.9	-1.2	
More than 180 and up to 270	5.7	6.4	-0.7	
More than 270	13.9	14.0	-0.2	
Percentage of Days Covered (PDC) <sup>b</sup>				
Mean PDC	23.6	24.5	-0.9	0.578
Percentage with PDC ≥ 80%	14.4	15.5	-1.0	0.553
Percentage with PDC ≥ 90%	13.4	14.5	-1.1	0.526
<b>Utilization of Rescue Medications</b>				
Mean DMA <sup>a</sup>	226.2	270.0	-43.7	0.036
Percentage with:				
No DMA	23.9	22.0	1.9	0.786
More than 0 and up to 90	32.8	34.0	-1.2	
More than 90 and up to 180	8.9	8.8	0.1	
More than 180 and up to 270	8.4	7.5	0.9	
More than 270	26.0	27.7	-1.7	
<b>Ratio of Controller Medications to Total Asthma Medications</b>				
Mean of ratio of Controller Medications DMA to Controller plus Rescue Medications DMA	24.1	23.9	0.1	0.927

Source: Alameda Alliance for Health (Alliance) prescription drug claims and enrollment data and Children's Hospital and Research Center at Oakland ED and hospital data.

Note: Includes all children with asthma who have an index ED visit from July 11, 2008, to June 30, 2011, and are enrolled in the Alliance Medicaid managed care plan for at least one day before the index date and one day after it. On their first day of eligibility, the child must be at least 1 year old and younger than 19, have a primary or secondary diagnosis of asthma (493.xx), be insured by Medi-Cal or a Medicaid managed care organization, and reside in a Bay Area city.

See Table 5 for a list of controller and rescue medications.

Because sample members might have fewer than 12 months of Alliance enrollment before their index dates, we weight results according to number of days enrolled. We normalize weights so that they sum to the total number of sample members. *p*-values are taken from *t*-tests (for dichotomous and continuous variables) and chi-square tests (for categorical variables).

<sup>a</sup> DMA are derived from the quantity field on the Alliance pharmacy claims data. When the quantity field was coded as missing or zero, we used the median value of all other claims for that drug class. For inhaled corticosteroids, we divided quantity by two because the median value for each claim was 60, and a typical day's supply value is 30.

<sup>b</sup> Percentage of days covered is calculated by dividing adjusted DMA by the number days enrolled and multiplying by 100. The adjusted DMA adds any remaining medication available from just before the 12-month pre-period and subtracts any medication available that extends beyond the index date.

**Table 7. ATTACK Clinic Participation Rate Among Children Eligible for the Treatment Group, by Six-Month Intervals**

	Referred to Clinic <sup>a</sup>			Attended Clinic <sup>b</sup>		
	Number of Children	Number of Children	Percentage of Total	Number of Children	Percentage of Treatment Group	Percentage of Referred
Jul - Dec 2008	375	93	24.8	35	9.3	37.6
Jan - Jun 2009	599	145	24.2	48	8.0	33.1
Jul - Dec 2009	367	120	32.7	58	15.8	48.3
Jan - Jun 2010	340	111	32.6	53	15.6	47.7
Jul - Dec 2009	194	85	43.8	36	18.6	42.4
Jan - Jun 2010	240	77	32.1	37	15.4	48.1
<b>Total</b>	<b>2,115</b>	<b>631</b>	<b>29.8</b>	<b>267</b>	<b>12.6</b>	<b>42.3</b>

Source: Data submitted by ATTACK clinic staff and data from CHRCO emergency department (ED).

Note: We identified the number of children in the treatment group based on ED visit data provided by CHRCO. A child was considered a member of the treatment group if he or she visited the ED on a randomly assigned treatment day and met other intervention eligibility criteria on that day.

<sup>a</sup>We identified the number of children referred to the clinic based on data provided by ATTACK clinic staff. A child and his or her family could be referred to the clinic either during a visit to the ED on a treatment day or via a telephone call made by an asthma educator who identified the child from ED visit data.

<sup>b</sup>We identified the number of children who visited the clinic based on data provided by ATTACK clinic staff.

**Table 8. ATTACK Clinic Participation Rate Among Children Referred to the Clinic and the Treatment Group, by Six-Month Intervention Intervals**

	Children Eligible for or Referred to the ATTACK Clinic	Children Referred to Clinic <sup>a,c</sup>	Referred as a Percentage of the Total	Children Who Attended the Clinic <sup>b</sup>	Attended as a Percentage of the Referred
Jul - Dec 2008	606	176	29.0	66	37.5
Jan - Jun 2009	1,097	271	24.7	101	37.3
Jul - Dec 2009	734	249	33.9	100	40.2
Jan - Jun 2010	736	274	37.2	110	40.1
Jul - Dec 2009	459	186	40.5	77	41.4
Jan - Jun 2010	544	208	38.2	92	44.2
<b>Total</b>	<b>4,176</b>	<b>1,364</b>	<b>32.7</b>	<b>546</b>	<b>40.0</b>

Source: Process measure data submitted by ATTACK clinic staff and data from CHRCO emergency department (ED).

Note: We identified the number of children in the treatment group based on ED visit data provided by CHRCO. A child was considered a member of the treatment group if he or she visited the ED on a randomly assigned treatment day and met other intervention eligibility criteria on that day.

<sup>a</sup>We identified the number of children referred to the clinic based on data provided by ATTACK clinic staff. A child and his or her family could be referred to the clinic either during a visit to the ED on a treatment day or via a telephone call made by an asthma educator who identified the child from ED visit data.

<sup>b</sup>We identified the number of children who visited the clinic based on data provided by ATTACK clinic staff.

<sup>c</sup>Children included in these columns may or may not have met all study research sample inclusion criteria. However, we do exclude 23 children who attended the clinic but could not be matched to the CHRCO data with their identification number, or who did not meet the inclusion criteria for age, excluded illnesses (for example, cancer), or a same-day inpatient admission.

**Table 9. Characteristics of Children Who Visited the ATTACK Clinic**

<b>Number of Children</b>	<b>546</b>
Primary Spoken Language	
English	65.2
Spanish	33.1
Other	1.7
Age	
Younger than 4 years	43.7
At least 4 but younger than 10 years	37.6
10 years or older	18.7
Stable Medical Home	92.1
Referred to Asthma Start Case Management	48.8
<i>Measures of Asthma Severity</i>	
Asthma control test: not well controlled	76.1
Asthma Classification	
Intermittent	26.6
Mild persistent	22.1
Moderate persistent	32.3
Severe persistent	19.0
Asthma Control	
Well controlled	15.2
Not well controlled	56.4
Poorly controlled	28.5
Insurance Type	
Alameda Alliance for Health	54.2
Anthem Blue Cross	23.4
Medi-Cal FFS	22.3
Race/Ethnicity	
Black	40.1
Latino	44.1
Other	15.8
Percentage (in the year before their visit) with	
No ED visits for asthma	22.7
One ED visit for asthma	55.7
More than one ED visit for asthma	21.4

Source: Data submitted by ATTACK clinic staff in August 2011 and CHRCO emergency department data.

Note: The ATTACK clinic intervention began in late July 2008.



**Table 10: Asthma-Related Emergency Department (ED) Visits After the Index ED Visit**

	Treatment	Control	Difference	p-value
<b>Children with an Index Date from July 11, 2008, to July 10, 2009</b>				
Number of Beneficiaries	991	712		
Percentage with an Asthma-Related Return Visit Within:				
30 days	6.1	6.5	-0.4	0.694
60 days	9.1	9.3	-0.2	0.879
90 days	13.4	12.2	1.2	0.559
120 days	16.8	14.9	1.9	0.353
180 days	22.0	18.7	3.3	0.137
<b>Children with an Index Date from July 11, 2009, to July 10, 2010</b>				
Number of Beneficiaries	698	502		
Percentage with an Asthma-Related Return Visit Within:				
30 days	3.3	4.2	-0.9	0.522
60 days	5.4	6.2	-0.7	0.729
90 days	8.0	7.4	0.7	0.581
120 days	9.5	9.2	0.3	0.816
180 days	13.8	13.1	0.6	0.824
<b>Children with an Index Date from July 11, 2010, to June 30, 2011</b>				
Number of Beneficiaries	426	319		
Percentage with an Asthma-Related Return Visit Within:				
30 days	3.8	2.8	0.9	0.781
60 days	5.6	3.1	2.3	0.159
90 days	7.3	6.6	0.7	0.948
120 days	9.6	8.1	1.5	0.612
180 days	13.3	9.1	4.2	0.108

Source: Children's Hospital and Research Center at Oakland ED and hospital data.

Note: Includes all children with asthma who have an index ED visit from July 11, 2008, to June 30, 2011. On their first day of eligibility, the child must be at least 1 year old and younger than 19, have a primary or secondary diagnosis of asthma (493.xx), be insured by Medi-Cal or a Medicaid managed care organization, and reside in a Bay Area city.

To identify an asthma-related ED visit or hospitalization, we used the primary and secondary diagnosis codes on each claim record.

Because sample members might have fewer than six months of enrollment after their index dates, we weight results according to number of days enrolled (between index and exit). We normalize weights so that they sum to the total number of sample members.

All estimates are regression adjusted. See Appendix A of the final evaluation report for complete details.

**Table 11. Percentage of Children with Emergency Department (ED) Visit for Any Reason in the First 6 Months After the Index ED Visit**

	Treatment	Control	Regression- Adjusted Difference	p-value
Number of Beneficiaries	2,115	1,533		
<b>ED Visits for Any Reason</b>				
Percentage with a Return Visit Within:				
30 days	12.0	12.1	-0.1	0.985
60 days	20.2	18.9	1.3	0.272
90 days	27.5	25.5	2.0	0.214
120 days	32.7	30.5	2.2	0.183
180 days	41.7	39.2	2.5	0.169

Source: Children's Hospital and Research Center at Oakland ED and hospital data.

Note: Includes all children with asthma who have an index ED visit from July 11, 2008, to June 30, 2011. On their first day of eligibility, the child must be at least 1 year old and younger than 19, have a primary or secondary diagnosis of asthma (493.xx), be insured by Medi-Cal or a Medicaid managed care organization, and reside in a Bay Area city.

Because sample members might have fewer than six months of enrollment after their index dates, we weight results according to number of days enrolled (between index and exit). We normalize weights so that they sum to the total number of sample members.

All estimates are regression adjusted. See Appendix A of the final evaluation report for complete details.

**Table 12. Emergency Department (ED) Return for Children Referred to the ATTACK Clinic, Compared to Children Who Were Not Referred**

Outcome	Difference (referred group – comparison group)			Mean
	Regression	Coarsened Exact Matching	Normalized Propensity Score Reweighting	
Percentage with ED Return for Asthma Within				
30 days	-0.29	0.33	-1.45	3.76
60 days	0.57	1.92*	-0.48	5.63
90 days	1.30	2.85*	0.55	7.86
120 days	1.29	3.27*	0.31	9.88
180 days	3.31*	5.44*	1.67	12.96
Percentage with ED Return for Any Reason Within				
30 days	-2.00	-1.03	-2.76*	10.71
60 days	-0.01	1.87	-0.50	17.48
90 days	1.10	3.18*	1.39	23.80
120 days	2.31	4.83*	1.95	28.42
180 days	2.68	5.82*	1.74	36.66

Source: Children's Hospital and Research Center at Oakland ED and hospital data.

Note: Three methods were used to compare ED return rates for children who were referred to the clinic to children in the research sample (see text for a definition) who were not referred. For each outcome, we present the difference between the treatment group ED return rate and the comparison group ED return rate. The first column presents the regression-adjusted difference, the second uses coarsened exact matching to select matched children, and the third uses normalized propensity score reweighting to balance baseline characteristics of the two groups. See the technical appendix for more details on these methods.

To identify an asthma-related ED visit or hospitalization, we used the primary and secondary diagnosis codes on each claim record.

To facilitate understanding of the relative magnitude of the differences, the fourth column presents the regression-adjusted mean for the comparison group using the regression model (that is, associated with column 1).

See Appendix A of the final evaluation report for complete details.

\*Significantly different from zero at the .05 level, two-tailed test.

**Table 13: Alameda Alliance: Incremental Return on Investment**

	Baseline	Year 1	Year 2	Year 3	Total
Investment in BCQII Intervention					
Discounted Investment or Operating Costs	\$27,000	\$2,249	\$2,134	\$879	\$32,262
Discounted Cost Savings/Loss from BCQII Intervention		\$(63,052)	\$20,665	\$(54,396)	\$(96,782)
<b>Return on Investment</b>					
Benefit-Cost Ratio		-2.16	-1.35	-3.00	-3.00
Net Present Value					(\$129,044)

Source: Alameda Alliance for Health (Alliance) prescription drug claims and enrollment data, Children's Hospital and Research Center at Oakland emergency department and hospital data, and cost data submitted by the Alliance.

Note: Costs exclude grant funding received from CHCS and passed through to Children's Hospital and Research Center at Oakland (CHRCO). We used a discount rate of 3 percent.  
Refer to Appendix B of the final evaluation report for a description of the ROI analysis calculations.

**Table 14. Percentage of Children with a Hospital Admission in the First 6 Months After the Index Emergency Department (ED) Visit**

	Treatment	Control	Regression- Adjusted Difference	p-value
Number of Children	2,115	1,533		
<b>Hospital Admission for Any Reason</b>				
Percentage with a Return Visit Within:				
30 days	2.4	2.5	-0.2	0.760
60 days	3.7	3.6	0.1	0.911
90 days	4.9	4.5	0.5	0.506
120 days	6.0	5.0	0.9	0.212
180 days	8.1	6.5	1.5	0.076
<b>Hospital Admission for Asthma</b>				
30 days	1.7	1.8	0.0	0.947
60 days	3.0	2.6	0.4	0.491
90 days	3.8	3.1	0.7	0.224
120 days	4.9	3.6	1.3	0.049
180 days	6.3	4.6	1.7	0.029

Source: Children's Hospital and Research Center at Oakland ED and hospital data.

Note: Includes all children with asthma who have an index ED visit from July 11, 2008, to June 30, 2011. On their first day of eligibility, the child must be at least 1 year old and younger than 19, have a primary or secondary diagnosis of asthma (493.xx), be insured by Medi-Cal or a Medicaid managed care organization, and reside in a Bay Area city.

Because sample members might have fewer than six months of enrollment after their index dates, we weight results according to number of days enrolled (between index and exit). We normalize weights so that they sum to the total number of sample members.

All estimates are regression adjusted. See Appendix A of the final evaluation report for complete details.

**Table 15. Return on Investment for the Children’s Hospital and Research Center at Oakland (CHRCO)**

	Similar Emergency Department Visit Rate		Reduce Emergency Department Visit Rate to 1 Percent	
	Actual Visits	Max Visits	Actual Visits	Max Visits
<b>Investment/Operating costs</b>				
Baseline	\$101,865	\$101,865	\$101,865	\$101,865
Year 1	\$95,982	\$95,982	\$95,982	\$95,982
Year 2	\$100,090	\$100,090	\$100,090	\$100,090
Year 3	\$112,547	\$112,547	\$112,547	\$112,547
<b>Total Costs</b>	<b>\$410,483</b>	<b>\$410,483</b>	<b>\$410,483</b>	<b>\$410,483</b>
<b>Revenue</b>				
Visit Reimbursement	\$90,415	\$250,427	\$90,415	\$250,427
Grant Funding	\$123,402	\$123,402	\$123,402	\$123,402
<b>Total Revenue</b>	<b>\$223,817</b>	<b>\$366,879</b>	<b>\$223,817</b>	<b>\$366,879</b>
<b>Loss/Gain to CHRCO on ED/Hospital Use</b>	<b>\$(692)</b>	<b>\$(692)</b>	<b>\$56,867</b>	<b>\$56,867</b>
<b>Discounted Net Present Value</b>	<b>\$(197,357)</b>	<b>\$(37,346)</b>	<b>\$(139,799)</b>	<b>\$20,213</b>

Source: Alameda Alliance for Health (Alliance) prescription drug claims and enrollment data, CHRCO Emergency Department and hospital data, and financial data submitted by CHRCO.

**Table 16. Office Visits Among Children in the First 6 Months After the Index Emergency Department (ED) Visit**

	Treatment	Control	Difference	<i>p</i> -value
Number of Beneficiaries	1,072	778		
Office Visit for Any Reason Within:				
30 days	43.3	42.0	1.3	0.568
60 days	53.2	52.4	0.9	0.708
Office Visit for Asthma Within:				
30 days	27.6	26.0	1.6	0.442
60 days	33.1	32.4	0.8	0.721

Source: Alameda Alliance for Health (Alliance) prescription drug claims and enrollment data and Children's Hospital and Research Center at Oakland ED and hospital data.

Note: To annualize the count of office visits, we divide the actual number by the number of days enrolled and multiply by 365. To identify an asthma-related office visit, we used the primary and secondary diagnosis codes on each claim record.

Includes all children with asthma who have an index ED visit from July 11, 2008, to June 30, 2011. On their first day of eligibility, the child must be at least 1 year old and younger than 19, have a primary or secondary diagnosis of asthma (493.xx), be insured by Medi-Cal or a Medicaid managed care organization, and reside in a Bay Area city.

Because sample members might have fewer than six months of enrollment after their index dates, we weight results according to number of days enrolled (between index and exit). We normalize weights so that they sum to the total number of sample members.

All estimates are regression adjusted. See Appendix A of the final evaluation report for complete details.

**Table 17: Controller Medication Utilization in the First 6 Months After the Index Emergency Department (ED) Visit: Number of Fills**

	Treatment	Control	Difference	p-value
Number of Beneficiaries	947	695		
<b>Controller Medications</b>				
Average Number of Fills	1.6	1.7	-0.1	0.384
Percentage with:				
No fills	58.1	60.9	-2.7	0.533
1 to 3 fills	31.5	28.6	2.9	
4 or more fills	10.4	10.6	-0.2	
Average Days of Medication Available (DMA) <sup>a</sup>	50.2	52.8	-2.6	0.698
Percentage with:				
No DMA	52.1	53.5	52.1	0.519
More than 0 and up to 90	31.0	28.4	2.5	
More than 90	16.9	18.0	-1.1	
Percentage of Days Covered (PDC) <sup>b</sup>				
Average PDC	19.7	20.3	-0.6	0.733
Percentage with PDC ≥80%	11.1	11.7	-0.7	0.673
Percentage with PDC ≥90%	10.0	10.1	-0.2	0.912
<b>Rescue Medications</b>				
Average Number of Fills	2.1	2.1	0.0	0.735
Percentage with:				
No fills	41.7	40.9	0.9	0.272
1 to 3 fills	42.7	41.4	1.3	
4 or more fills	15.5	17.7	-2.2	
Average DMA	122.6	109.2	13.4	0.163
Percentage with:				
No DMA	35.4	35.0	0.4	0.770
More than 0 and up to 90	32.3	33.9	-1.6	
More than 90	32.4	31.2	1.2	
Mean of Ratio of Controller Medications DMA to Controller plus Rescue Medications DMA	0.23	0.23	0.0	0.831

Source: Alameda Alliance for Health (Alliance) prescription drug claims and enrollment data and Children's Hospital and Research Center at Oakland ED and hospital data.

Note: Includes all children with asthma who have an index ED visit from July 11, 2008, to June 30, 2011. On their first day of eligibility, the child must be at least 1 year old and younger than 19, have a primary or secondary diagnosis of asthma (493.xx), be insured by Medi-Cal or a Medicaid managed care organization, and reside in a Bay Area city.

See Table 5 for a list of controller and rescue medications. All estimates are regression adjusted. See Appendix A of the final evaluation report for complete details.

Because sample members might have fewer than six months of enrollment after their index dates, we weight results according to number of days enrolled (between index and exit). We normalize weights so that they sum to the total number of sample members.



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