

**FINAL REPORT**

**Evaluation of Healthcare Costs and Utilization among Medicaid Recipients in  
Schools with School-Based Health Centers**

**SUBMITTED TO**

**THE HEALTH FOUNDATION OF GREATER CINCINNATI**

by

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## *Summary*

School-Based Health Centers (SBHCs) provide essential health care to school children and eliminate many access barriers. Several SBHCs serve elementary school students in the Greater Cincinnati area. This study was designed to measure the cost effectiveness of these SBHCs. This study focused on four in three urban and one rural Ohio school districts in Greater Cincinnati. Two Ohio schools without SBHCs, one urban and one rural, served as comparison schools. The study period for this report covered five-and-a-half years, from September 1997 to February 2003 (5.5 calendar years). This study looked at the 5,506 students who were enrolled in the six schools and in the Ohio Medicaid program. These students had an average age of 8.4 years in September 2000, and 45% were African-American, 53% were White, 49% were female, and 51% were male.

This study is the companion to a health outcomes study of eight SBHCs in Greater Cincinnati (The Health Foundation of Greater Cincinnati, 2004). For details about the companion study, please visit <http://www.healthfoundation.org/sbhcstudy>, or call 513-458-6616.

For the study design, we used a retrospective quasi-experimental time-series analysis. A descriptive time-series trend analysis evaluated total costs, hospitalization, emergency department (ED) visits, mental health services, prescription drugs, physician encounters, Early Periodic Screening, Diagnosis, and Treatment (EPSDT), and dental care. A repeated-measure analysis of covariance (ANCOVA) assessed the effect of the SBHC program on students' total Medicaid costs, costs of hospitalization, and ED visits. General estimated equation (GEE) regression Poisson repeated measures assessed the

risk of hospitalization and ED visits. Hierarchical linear/nonlinear modeling for controlling unbalanced data due to student attrition assessed the quarterly total Medicaid costs over time between students in intervention and comparison groups. Cost-Benefit Analysis (CBA) estimated the value of resources used by the SBHCs compared to the value of resources the program might save or create. We also calculated the net social benefit.

The Ohio Medicaid program spent a total of \$30 million dollars on the 5,506 students during the five-and-a-half years. The major cost components for students were mental health services, outpatient care, hospitalization and ED visits, physician encounters, and prescription drugs. During the study period, hospitalization and ED visits decreased for students with asthma in intervention schools. Students in intervention schools also accessed significantly higher mental health services and dental care, but had significantly lower prescription drug use compared to students in comparison schools. Disabled students received significantly more health benefit from being in a school with an SBHC. African-American students in intervention schools received more mental health care, Early Periodic Screening, Diagnosis, and Treatment (EPSDT) visits, and dental care after the SBHCs opened.

**From a societal perspective, the Foundation's support of the four SBHCs was cost beneficial.** We estimated the Net Social Benefits of the SBHC program in the four Ohio schools to range from \$553,553 to \$4,628,864 over the first three years of operation. This report contains more detail on how we reached these estimates.

Final Report:

Evaluation of Health Costs among Medicaid Recipients  
in Schools with School-Based Health Centers

*I. INTRODUCTION*

School-Based Health Centers (SBHCs) provide health care for children and adolescents in schools and eliminate many health care access barriers. The Health Foundation of Greater Cincinnati has funded several SBHC programs to increase health care access for students. Evaluation of program costs was an important component of the Foundation's SBHC Initiative.

Foundation-funded SBHCs primarily serve students in grades K–8. All students are eligible to enroll in and receive services from the SBHC with parental permission. A large number of students enrolled in schools with a Foundation-funded SBHC are also enrolled in Medicaid or the State Children's Health Insurance Program (CHIP) due to their low family incomes. In the four intervention schools (i.e., the schools with an SBHC) in this study, the percentage of students who received free or discounted school lunch programs ranged from 37% to 88% (Mean = 63.5%). The percentage of Medicaid students in each intervention school ranged from 22% to 72% (Mean=42.25%).

For this study, we focused on four Ohio SBHCs established in September 2000, three in urban districts and one in a rural district. These SBHCs have remained in operation. One urban and one

rural Ohio school without an SBHC served as comparisons. A total of 5,506 students were involved, 3,673 in intervention schools and 1,383 in comparison schools. These students were enrolled in an intervention or comparison school and were matched in the Ohio Medicaid enrollment database based on name, gender, race, date of birth, and county code. Students in the comparison schools had similar characteristics as those in intervention schools based on census data from the local education departments, including percentage of student body that was non-white and percentage of students eligible for free or reduced lunch.

#### SPECIFIC AIMS AND HYPOTHESES

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*The general objective* of this study was to evaluate the health economic impact of students enrolled in the intervention schools compared to students in comparison schools. *The central hypotheses* of this study are described in Figure 1. First, we reasoned that increased accessibility of early diagnosis and treatment for students in intervention schools would decrease hospitalizations and emergency department (ED) visits. Second, that the total Medicaid expenses per student in an intervention school would decrease over time.

**There were three specific aims for this study:**

**Aim 1.** To evaluate the health costs and utilization of Medicaid-enrolled students in schools with SBHCs compared to students in schools without SBHCs before and after the SBHCs opened.

**Aim 2.** To evaluate health costs and utilization of students in schools with SBHCs who have asthma or mental illnesses compared to students in schools without SBHCs before and after the SBHCs opened; and

**Aim 3.** To quantify and evaluate health economic costs and benefits of SBHCs.

## BACKGROUND AND SIGNIFICANCE

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School-aged children and adolescents have high prevalence rates for diseases such as asthma and attention deficit/hyperactivity disorder (ADHD) (NIH, 1997; Richters, Arnold, Jensen, et al. 1995). In the U.S., 7% of children have asthma and constitute over 30% of asthmatic patients (NIH, 1997). About 3–6% of school-aged children in the US are diagnosed with ADHD (Richters et al., 1995; Goldman et al., 1998). SBHCs improve accessibility to health care for students, especially those with chronic or acute diseases. Theoretically, timely and appropriate primary care leads to better health for students. Better health status in turn would increase student attendance and consequently academic performance. Better health status would also decrease the need for costly medical care and services.

Numerous studies have documented that SBHCs effectively reduce health care access barriers and emergency department visits for school-age children (Young, 2001; Adams, et al., 2000; Kaplan, et al. 1999; Kaplan, et al. 1998; Webber et al, 2003). SBHCs are in a unique position to reduce

financial, language, familial, and transportation barriers to care for children. Table 1 summarizes recently published major studies on SBHCs.

A Kentucky elementary SBHC program showed that the major reasons for visits were trauma, otitis media (ear infections), upper respiratory infections, and gastroenteritis (“stomach flu”). Non-urgent emergency department visits decreased among children after the SBHC opened. Medicaid-insured children are more likely to use the emergency department than privately insured or uninsured children (Young, 2001).

A study conducted in Georgia reported a significant decrease in Medicaid expenses for inpatient, non-emergency department transportation, drug, and emergency department visits for students enrolled in an SBHC compared to those not enrolled in an SBHC. While Medicaid expenses for the emergency department decreased, the Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) preventive care expenses increased (Adams, et al., 2000). A survey of parents of students in Colorado indicated that children in an SBHC had less difficulty obtaining physical health care and visited the emergency department fewer times than students in a comparison school (Kaplan, et al., 1999).

In a New York survey study, 46% of children with asthma had ED visits and 13% were hospitalized. The rate of hospitalization for children with asthma was 50% higher among children in schools without an SBHC than those in schools with an SBHC (Webber et al., 2003).

Since the early 1980s, an increasing number of SBHCs have been established in the U.S. By 1998, more than 1,200 SBHCs were in operation. Funding comes from a combination of sources, including state governments, foundations, Medicaid, health insurance, and some ear-marked federal dollars via the “Healthy Schools, Healthy Communities” program of the Bureau of Primary Health and Maternal and Child Health (Dryfoos, 1998).

U.S. government agencies have supported SBHCs in many ways. In December 1993, the Office of the Inspector General (OIG) released an SBHC report and made a recommendation to the Health Care Financing Administration (HCFA) for improving coordination between SBHCs and managed care organizations. Following the release of the report, the Medicaid Managed Care Team (MMCT) developed a Corrective Action Plan (CAP) for this recommendation (Montgomery, 1995).

In 1994, the General Accounting Office (GAO) also released an SBHC report based on experiences in New York, New Mexico, and California. It noted that SBHCs provide many basic health services, such as dental, preventive, and mental health care services. SBHCs providers have greater contact with children and can more easily ensure that they keep appointments. However, funding and billing problems are primary obstacles to operating SBHCs. Because of lack of financial resources and staffing, both medical and administrative SBHC capabilities are often insufficient. In late 1994, Congress discussed a federal program that would have provided up to \$400 million by 1999 for the expansion and creation of school-based and school-linked health centers. They also discussed which type of payment, fee-for-service or capitation, would be best for SBHCs (Leonard, 1994; GAO, 1994a; GAO, 1994b). Congress did not pass this program.



In many SBHCs, children from low-income families account for 50– 90% of enrollees, varying by school and state. Since the late 1990s, many state Medicaid programs have implemented the State Children’s Health Insurance Program (SCHIP) for children from low-income families. It has been suggested that the cost of services through SBHCs be covered by CHIP. A number of SBHCs have successfully established contracts with managed care organizations (MCOs) or health maintenance organizations (HMOs). However, managed care can reduce SBHC revenue. It was reported that the implementation of Tennessee and Massachusetts’ Medicaid managed care programs decreased SBHC billings to Medicaid by about 50– 80% (Hacker, 1996).

#### SIGNIFICANCE OF THIS STUDY

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Most studies about SBHCs to date were based on either a parent’s self-report or a short follow-up period. Such reports are subject to the limitations of incomplete recall, information bias, or short-term effect. This study uses quantitative data over a longer time period, which provides a better understanding of the impact SBHCs have on health costs and utilization. This is the first study that provides a comprehensive look at the economic outcomes of SBHCs.

To earn the support of Medicaid, managed care organizations, and other payers, SBHCs have to show their value. SBHCs should measure their impact on outcomes that are important to these payers, including reduced hospitalization admissions rates, reduced emergency visits, increased Early Periodic Screening, Diagnosis, and Treatment (EPSDT) visits, increased health care access for indigent children, and increased delivery of preventive services. In other words, SBHCs need to show

that their benefits outweigh their costs. This study provides valuable information to community and health decision makers about the benefits of SBHCs.

This study is also important as the companion study to “Evaluation of Health Outcomes of Students Using School-Based Health Centers” study (The Health Foundation of Greater Cincinnati, 2004), which looked at the impact of SBHCs on the health of school children in Greater Cincinnati. The four intervention and two comparison schools from this study participated in the companion study.

## *II. METHODOLOGY*

### STUDY DESIGN

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This study used a retrospective quasi-experimental time-series design. The study involved four intervention schools and two comparison schools. The SBHCs in the intervention schools opened in September 2000, and were continuously open through the end of the study.

### CONSENT FOR EVALUATION AND IRB APPROVAL

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All students enrolled in the SBHCs had parental approval to participate in this study. Each SBHC kept the written consents for evaluation. If students or their parents did not want to participate, we did not include these students in the study. Consent was not needed for students in intervention schools who were not enrolled in the SBHCs or for students in comparison schools. The Principal Investigator (PI) in this study was also co-PI on a Medicaid utilization review, and consent for that review covered the Medicaid data in this study. Also, Health Insurance Portability and Accountability Act (HIPAA) exceptions allow researchers to forgo consent in large studies if it is difficult to get consent from participants on an individual basis.

Due to the nature of retrospective data analysis in this study, researchers didn't modify or alter any medical treatment or services for student participants. There was little risk to study subjects

in this study. This study was approved by University of Cincinnati Institutional Review Board (IRB) with protocol# 01-09-19-05-EE in October 2001, and renewed in October 2002.

#### DATA SOURCES AND STUDY PERIOD

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Two data sources were used for this study: 1) intervention and comparison school student enrollment data, and 2) the Ohio Medicaid claims databases. The student enrollment data included first name, middle initial, last name, date of birth, race, gender, and school name. The Ohio Medicaid claims databases contained recipient demographics, Medicaid enrollment programs, and institutional, pharmacy, and medical claims.

Due to timing of Medicaid claims extraction, we collected all claims data for students in the study between September 1, 1997 and February 28, 2003. There were three years of claims data before the SBHCs opened (August 1997–August 2000) and two-and-a-half years of claims data after the SBHCs opened (September 2000–February 2003). Due to the delay for medical claims submissions and processes, and severe Health Insurance Portability and Accountability Act (HIPAA) and other regulation changes, we were unable to collect and use Medicaid claims data from March 2003 to August 2003.

The primary assumption in this study was that the Medicaid claims database captured all health services children in the study received under the Ohio Medicaid program. There is no economic incentive for these recipients to spend out-of-pocket money for medical services and medications.

This geographically diversified claims database provides both a large population perspective and also data on all health utilization, medical treatment, and payment information. The use of a claims database to assess and evaluate health outcomes and costs in large populations has been well documented (Adams, 2000; Guo, 1998).

#### TARGET POPULATION AND STUDY GROUPS

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The target population was Greater Cincinnati area students who are from low-income families or who are disabled and who are enrolled in Ohio Medicaid.

The intervention group consisted of all students enrolled in the four selected schools with an SBHC who were also identified in the Ohio Medicaid automated database. The comparison group consisted of students in the two selected schools without an SBHC who were identified in the Ohio Medicaid automated database.

A total of 5,069 students were identified in the Ohio Medicaid program and enrolled in either intervention or comparison schools from September 2000 to August 2002. We excluded 12 students who moved either from intervention to comparison schools or vice versa and 1 student who had severe disabilities including mental illness and asthma. Of the 5,056 remaining students:

2,153 students were enrolled in Medicaid and the same school for both Year 1 (2000–2001 school year) and Year 2 (2001–2002 school year),  
 1,153 students were enrolled in Medicaid and the same school for Year 1 only, and  
 1,750 students were enrolled in Medicaid and the same school for Year 2 only.

Table 2 summarizes the characteristics of identified students in the intervention and comparison schools. These characteristics are discussed more fully in the Results section. Of the 5,069 students, 3,673 students were in intervention schools and 1,383 students were in comparison schools.

## THEORETICAL MODELS

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### Total Medicaid expenses

*Total Medicaid expenses* were the sum of payments for hospitalizations, physician encounters, emergency department visits, prescription drugs, outpatient care, and other services. Total Medicaid Expenses were modeled using this regression equation:

Equation 1

$$\begin{aligned}
 MedicaidExpense_i &= \sum (Hospital, Physician, ERVisit, Outpatient, Mental, Drug, Dental, EPSDT) \\
 &= \sum_{t=n+1}^m \frac{[HOSP_t + PHYS_t + ER_t + OUTPAT_t + MENTAL_t + DRUG_t + DENTAL_t + EPSDT_t]}{(1+r)^{t-1}}
 \end{aligned}$$

where

$MedicaidExpense_i$  was the sum of Medicaid payment amounts for an eligible student recipient  $i$  during the study period;

$i$  is for an individual student (samples from 1 to N);

$1/(1+r)^{t-1}$  is a discount factor at annual interest rate  $r$ ;

$t$  is for year (from year  $n+1$  to  $m$ ); and

$HOSP$ ,  $PHYS$ ,  $ED$ ,  $OUTPAT$ ,  $MENTAL$ ,  $DRUG$ ,  $DENTAL$ , and  $EPSDT$  were total Medicaid payment amounts for:

- Hospitalizations (hospital accommodation, medical therapy services, physician encounters, radiology diagnosis fees);
- Physician office encounters (physician diagnosis or consultation fees);
- Emergency department visits (emergency department services and associated medical services, including physician encounters);
- Outpatient visits and other medical claims (laboratory tests, home services, hospice, etc.);
- Mental health (mental inpatient, mental health services, mental retardation services, mental health support services);
- Prescription drugs (prescription drugs, pharmacy dispensing fees);
- Dental (dental care and services);
- EPSDT (Early Periodic Screening, Diagnosis, and Treatment services, including well-child check-ups).

## Descriptive Time-Series Trend Analyses

We measured the trend of Medicaid expenses using aggregate level data. In order to detect seasonal variation, we measured the total Medicaid expenses per 100 recipients each quarter during the study period. The four seasonal quarters were defined as winter (December-February), spring (March-May), summer (June-August), and fall (September-November).

In addition, we measured quarterly trends of Medicaid expenses and health utilization per 100 recipients in intervention and comparison schools in the following categories:

- Hospitalization (total amount paid for hospital accommodation, medical therapy services, physician encounters in hospital, radiology diagnosis fees, etc.);

- Physician encounters (i.e., physician diagnosis or consultation fees);

- Emergency department visits (total amount paid for ED services and associated medical services during ED visits, etc.);

- Outpatient care and other medical care (i.e., outpatient medical care, laboratory tests, home services, etc.);

- Mental health care (i.e., mental health services and psychiatric specialist encounters);

- Prescription drugs;

- Dental care; and

- EPSDT, including routine well-child exams (code V20) and general medical exams (code V70).



**Inflation-Adjusted Discount Factor:**

During the five-and-a-half-year study period, costs of all claims of medical services and prescription drugs were adjusted using the medical component of the Consumer Price Index (MCPI) to the dollar value in 2002 based on data from the U.S. Bureau of Labor Statistics (BLS). The BLS monitors price changes for several hundred categories of products and services, including medical services and pharmaceutical products. The inflation-adjusted discount rate was calculated using a 3% discount rate and the MCPI rate for each year in this study (Drummond, O'Brien, et al, 1999). The annual rates of change of MCPI were as followings:

2.8% in 1997,  
3.4% in 1998,  
3.7% in 1999,  
4.2% in 2000,  
4.7% in 2001, and  
4.6% in 2002 (BLS, 2001; BLS, 2002).

**Function of Medicaid Expenses per Recipient**

In order to control certain factors that may affect how school-age children use Medicaid services, the function of Medicaid expenses per recipient was represented as a theoretical framework as shown in Equation 2:

**Equation 2**

$$\begin{aligned} PerExpense_i = & \beta_1 AGE + \beta_2 SEX + \beta_3 RACE + \beta_4 AFDC + \beta_5 MCO \\ & + \beta_6 DISABLED + \beta_7 CHIP + \beta_8 TIME + \beta_9 SBHC \\ & + \beta_{10} TIME * SBHC + \epsilon \end{aligned}$$

where

*PerExpense* is the Medicaid expense per recipient that was defined as the sum of Medicaid expenses for a recipient before and after the SBHCs opened.

*AGE* is student age in years as of September 30, 2000.

*SEX* is student gender (male = 1 and female =0).

*RACE* is student race (African American =1 and White and others = 0).

*AFDC* is a percentage indicator for a student enrolled in Aid for Families with Dependent Children (now called Temporary Assistance for Needy Families (TANF)). In Ohio, AFDC has two components: the Healthy Start program, which covers low-income children from birth through age 18 and pregnant women, and the Healthy Families and Related program, which covers low-income single- and two-parent families as well as children. Because recipients could have been enrolled in multiple Medicaid programs during the study period, the percentage indicator was calculated as the number of months each recipient was enrolled in AFDC divided by the total number of months enrolled in Medicaid.

*MCO* is a percentage indicator for a student enrolled in a Medicaid managed care organization (MCO). The percentage indicator was calculated as the number of months

each recipient was enrolled in an MCO divided by the total number of months enrolled in Medicaid. This indicator allowed us to measure the difference between Medicaid recipients enrolled in fee-for-service plans and Medicaid recipients enrolled in MCOs.

*Disabled* is a percentage time enrollment indicator for a student enrolled in Ohio's Aged, Blind, or Disabled (ABD) Medicaid program. The percentage indicator of disabled was calculated as the number of months each recipient was enrolled in the ABD Medicaid program divided by the total number of months enrolled in Medicaid.

*CHIP* is a percentage time enrollment indicator for a student enrolled in the Ohio's Children's Health Insurance Program (CHIP). The percentage indicator of CHIP was calculated as the number of months each recipient was enrolled in CHIP divided by the total number of months enrolled in Medicaid.

*TIME* is an indicator of pre- or post-SBHC opening (pre-SBHC =0, post-SBHC=1).

*SBHC* is an indicator for student enrollment status in a school with an SBHC (intervention school =1; comparison school = 0).

*TIME\*SBHC* is an interaction term for measuring the differences in Medicaid expenses between the intervention and comparison students over the pre- or post-SBHC period;

is an error term;

$\beta_i$  (i=1,2,...,n) are the standardized regression coefficients of independent variables.

The function of Rate of Hospitalizations consisted of the elements in Equation 3:

**Equation 3**

$$RHOSPITAL_i = \alpha + \beta_1 AGE + \beta_2 SEX + \beta_3 RACE + \beta_4 AFDC + \beta_5 MCO + \beta_6 DISABLED + \beta_7 CHIP + \beta_8 TIME + \beta_9 SBHC + \beta_{10} TIME * SBHC + \varepsilon$$

where

$\alpha$  is a standard constant, and

$RHOSPITAL_i$  is number of hospitalizations for a recipient divided by the total number of months enrolled in Medicaid before and after the SBHCs opened.

The function of Rate of Emergency department Visits consisted of the elements in Equation 4:

**Equation 4**

$$REDVISIT_i = \alpha + \beta_1 AGE + \beta_2 SEX + \beta_3 RACE + \beta_4 ADFC + \beta_5 MCO + \beta_6 DISABLED + \beta_7 CHIP + \beta_8 TIME + \beta_9 SBHC + \beta_{10} TIME * SBHC + \varepsilon$$

where

$\alpha$  is a standard constant, and

$REDVISIT_i$  is the number of emergency department (ED) visits for a recipient divided by the total number of months enrolled in Medicaid before and after the SBHCs opened.

## THEORETICAL MODEL OF COST-BENEFIT ANALYSIS

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Cost-Benefit Analysis (CBA) is a method to compare the value of resources consumed (costs) in providing a program or intervention with the value of the outcome (benefit) from that program or intervention (Warner, Luce, 1992). This view of CBA assumes that an SBHC is being compared to a non-SBHC alternative. CBA requires health outcomes of the SBHC program to be valued in monetary units, thus enabling health decision-makers to compare the program's incremental costs with its incremental outcomes.

Two major components of health economic evaluation are costs and consequences as shown in Figure 2 (Drummond, O'Brien, et al., 1999). Costs of (or resources consumed by) the SBHCs included three sectors:

Costs from the healthcare sector, i.e., SBHC operation costs, such as prescription drugs, medical equipment, physician and nurse hours, etc.;

Costs from the patient and family sector, i.e., out-of-pocket expenses in traveling to get medical care, co-payments, lost work-time, and other expenditures; and

Costs from other sectors, such as essential startup funds (not including SBHC operational costs), costs for school facility use, etc.

Consequences included:

The students' health state change, which can be measured in terms of equivalent value of clinical effects;

Other values created by the SBHCs; and

Resources saved by the SBHCs, or costs not spent on an alternative, which mirror the costs and were measured in a similar way.

The fundamental principle of CBA is to select and support programs where benefits exceed costs (Gramlich, 1997). A positive net social benefit indicates that the program is worthwhile. Net social benefit from implementing the four SBHCs in this study was defined using the components in Equation 5 (Drummond, O'Brien, 1999):

Equation 5

$$NSB_i = \sum_{t=1}^n \frac{BENEFIT_i(t) - COST_i(t)}{(1+r)^{t-1}}$$

where

$NSB_i$  = net social benefit of SBHC, i, (discounted);

$BENEFIT_i(t)$  = benefits in dollars derived in year t;

$COST_i(t)$  = costs in dollars derived in year t;

$1/(1+r)^{t-1}$  = discount factor at annual interest rate r; and

$n$  = lifetime of project.

Factors included in  $BENEFIT_i(t)$  were:

Changes in health status, quantified by additional health services due to the SBHC, such as:

- 1) equivalent values of office visits in SBHCs;
- 2) increased EPSDT visits, mental health services, and dental care; and
- 3) estimated savings from non-billable health care activities. For example, in the current SBHCs, nurse practitioners spend 30– 50% of their time on non-billable, health-related activities, such as health care services for school teachers and staff, student smoking cessation programs, student health status consultations, staff meetings, etc.

Other value created, including the value of other sources of support brought in because of the SBHCs, such as grants to supplement or improve the operation of the SBHCs.

Healthcare sector savings, including estimated cost savings due to fewer hospitalizations, ED visits, prescription drug use, etc.

Family savings, including otherwise lost family productivity, work-time, transportation, and other savings related to not needing to accompany students to primary care services. To determine family income lost in obtaining primary care services for children at a site other than an SBHC, we estimated that one primary care visit would cost a parent a half- to a full-day (4–8 hours) of wages. The hourly wage ranged from \$15.34 to \$21.62<sup>1</sup> using sensitivity analysis.

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<sup>1</sup> As reported on the Compensation Survey September 2002 by the Bureau of Labor Statistics, the average hourly wages were \$15.34 for blue-collar and \$21.62 for white-collar workers (or \$14.80 for blue-collar employees and \$20.50 for white-collar workers in 2000) in Greater Cincinnati area. Internet: <http://www.bls.gov/ro5news.htm>.

Savings or benefits from other sectors, including the estimated value of medical referrals to health care professionals for students, school efficiency related to fewer student absences because of the medical care in SBHCs, and the community multiplier effect due to the Medicaid program (Greenbaum, Desai, 2003).

We also included the value of unquantifiable benefits, such as:

- Healthy students have better attendance and better learning performance.
- Increased health care accessibility for minorities and children from low-income families.

Factors included in  $COST_i(t)$  were:

Costs of the healthcare sector, including:

- start-up funds provided by The Health Foundation of Greater Cincinnati;
- items such as nurse practitioner's salary, costs of drugs, medical equipment, supplies;
- pediatrician, nurse, and other staff time; and
- the Health Schools/Healthy Communities Grants or support from other funding agencies for the SBHCs.

Costs of the family sector, including any documented family costs related to using services at the SBHC. Medicaid recipients had no out-of-pocket costs for SBHC encounters. Students with private insurance plans paid copayments for their visits. There was very little cost to students' families in the SBHCs.



Costs of other sectors such as, operational costs for SBHCs, school facility and utility costs, etc.

The theoretical CBA model outlined above is a commonly accepted structure for assessing the benefits and costs of a project. Numerous federal agencies provide guidelines for the conduct of such assessments (EPA, 2002; OMB, 1992; NIH, 1998). Costs reflecting resource elements are derived from carefully accumulated direct medical cost data. Costs for indirect measures, such as productivity changes and pain and suffering, are used less frequently; however, with effort, they can be generated. Benefits are estimated by accumulating savings in direct costs and changes in productivity status or quality of life. Benefits may also be estimated using contingent valuation techniques to quantify consumer surplus or by using proxy markets when no direct markets exist. We used the latter approach in this study.

Implementation of such detailed CBA studies has been acknowledged to be costly and labor intensive. A Congressional Research Service Report estimated that the average cost of a federal government CBA to be \$1,000,000 in 1995 (equivalent to \$1,220,000 in 2004 dollars). In the present study, funding levels were much more modest; consequently, assessments of costs and benefits depart in some respects from the theoretical model.

Theory dictates that data collection be initiated from the outset of the intervention and be sustained for each year of the project. Since this cost study was funded and initiated in the second year of the SBHC intervention, detailed and prospective data collection of operations was not possible.

Although less detailed and intensive than the theoretical model, we believe that our approach is logically defensible and adequate to gain a sense of the economic efficiency of the SBHCs. We detail the rationale and assumptions for the base-case analysis below (see the section entitled “Statistical Analysis”). We also conducted sensitivity analysis of key parameters.

### **Questionnaire for Cost-Benefit Variables**

In order to measure and estimate the cost-benefit variables, we developed two brief questionnaires. Parents answered the first questionnaire during the parent interviews conducted as part of the “Evaluation of Health Outcomes of Students Using School-Based Health Centers” study (The Health Foundation of Greater Cincinnati, 2004), which is the companion to this study. The sample of parents in the companion study was randomly selected from intervention and comparison schools. We assumed the results from questionnaires were generalizable to parents who were not sampled. The questionnaire (see Appendix X) gathered information about:

how many times a parent took a child to see his or her doctor or health care provider when the child was sick in the last academic year,

how many minutes it took to get to the doctor or health care provider,

how many times during the last school year the parent took a child to a hospital emergency department about his or her health,

how many minutes it took to get to the hospital emergency department, and

how many days or hours a parent missed work in the past four weeks to take a child to see a doctor for regular or routine health care or because of illness.

Selected SBHC administrative staff answered the second questionnaire during telephone or in-person interviews. The questionnaire (see Appendix X) gathered information about:

how many staff usually work in the SBHC and how many hours each staff person (pediatrician, nurse, and others) works;

the estimated cost facility, utilities, and stationary and supply costs;

the estimated costs for medical equipment and supplies, such as scales, blood pressure meters, examination beds, etc.;

the costs for computers, monitors, and software; and

any funding that the school or SBHC received from outside sources due to the SBHC program and the estimated funding per year or per project.

## STUDY SUBGROUPS: COHORT STUDY FOR STUDENTS WITH CHRONIC DISEASES

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Both the intervention and comparison groups contained two sub-groups of students with chronic diseases.

### 1. Asthma Cohort

This cohort included students with a primary diagnosis of asthma as indicated by the International Classification of Disease, Ninth Revision (ICD-9) codes 493.xx and at least one anti-asthmatic medication from the following classes (see Appendix X):

- Long- or short-acting  $\beta_2$  agonists (inhaled, oral tablets)
  - Short-acting  $\beta_2$  agonists, e.g., albuterol (Proventil , Ventolin ), isoproterenol (Isuprel , Norisodrine , Medihaler-Iso ), metaproterenol

(Alupent , Metaprel ), pirbuterol (Maxair ), terbutaline (Brethine , Brethaire , Bricanyl ), bitolterol (Tornalate ), isoetharine (Bronkometer , Bronkosol ), and levalbuterol (Xopenex ).

- Long-acting  $\beta_2$  agonists, e.g., salmeterol (Serevent ) and formoterol (Foradil ).
- Glucocorticoids/Corticosteroids (systemic, inhaled):
  - Oral corticosteroids: prednisone, prednisolone, methyl-prednisolone, and hydrocortisone.
  - Inhaled corticosteroids: beclomethasone (Beclivent , Vanceril ), dexamethasone (Decadron Phosphate Respihaler and others), fluticasone (Flovent ), budesonide (Pulmicort ), flunisolide (AeroBid ), and triamcinolone (Azmacort and others).
- Theophylline (tablet, liquid, injectable, and sustained release forms).
- Anticholinergic agents, e.g., inhaled ipratropium bromide (Atrovent ).
- other anti-inflammatories, e.g. cromolyn sodium (Intal , Nasalcrom nasal spray), and nedocromil (Tilade ).
- leukotriene receptor antagonist, e.g., montelukast (Singulair ), zafirlukast (Accolate ), and zileuton (Zyflo ).

## 2. Mental Health Cohort

This cohort included students with a primary diagnosis of a mental illness as indicated by ICD-9 codes from 290.xx to 316.xx (see Appendix X) as well as at least one drug claim for mental health therapy such as psychotherapeutics, antidepressants, antipsychotics, anticonvulsants, anxiolytics, sedatives, and hypnotics (see Appendix X). Mental illnesses among school-age children primarily include depression, attention-deficit/hyperactivity disorder (ADHD), substance abuse, anxiety disorder, and other illnesses.

We identified all disease diagnoses for both cohorts through ICD-9 codes in Medicaid institutional or medical claims. We identified all prescription drugs through National Drug Codes (NDC) in Medicaid pharmacy claims.

## STATISTICAL ANALYSES

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The major comparisons in this report focus on intervention and comparison students. We used multivariate statistical techniques because there are many forces at work affecting the health of the students. These analytical approaches allow us to separate and identify which factors have the strongest influence.

The database has numerous observations on a given individual. This richness of data allows use of repeated measure designs, which are desirable because they provide for control of variations within subjects.

Repeated-measure Analysis of Covariance (ANCOVA) techniques allow for statistical control of the numerous independent variables that potentially contribute to differences between the intervention and comparison groups. Moreover, this approach allows for examination of combinations of variables through their interactive effect. In this way, we are able to identify which individual factors or combinations of factors exert an influence. In order to identify if any additional characteristics of the children affect their use of Medicaid services, we conducted a repeated measures ANCOVA to analyze the total Medicaid expenses for all continuously enrolled students based on Equations 2, 3, and 4. After controlling for other social-demographics and enrollment factors, we focused on SBHC groups (treatment and comparison groups), time (before and after SBHC), as well as group\*time interaction term because this term was a measure of the difference in change over time between the various groups. Time refers to the three years prior to the SBHCs opening and the first two-and-a-half years of the SBHCs' operations.

Repeated-measures Poisson regression analysis examines relationships among variables that are highly skewed and depart from the assumed normal distribution required for ANCOVA techniques. In order to measure the probability of hospitalization and ED visits, a *generalized estimating equations (GEE)* analysis of repeated measures Poisson regression was used to assess the time-related interaction effect before and after the SBHC program based on Equations 3 and 4. Time again refers to the three years prior to the SBHCs opening and the first two-and-a-half years of the SBHCs' operations.

*Hierarchical linear/nonlinear modeling (HLM)* done on a repeated measures basis, allows compensation for the fact that student data appear in the database for different amounts of time (by quarter year). The number of observations on students is not uniform nor is it balanced in number.

HLM adjusts for this difference in observations. We conducted HLM for this repeated measure design in order to control unbalanced data due to student attrition or different enrollment periods in Medicaid programs. Because repeated observations were collected on a set of students enrolled in SBHCs, some measurement occasions would not be identical for all students. The multiple observations are properly conceived as nested within individuals; that is, individuals might also be nested within SBHC sites. Likewise, individuals are nested within gender or race categories. Within the HLM, a unique sub-model formally represents each level in the data structure (e.g., repeated observations within individuals). The quarterly total Medicaid costs per student were measured as time-related variables. We conducted this HLM analysis based on all eligible students during the study period. We used HLM software version 5.05 (Raudenbush S, 2000) for the analysis.

We used *sensitivity analysis* to assess the impact of uncertain costs or benefits on the study results. Sensitivity analysis is the main method for considering uncertainty in economic evaluations. In general, sensitivity analysis involves three steps:

1. Identifying the uncertain parameters for which sensitivity analysis is required. If parameter estimates are unknown based on current literature or previous analysis, the variables will be potential candidates for sensitivity analysis.
2. Specifying the plausible range over which uncertain factors are thought to vary. The plausible range could be determined by reviewing the literature, consulting expert opinion, and using a specified confidence interval around the mean.
3. Calculating study results based on combinations of the best guess, most conservative, and least conservative estimates. We conducted one-way sensitivity analysis by varying across the

range of one variable at a time in order to investigate the impact on study results (Briggs, Sculpher, 1994; Briggs, Sculpher, 1995).

In the numerous results tables from these multivariate analyses, we reported the variables, or combination of variables in the case of interactions, that are statistically significant at an alpha level of 0.05. They should be interpreted to mean that they have an apparent effect on the dependent variable at a high probability level.

In addition, most of children enrolled in CHIP were also partially enrolled in the Aid to Families with Dependent Children (AFDC, now called Temporary Assistance to Needy Families [TANF]) program. Therefore, we did not include AFDC in the final models in order to minimize the multicollinearity problem. We conducted a power analysis and sample size estimation for the regression analysis approach. For these regression analyses, the statistical power is greater than 0.80 with  $\alpha = 0.05$  and medium effect size of 0.15 (Cohen, et al., 1983; Steven, 1996). We used both SPSS for Windows version 10.0 and SAS for Windows version 8.02 for all statistical analyses.



### *III. RESULTS – Aim #1*

**Aim 1.** To evaluate the health costs and utilization of Medicaid-enrolled students in schools with SBHCs compared to students in schools without SBHCs before and after the SBHCs opened.

#### DEMOGRAPHICS

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Table 2 lists the demographic characteristics of all students in both the intervention and comparison schools (N=5,056).

The average age of 8.41 years for intervention students was slightly higher than the average age of 8.04 years for comparison students ( $p < 0.0001$ ). The average ages were calculated using the students' ages as of September 30, 2000.

The number of months intervention students were enrolled in Medicaid and CHIP were slightly higher than for comparison students (40.3 months vs. 38.4 months,  $p = 0.0007$ ).

The percentage of intervention students enrolled in Medicaid managed care organizations was higher than that for comparison students (24.8% vs. 14.6%,  $p < 0.0001$ ).

There were no differences in ethnicity distribution between the intervention group (45.3% African-American, 53% White, 1.7% others) and comparison group (44.3% African-American, 52.9% White, 2.8% others). There were nearly zero Asian American and Native American students.

There was no difference between intervention and comparison schools in gender distribution or enrollment in AFDC or the Aged, Blind, or Disabled Medicaid program.

Of the 5,506 students in both intervention and comparison schools, 2,153 students were continuously enrolled in Medicaid and the same schools for at least two academic years from September 2000 to June 2002. There were:

- 395 students in the rural intervention school,
- 1212 students in the urban intervention schools,
- 330 students in the rural comparison school, and
- 216 students in the urban comparison school.

#### TRENDS FOR MEDICAID TOTAL COSTS BY SBHC

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Table 3 summarizes the Medicaid costs for the 5,056 students during the study period. A total of \$27.1 million (or \$29.8 million in adjusted 2002 value) were spent on those students during the study period. Figure 3 shows the percentage distribution of cost components for the students' health care. The major cost components included:

- mental health services (29.7%);
- outpatient care and other medical services, such as lab tests, home health services, hospice, etc. (24.7%);
- hospitalizations (14.2%);
- physician encounters (11.2%);
- prescription drugs (9.5%); and
- emergency department visits (5%).

Dental care (4.3%) and EPSDT (1.6%) were relatively small components for the total Medicaid costs because these services are relatively cheaper.

We conducted trend analyses on students continuously enrolled in Medicaid and the same schools from 2000 to 2002 (N=2,153) for this study. Figure 4 demonstrates the trends of adjusted total Medicaid costs per 100 students. These trends are directly comparable having been adjusted per 100 students per quarter. The adjusted total costs were calculated as the total quarterly adjusted costs as 2002 dollar value divided by the total number of Medicaid enrolled students in the quarter, then times 100. The average quarterly total cost for students in intervention schools was about \$30,000 per 100 students in the first and third quarters (September–November 1997 and March–May 1998) and increased gradually over the study period to about \$40,000 per 100 students in quarters 21 and 22 (September–November 2002 and December 2002–February 2003). The average quarterly total cost for students in comparison schools was also about \$30,000 per 100 student in the beginning of the study (except for the very high first quarter) and it also increased slightly over time to about \$40,000 per 100 students in the last two quarters. There was a slight seasonal variation in both cost trends, with troughs in the summer quarters and higher costs in the fall, winter, and spring quarters.

We conducted time-series secular trend analyses for each category as follows:

Figure 5 shows the trend of quarterly hospitalization costs per 100 students. There were no distinctly different patterns for either group. Quarterly hospitalization costs fluctuated over time, ranging from \$0 to \$8,000 and hovering mostly just below \$5000. The dramatically higher first quarter hospitalization cost for comparison students was probably due to one unusually sick child who had a high-cost hospitalization in that quarter.

Figure 6 shows the trend of quarterly physician visit costs per 100 students. The quarterly physician visit costs for students in intervention schools were \$2,000 in the first quarter, increased to \$6,000 in quarter 11 (March–May 2000), then decreased over time after quarter 13 (September–November 2000, when the SBHCs opened). The quarterly physician visit costs for students in comparison schools were about \$6,000 in the first quarter, dropped then rose to about \$7,000 in quarter 11, then fluctuated overtime in the later quarters, ranging from \$3,000 to \$6,000 per 100 students.

Figure 7 shows the trend of quarterly costs for emergency department (ED) visits per 100 students. The quarterly ED costs for intervention students were about \$1,200 per 100 students in the first quarter, decreased to about \$500 in quarters 4 and 5 (June–August 1998 and September–November 1998), increased gradually to \$2,500 in quarter 11, then, decreased slightly overtime to about \$1,500 in quarters 20–22 (June–August 2002, September–November 2002, and December 2002–February 2003). The quarterly ED

costs for comparison students had a similar but higher magnitude trend in the first 12 quarters and remained relatively higher over the last 10 quarters.

Figure 8 shows the trend of quarterly outpatient and other medical care costs per 100 students. The quarterly outpatient and other medical care costs for students in intervention schools were about \$13,000 in the early quarters, decreased to \$5,000 in quarter 8 (June–August 1999), and then increased to about \$10,000 in the later quarters. The quarterly outpatient and other medical care costs for students in comparison schools were about \$9,000 in the early quarters, decreased to \$5,000 in quarter 8, and then increased to a high of \$8,000 in quarter 20 (June–August 2002).

Figure 9 shows the trend of quarterly mental health services costs per 100 students. There was a strong seasonal pattern, with lower costs in the summer quarters and relatively higher costs in the fall, winter, and spring quarters. The quarterly mental health services costs for intervention students increased over time from an average of about \$5,000 per 100 students in the early quarters to a high of \$16,000 per 100 students in quarter 21 (September–November 2002). The quarterly mental health services costs for comparison students also increased over time from \$8,000 per 100 students in the early quarters to \$12,000 per 100 students in quarter 21.

Figure 10 shows the trend of quarterly prescription drug costs per 100 students. The quarterly prescription drug costs for students in intervention schools increased gradually

from \$1,000 per 100 students in quarter 1 to \$5,000 in quarter 22. The drug costs for students in comparison schools also increased gradually, going from \$2,000 per 100 students in quarter 1 to \$10,000 in quarter 22. There were large differences in after the SBHCs opened.

Figure 11 shows the trend of quarterly dental care costs per 100 students. The overall trends of quarterly dental care costs between the two groups were similar. The quarterly dental care costs for intervention students were about \$600 in the early quarters, increased gradually to \$2,500 in quarter 11, and fluctuated through the next quarters until reaching \$1,600 in quarter 22. The quarterly dental care costs for comparison students were about \$1,000 in the early quarters, increased gradually to \$2,500 in quarter 14 (December 2000–February 2001), and fluctuated through the next quarters until reaching \$1,400 in quarter 22.

Figure 12 shows the trend of quarterly Early Periodic Screening, Diagnosis, and Treatment (EPSDT) visit costs per 100 students. There was a strong seasonal pattern, with lower EPSDT visit costs in the winter and spring quarters, and relatively higher EPSDT visit costs in the summer quarters. The overall trends of quarterly EPSDT visit costs between the two groups were similar, ranging from \$200 to \$1,000 per 100 students over time.

In addition, we conducted trend analyses for total costs by rural and urban based on students who were continuously enrolled in Medicaid and the same schools (N= 2,153) during the first two academic years the SBHCs were open (2000–2001 and 2001–2002). Figures 13 – 21 indicate the following trends for the urban and rural intervention and comparison groups:

- total costs per 100 students (Figure 13),
- hospitalization costs per 100 students (Figure 14),
- physician visit costs per 100 students (Figure 15),
- ED visit costs per 100 students (Figure 16),
- outpatient and other medical care costs per 100 students (Figure 17),
- mental health services costs per 100 students (Figure 18),
- prescription drug costs per 100 students (Figure 19),
- dental care costs per 100 students (Figure 20), and
- EPSDT visit costs per 100 students (Figure 21).

#### **TOTAL MEDICAID COSTS FOR STUDENTS BEFORE AND AFTER THE SBHCs OPENED**

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Based on the theoretical framework expressed in equation 2, we conducted repeated measures ANCOVA for students (N=2,153) across years in order to control certain characteristics of school-age children that may affect their use of Medicaid services and expenses. Because many students had both AFDC and CHIP enrollments during the study period, AFDC was not included in the regression model in order to minimize the multicollinearity problem.

The marginal mean is the mean value for the variable stripped of the effects of all other variables using covariance analysis techniques. It reflects the pure cost due to that variable alone.

Table 4 summarizes the results of multivariate tests for repeated measures ANCOVA of marginal means of adjusted total Medicaid costs between intervention and comparison schools. It indicates that the adjusted total cost was not significantly different before and after the SBHCs opened, with TIME effect  $p=0.232$ , and no significant interaction (Time\*SBHC) effect, with  $p=0.148$ . Figure 22 demonstrates mean total costs per student before and after the SBHC program. The estimated average total costs per student for both the intervention and comparison groups increased over time. The average total cost per intervention student increased more dramatically compared to the cost per comparison student, and that is elaborated in the discussion section.

In addition, the total costs for male students were significantly higher than female students ( $F=3.34$ ,  $p=0.068$ ) at one-tail test alpha level 0.10. The total cost for male students increased more than female students (TIME\*SEX,  $F=10.5$ ,  $p=0.001$ ). The total costs per student also increased with age ( $F=3.534$ ,  $p=0.060$ ) at one-tail test alpha level 0.10. The total costs for disabled students were significantly higher than for other students ( $F=295.7$ ,  $p<0.0001$ ). The total costs for African-American students were significantly different than for other students ( $F=4.43$ ,  $p=0.035$ ). After the SBHCs opened, the total costs for African-American students increased significantly more than for other students (RACE\*SBHC,  $F=8.28$ ,  $p=0.004$ ).



## HOSPITALIZATION COSTS BEFORE AND AFTER THE SBHCs OPENED

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Based on the theoretical framework expressed in equation 2, we conducted repeated measures ANCOVA to assess the impact of the SBHCs on hospitalization costs. Table 5 summarizes the multivariate tests for repeated measures ANCOVA on the marginal mean of hospitalization costs. It indicates that the average hospitalization cost per student was not significantly different before and after the SBHCs opened, with TIME effect  $p=0.287$ , and no significant Time\*SBHC effect, with  $p=0.247$ . In addition, the hospitalization costs for disabled students were significantly higher than for other students ( $F=72.38$ ,  $p<0.0001$ ). After the SBHCs opened, the hospitalization costs for African-American students changed significantly more than for other students (RACE\*SBHC,  $F=4.54$ ,  $p=0.033$ ).

## COSTS OF EMERGENCY DEPARTMENT VISITS BEFORE AND AFTER THE SBHCs OPENED

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Based on the theoretical framework expressed in equation 2, we conducted repeated measures ANCOVA to assess the impact of the SBHCs on costs of emergency department (ED) visits ( $N=2,153$ ). Table 6 summarizes the multivariate tests for repeated measures ANCOVA of the marginal mean of ED costs. It indicates that the average ED cost per student was not significantly different before and after the SBHCs opened, with TIME effect  $p=0.471$ , and no significant TIME\*SBHC effect, with  $p=0.489$ . In addition, the ED costs increased significantly over time for older students (TIME\*AGE,  $F=6.42$ ,  $p=0.011$ ). The ED costs for students enrolled

in a Medicaid MCO were significantly different than other students ( $F=78.82, p<0.0001$ ). The ED costs also changed significantly over time for students enrolled in Medicaid MCOs ( $TIME*MCO, F=8.86, p=0.003$ ). The ED costs for disabled students were significantly different than for other students ( $F=29.51, p<0.0001$ ) and changed significantly over time ( $TIME*DISABLED, F=12.99, p<0.0001$ ). The ED costs for students enrolled in CHIP were significantly different than for other students ( $F=11.87, p=0.001$ ). The ED costs for African-American students were significantly different than for other students ( $F=11.94, p=0.001$ ). The ED costs for students in intervention schools were significantly less than for students in comparison schools ( $F=15.03, p<0.0001$ ). After the SBHCs opened, the ED costs for male students changed more than for female students ( $SEX*SBHC, F=4.67, p=0.031$ ). Also, after the SBHCs opened, the ED cost for African-American students changed more than for other students ( $RACE*SBHC, F=32.03, p<0.0001$ ).

#### **COSTS FOR MENTAL HEALTH SERVICES BEFORE AND AFTER SBHC PROGRAM**

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Based on the theoretical framework expressed in equation 2, we conducted repeated measures ANCOVA to assess the impact of the SBHCs on costs of mental health services ( $N=2,153$ ). Table 7 summarizes the multivariate tests for repeated measures ANCOVA of the marginal mean of mental health services costs. It indicates that there was a significant interaction effect of the SBHCs ( $TIME*SBHC, F=4.16, p=0.042$ ). There were other significant interaction effects on the mental health service costs, including  $TIME*DISABLED (F=16.48, p<0.0001)$  and  $TIME*SEX (F=4.72, p=0.030)$ . Figure 23 shows that the mental health service costs for students in

intervention schools increased from \$520 to \$1,200 per student, while the mental health service cost for students in comparison schools increased from \$620 to \$910 per student.

In addition, the mental health service costs increased significantly with age ( $F=22.48$ ,  $p<0.0001$ ).

The mental health service costs for disabled students were significantly higher than for other

students ( $F=148.37$ ,  $p<0.0001$ ). The mental health service costs for male students were

significantly higher than for female students ( $F=22.81$ ,  $p<0.0001$ ). There were also significant

interaction effects for RACE\*SBHC ( $F=6.29$ ,  $p=0.012$ ).

#### **PRESCRIPTION DRUG COSTS BEFORE AND AFTER THE SBHCs OPENED**

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Based on the theoretical framework expressed in equation 2, we conducted repeated measures

ANCOVA for students to assess the impact of the SBHCs on prescription drug costs ( $N=2,153$ ).

Table 9 summarizes the multivariate tests for repeated measures ANCOVA of prescription drug

costs before and after the SBHCs opened. It indicates that the average prescription drug costs per

student increased significantly over time, with TIME effect ( $F=7.74$ ,  $p=0.005$ ), and there was a

significant interaction effect of the SBHCs (TIME\*SBHC,  $F=5.002$ ,  $p=0.025$ ). There were other

significant interaction effects on prescription drug costs, including TIME\*MCO interaction

( $F=5.10$ ,  $p=0.024$ ), TIME\*DISABLED ( $F=8.33$ ,  $p=0.004$ ), and TIME\*SEX ( $F=13.27$ ,

$p=0.004$ ). Figure 24 shows that the prescription drug costs for students in intervention schools

increased from \$180 to \$350 per student, while the prescription drug cost for students in comparison schools increased from \$250 to \$640 per student.

In addition, prescription drug costs for students in intervention schools were significantly less than for students in comparison schools ( $F=10.35$ ,  $p=0.001$ ). The prescription drug costs per student were also significantly different between students enrolled in a Medicaid MCO and others ( $F=6.99$ ,  $p=0.008$ ), between disabled students and others ( $F=84.48$ ,  $p<0.0001$ ), between male and female students ( $F=5.12$ ,  $p=0.024$ ), and between African-American students and others ( $F=11.73$ ,  $p=0.001$ ).

#### DENTAL CARE COSTS BEFORE AND AFTER SBHC PROGRAM

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Based on the theoretical framework expressed in equation 2, we conducted repeated measures ANCOVA students to assess the impact of the SBHCs on dental care costs ( $N=2,153$ ). Table 10 summarizes the multivariate tests for repeated measures ANCOVA of dental care costs before and after the SBHCs opened. It indicates that the average dental care costs per student increased significantly over time, with TIME effect ( $F=31.43$ ,  $p<0.0001$ ), and there was a significant interaction effect of the SBHCs (TIME\*SBHC,  $F=2.82$ ,  $p=0.093$ , see Figure 25) at one-tail test alpha level 0.10. There were other significant interaction effects of dental care costs, including TIME\*AGE ( $F=4.46$ ,  $p=0.035$ ), TIME\*MCO ( $F=22.88$ ,  $p<0.0001$ ), and TIME\*DISABLED ( $F=8.08$ ,  $p=0.005$ ). Figure 25 shows that the dental care costs for students in intervention

schools increased from \$110 to \$195 per student, while the dental care cost for students in comparison schools increased from \$110 to \$165 per student.

In addition, dental care costs for students in intervention schools were significantly higher than for students in comparison schools ( $F=3.14$ ,  $p=0.077$ ) at one-tail test alpha level 0.10. The dental care costs per student were also significantly different between students enrolled in a Medicaid MCO and others ( $F=155.85$ ,  $p<0.0001$ ) and between students enrolled in CHIP and others ( $F=5.20$ ,  $p=0.023$ ). There was a significant RACE\*SBHC interaction ( $F=11.79$ ,  $p=0.001$ ).

#### **EPSDT COSTS BEFORE AND AFTER SBHC PROGRAM**

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Based on the theoretical framework expressed in equation 2, we conducted repeated measures ANCOVA to assess the impact of the SBHC program on EPSDT costs ( $N=2,153$ ). Table 8 summarizes the multivariate tests for repeated measures ANCOVA of EPSDT costs before and after the SBHCs opened. It indicates that the average EPSDT costs per student increased significantly over time, with TIME effect ( $F=46.9$ ,  $p<0.0001$ ). There were other significant interaction effects of EPSDT costs, including TIME\*AGE ( $F=71.2$ ,  $p<0.0001$ ), and TIME\*RACE ( $F=15.7$ ,  $p<0.0001$ ).

EPSDT costs for students in intervention schools were significantly higher than for students in comparison schools ( $F=17.6$ ,  $p<0.0001$ ). EPSDT costs were also significantly different between students of different ages, between students with Medicaid managed care and students with Medicaid fee-for-service plans (CHIP, ABD, etc.), between disabled and non-disabled students, and between African Americans and other ethnicities.

#### GROWTH CURVE ANALYSIS (HIERARCHICAL LINEAR/NONLINEAR MODELING) FOR TOTAL MEDICAID COSTS

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The five-and-one-half academic years of data have a nested data structure—repeated observations are nested within individuals. The nested-structure growth analysis allows for examination of linear, quadratic, and cubic growth trajectories, and for examination of which trajectory best represents individuals' change over time (Raudenbush & Bryk, 2002; Snijders & Bosker, 1999). Unlike other repeated measures analyses, HLM can examine the fit of data with an unequal number of repeated observations for each individual. We conducted hierarchical linear/nonlinear modeling (HLM) analyses for all eligible students to analyze growth trajectories across the 22 quarters and to control unbalanced data due to student attrition or different enrollment periods. We used all 5,056 students in the study for the HLM analysis. These students were enrolled in Medicaid for at least one quarter during the study period and were enrolled in either an intervention or comparison school for at least one academic year from 2000–2002.

The outcome measure ( $Y$ , dependent variable) for HLM analysis is the quarterly total Medicaid costs (adjusted 2002 dollar value). There are two levels of HLM models:

Level 1 (Repeated-observations): A polynomial model of the effect of time (*i.e.*, the 22 quarters from fall 1997 to winter 2003) on the outcome variable.

Level 2 (Student-level): Linear models of the effects of the individual differences, such as race, gender, age, SBHC, CHIP, disabled, and MCO on the growth trends.

Following is the summary of the **model** specified in equation format.

**Level 1 Model** (repeated observations):

$$Y = B_0 + B_1*(QR) + B_2*(QR^2) + B_3*(QR^3) + E$$

Where

$Y$  is the outcome variable;

$QR$  is the time variable and is centered at quarter 13, when the SBHCs opened (*i.e.*, intervention starting point);

$B_0$  is the initial status at quarter 13;

$B_1$  is the linear growth trend at quarter 13;

$B_2$  is the quadratic growth trend at quarter 13;

$B_3$  is the cubic growth trend at quarter 13;

$E$  is the Level 1 random error.

Level 2 Model (individual measurement):

$$B_0 = G_{00} + G_{01}*(SEX) + G_{02}*(RACE) + G_{03}*(AGE) + G_{04}*(SBHC) \\ + G_{05}*(MCO) + G_{06}*(CHIP) + G_{07}*(DISABLED) + U_0$$

$$B_1 = G_{10} + G_{11}*(SEX) + G_{12}*(RACE) + G_{13}*(AGE) + G_{14}*(SBHC) \\ + G_{15}*(MCO) + G_{16}*(CHIP) + G_{17}*(DISABLED)$$

$$B_2 = G_{20} + G_{21}*(SEX) + G_{22}*(RACE) + G_{23}*(AGE) + G_{24}*(SBHC) \\ + G_{25}*(MCO) + G_{26}*(CHIP) + G_{27}*(DISABLED)$$

$$B_3 = G_{30} + G_{31}*(SEX) + G_{32}*(RACE) + G_{33}*(AGE) + G_{34}*(SBHC) \\ + G_{35}*(MCO) + G_{36}*(CHIP) + G_{37}*(DISABLED)$$

Where

$G_{XX}$  are the intercepts;

$G_{X1}$  are the effects of gender (male = 1 and female = 0) on the growth trends;

$G_{X2}$  are the effects of race (black = 1 and others = 0);

$G_{X3}$  are the effects of age (in years as of September 30, 2000);

$G_{X4}$  are the effects of an SBHC (SBHC = 1 and non-SBHC = 0);

$G_{X5}$  are the effects of Medicaid MCO enrollment;

$G_{X6}$  are the effects of CHIP enrollment;

$G_{X7}$  are the effects of enrollment in the Medicaid Aged, Blind, or Disabled (ABD) program;

and

$U_0$  is the level-2 random error.



**Table 11** summarizes the final least-squares estimates of fixed effects with robust standard errors for quarterly total Medicaid costs under the HLM analysis. It demonstrates the effects of race, gender, age, SBHC, and enrollment in Medicaid programs such as ABD, CHIP, or an MCO on the growth trends of the quarterly total Medicaid costs. There are several major findings, as follows:

- (1) The average total Medicaid costs at quarter 13 (September–November 2000, when the SBHCs opened) across all students was significantly different from zero ( $p < 0.0001$ ). This implies that all students used the Ohio Medicaid program for their health care services.
- (2) There was a significant race difference ( $p = 0.061$ ) in the total Medicaid cost at quarter 13. Specifically, the total costs for African-American students were significantly lower than those for other students at quarter 13.
- (3) There was a significant gender difference ( $p = 0.027$ ) in the total Medicaid cost at quarter 13. Specifically, the total costs for male students were significantly higher than those for female students at quarter 13.
- (4) Disabled students had significantly higher costs ( $p < 0.0001$ ) at quarter 13.

- (5) There was a significant linear growth trend of total Medicaid costs for older students ( $p = 0.018$ ), implying that the total Medicaid costs increased with age after the SBHCs opened in quarter 13.
  
- (6) There was a significant quadratic negative growth trend of total costs for disabled students ( $p < 0.0001$ ). This implies that compared with the costs for other students, the quarterly total costs for disabled students tended to have significantly faster acceleration in the early quarters of SBHC operations than in the later quarters.

Figure 26 is the HLM growth curve of quarterly total costs by gender. For all students in both intervention and comparison schools, we found a similar pattern of quarterly total Medicaid costs between male and female students. The quarterly total costs for a male student were about \$290 in quarter 1 (September–November 1997), decreased slightly to \$240 in quarters 4 and 5 (July–August 1998 and September–November 1998), and then increased dramatically to a peak of \$460 in the last two quarters (September–November 2002 and December 2002–February 2003). The quarterly total cost for a female student decreased in the first few quarters from \$290 to \$240, then gradually increased over time to \$360 in the last three quarters.

Figure 27 is the HLM growth curve of quarterly total costs by ethnicity. It shows that there is a different trend of quarterly total costs between African-Americans and others. The quarterly total costs for African-American students were about \$260 per student in quarter 1, decreased slightly to \$200 in quarter 4, then increased dramatically to \$420 in the last quarter. The quarterly total

cost for other ethnicities was \$330 in quarter 1, decreased to \$290 level in quarter 4, increased rapidly to \$420 in quarters 19 and 20 (March–May 2002 and June–August 2002), and then slightly decreased through quarter 22. African-American students had lower quarterly total costs than other students at the start of quarter 13 (when the SBHCs opened), but by the end of the study, they had equal to slightly higher total costs.

Figure 28 is the HLM growth curve of quarterly total costs by age. We looked at three representative ages of students in the study: 11 years old (the higher median), 8 years old (median), and 6 years old (lower median). The figure shows that the quarterly total costs for all students were about \$300 per student in the early quarters, decreased slightly to \$250 in quarters 4 and 5, and increased rapidly with age through the end of the study. In the last few quarters, the older students had higher quarterly costs than younger students: 11-year-olds had a cost of \$500 per student; 8-year-olds, \$400 per student; and 6-year-olds, \$300 per student.

Figure 29 is the HLM growth curve of quarterly total costs for the intervention and comparison groups. The quarterly total costs for a student in intervention schools were \$290 in quarter 1, decreased slightly to \$220 in quarters 4 and 5, and increased rapidly to the peak of \$430 in the last quarter. The quarterly total costs for a comparison student were \$310 in quarter 1, decreased slightly to \$300 in quarters 3 and 4 (March–May 1998 and June–August 1998), increased slightly to \$380 in quarters 17 and 18 (September–November 2001 and December 2001–February 2002), and then decreased slightly to \$320 in the last quarter.

Figures 30 – 32 are HLM growth curves of quarterly total cost by intervention or comparison group and by sex, race, and age, respectively. These curves demonstrate detailed patterns of quarterly total costs between intervention and comparison groups.

#### **RATES OF HOSPITALIZATION BEFORE AND AFTER THE SBHCs OPENED**

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Based on the theoretical framework expressed in equation 3, we used a generalized estimating equations (GEE) analysis of repeated measures Poisson regression to assess the time-related interaction effect on hospitalization rates before and after the SBHCs opened. Table 12 summarizes the odds ratios of hospitalization rates for students. The overall risk of hospitalization per student was not significantly different before and after the SBHCs opened. The risk of hospitalization for disabled students was 3.015-fold higher than for other students (95% CI, 1.644 – 5.529). The risk of hospitalization for students enrolled in a Medicaid MCO was 86% less than for other students, i.e., odds ratio reduction as  $(1 - 0.14 = 0.86)$ .

#### **RATES OF EMERGENCY DEPARTMENT VISITS BEFORE AND AFTER THE SBHCs OPENED**

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Based on the theoretical framework expressed in equation 4, we used a GEE analysis of repeated measures Poisson regression to assess the time-related interaction effect on emergency department (ED) visits before and after the SBHCs opened. Table 13 summarizes the odds ratios of ED visits. The risk of ED visits for students in comparison schools was 50% higher than

students in intervention schools. While the risk of ED visits for students in comparison schools increased 20%, the risk of ED visits for students in intervention schools was not significantly different (OR = 1.06, 95% CI 0.96 – 1.18) before and after the SBHCs opened. For all students, the risk of ED visits for African-American students was 25% lower than other students, i.e., odds ratio reduction as  $(1 - 0.75 = 0.25)$ . Disabled students had 21% higher risk of ED visits. Students enrolled in a Medicaid MCO had an 85% lower risk of ED visits than other students. The students enrolled in CHIP had a 20% lower risk of ED visits than other students.

## *IV. RESULTS – Aim #2*

**Aim 2.** To evaluate health costs and utilization of students in schools with SBHCs who have asthma or mental illnesses compared to students in schools without SBHCs before and after the SBHCs opened.

### COHORT STUDY FOR STUDENTS WITH ASTHMA

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Of the 5,056 students in this study, we identified a total of 556 (11% of the study participants) students who had at least one medical claim with an asthma diagnosis indicated by the International Classification of Disease, Ninth Revision (ICD-9) codes 493.xx and at least one pharmacy claim of anti-asthmatic medication during the study period. These anti-asthmatic medications include the following therapeutic classes:  $\beta_2$  agonists (inhaled or oral tablets), glucocorticoids or corticosteroids (systemic, inhaled), sustained release theophylline, anticholinergics, other anti-inflammatory agents, and leukotriene receptor antagonists (see Appendix X). We excluded 282 children who were only enrolled in their school for one year or who changed schools between the intervention and comparison groups. We also excluded one outlier child who had severe asthma and multiple comorbidities and extremely high health care use. The final cohort consisted of 273 students with at least two-years continuous enrollment in their schools, with 196 children in intervention schools and 77 children in comparison schools.

In order to compare baseline characteristics, we looked at the children's comorbid medical illnesses prior to September 2000 (when the SBHCs opened) for the intervention and comparison groups.

The most frequent comorbidities included:

obesity (ICD-9 codes 278, 278.0x),

depression (ICD-9 codes 296.2x, 296.3x, 311.xx),

allergies (ICD-9 codes 477.xx),

sinusitis (ICD-9 codes 461.xx, 473.xx),

gastro-esophageal reflux disease (ICD-9 code 530.81), and

attention deficit/hyperactivity disorder (ADHD) (ICD-9 codes 314.xx).

Of the 273 students in this cohort, 42.1% were female. The average age was 8.2 (Standard Deviation [SD] 2.3) as of September 30, 2000, and the average term of Medicaid enrollment was 59.3 months (SD 11.8). The baseline characteristics for intervention and comparison groups were quite similar in term of demographics, enrollment, and asthma comorbidity (see Table 14). Exceptions are that compared to the intervention group, the comparison group had a significantly higher percentage of females and non-African-Americans, but a significantly lower percentage of students enrolled in a Medicaid MCO and students with allergy comorbidity.

#### RISK OF HOSPITALIZATION AND ED VISITS FOR STUDENTS WITH ASTHMA

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Figure 33 shows the numbers of hospitalizations and emergency department (ED) visits for children with asthma before and after the SBHCs opened in both the intervention and comparison groups.

Intervention students showed lowered hospitalizations and ED visits after quarter 13, when the SBHCs opened, compared to before. Comparison students remained at the same level before and after quarter 13. Based on results from the GEE analysis of repeated measure Poisson regression, the odds ratios of hospitalization decreased 2.4-fold (i.e.,  $3.403 - 1.0 = 2.4$ ) and odds ratios of ED visits decreased 33.5% (i.e.,  $1.335 - 1.00 = 0.335$ ) after the SBHCs opened for intervention students (see Table 15). In addition, the risk of ED visits for children enrolled in both a Medicaid MCO and CHIP were 5.7% (i.e.,  $1.00 - 0.943 = 0.057$ ) and 24% (i.e.,  $1.00 - 0.76 = 0.24$ ), respectively, lower than children enrolled in other Medicaid programs.

We conducted additional analyses to investigate the primary diagnoses for hospitalization and ED visits before and after the SBHCs opened. Table 16 indicates that hospitalizations for asthma, mental disorders, bronchitis, and pneumonia decreased significantly for students with asthma in the intervention schools after the SBHCs opened, while those hospitalizations remained at the same level for children with asthma in the comparison schools. Two hospitalizations related to pregnancy labor abnormalities and congenital musculoskeletal deformities occurred in the intervention group after the SBHCs opened.

Table 17 shows that the total number of ED visits decreased from 344 to 307 in the intervention group after the SBHCs opened, while the total number of ED visits increased from 200 to 210 in the comparison group. The decrease in ED visits for otitis media (ear infections) were statistically significant in the intervention group after the SBHCs opened, although the ED visits for other specific diagnoses had no significant difference.



Table 18 summarizes the costs of hospitalization and ED visits for children with asthma before and after the SBHCs opened. Based on results from the repeated measure ANCOVA, there was a significant interaction effect (TIME\*SBHC,  $F=4.115$ ,  $p=0.044$ ) for the cost of hospitalization before and after the SBHCs opened (see Table 19). Figure 34 demonstrates this interaction effect. While the cost of hospitalization per child decreased from \$1,150 per child to \$180 after controlling covariates in the intervention group, the cost of hospitalization per child was relatively unchanged from \$583 to \$606 in the comparison group before and after the SBHCs opened. In addition, African-American children with asthma had significantly decreased costs of hospitalization (TIME\*RACE,  $F=5.198$ ,  $p=0.023$ ) after the SBHCs opened. Disabled children with asthma had significantly higher costs of hospitalization than other children with asthma ( $F=4.70$ ,  $p=0.031$ ).

Although there was no significant interaction effect on the costs of ED visits for all students before and after the SBHCs opened (TIME\*SBHC,  $F=0.507$ ,  $p=0.477$ ) (see Table 20), the costs of ED visits for children with asthma in comparison schools were significantly higher than for children with asthma in intervention schools ( $F=19.8$ ,  $p<0.0001$ ) after the SBHCs opened. Figure 35 indicates that the cost of ED visits per child was \$303 in both the intervention comparison groups before the SBHCs opened, then decreased to \$275 per child in the intervention group and increased to \$331 per child in the comparison group after the SBHCs opened.

Of the 5,069 students in this study, we identified a total of 1,200 students who had at least one medical claim with a mental health diagnosis indicated by ICD-9 codes 290.xx – 316.xx (Appendix X) and at least one pharmacy claim for mental health drugs (Appendix X). Mental illnesses among school-age children primarily include depression, attention deficit/hyperactivity disorder (ADHD), substance abuse, and anxiety disorder. Related medications include:

CNS stimulants: (e.g. methylphenidate);

Anticonvulsants (e.g. phenytoin, methsuximide);

Barbiturates (e.g. secobarbital);

Benzodiazepines (e.g. flurazepam);

Antidepressants (e.g., SSRI antidepressants, tricyclic antidepressants, and MAOI inhibitors);

antipsychotics, and other anxiolytics, sedatives, and hypnotics (e.g. meprobamate); and psychotherapeutic agents and combinations.

Table 21 lists the mental illnesses diagnosed for students during hospitalization or hospital outpatient visits (N=1,200). The five most frequent diagnoses were:

hyperkinetic syndrome of childhood (or ADHD),

affective psychoses,

disturbance of conduct,

adjustment reaction, and  
disturbance of emotions specific to childhood and adolescence.

Table 22 summarizes the mental illnesses diagnosed for students during medical office visits (N=1,200). The five most frequent diagnoses were:

hyperkinetic syndrome of childhood (or ADHD),  
adjustment reaction,  
disturbance of emotions specific to childhood and adolescence,  
disturbance of conducts, and  
affective psychoses.

Simply looking at the mental health cohort masked any increases in access to mental health treatment for all students caused by the SBHCs. Because we wanted to see if students in intervention schools received more mental health services regardless of diagnosis of a mental health disorder, we looked at the 2,153 children who were enrolled in Medicaid and the same school for two years. Figure 36 shows the percentage of these students who received mental health care before and after the SBHCs opened (N=2,153). After September 2000 (when the SBHCs opened), 5.1% more students in urban intervention schools and 7.1% more students in rural intervention schools received mental health services than before September 2000. Only 2.3% more students in urban comparison schools and 1.5% more students in rural comparison students received mental health services after September 2000.

## TOTAL COSTS FOR STUDENTS WITH MENTAL HEALTH PROBLEMS

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We conducted a cohort study of students with mental illnesses who enrolled in the same school and in Medicaid for at least two years from 2000 to 2003. This group consisted of 551 students, with 402 students in intervention schools and 149 students in comparison schools. Table 23 summarizes the repeated measures ANCOVA of total costs for students with mental health illnesses before and after the SBHCs opened. Older students had higher total costs than younger students ( $F=5.69$ ,  $p=0.017$ ). Disabled students also had higher total costs ( $F=37.66$ ,  $p<0.0001$ ). There was a significant RACE\*SBHC interaction effect ( $F=5.85$ ,  $p=0.016$ ).

Figure 37 demonstrates that the total costs for students with mental illnesses in both groups increased overtime. The total cost for a student with mental illness in an intervention school increased more rapidly, going from \$4,100 to \$7,200 after the SBHCs opened, while the total cost for a student with mental illness in a comparison school increased from \$5,000 to \$6,500. The net difference of total cost was calculated as  $(\$7,200 - \$4,100) - (\$6,500 - \$5,000) = \$3,100 - \$1,500 = \$1,600$  per student during the study period.

We also conducted repeated measures ANCOVA for mental health services costs before and after the SBHCs opened (see Table 24, Figure 38). The mental health services costs increased with age ( $F=14.09$ ,  $p<0.0001$ ). Disabled students had higher mental health services costs than other students ( $F=19.59$ ,  $p<0.0001$ ). Male students had significantly higher mental health services costs than female students ( $F=5.88$ ,  $p=0.016$ ). There was a significant SEX\*SBHC interaction effect ( $F=4.92$ ,  $p=0.027$ ).

## *V. RESULTS – Aim #3*

**Aim 3.** To quantify and evaluate health economic costs and benefits of SBHCs.

### **COST-BENEFIT ANALYSIS FOR THE SBHC PROGRAM**

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Cost-benefit analysis of the SBHCs was based on all students enrolled in each intervention school regardless of type of health insurance or non-insurance. There were a total of 7,608 students enrolled in the four intervention schools. We estimated the costs and benefits in this study based on three years of SBHC operations.

The major departure from the theoretical model lies in using the Health Foundation’s three-year funding totals as a proxy for the detailed direct medical costs of SBHC operations. This provides a minimum value of the economic resources used and is substantiated by data from surveys from each of the intervention schools, which indicated very few “in-kind” resources other than physical space and minor pieces of equipment. This approach also avoids double counting of resources.

The actual operating costs for each of the intervention schools are presented in Table 25. A total of \$1,382,260 was spent over the first three years of operations. The critical question is whether this investment enabled the SBHCs to generate economic outcome that exceeds it, and that is elaborated below.

### **Economic Outcomes from Three Years of SBHC Operations in Four School Districts**

This analysis uses information from the SBHC Welligent database (Wade, et al., 2004). The four intervention schools had a total student population during the study period of 7,608 students. Of these, 4,136 students were enrolled in the SBHC (see Table 26). During the study period, 2,314 students generated a total of 7,572 SBHC encounters (see Table 27). The estimated values for these encounters are summarized in Table 28.

Most frequently, students returned to the classroom after an SBHC visit (see Table 29). Noteworthy are the 618 encounters that resulted in a student being dismissed from school after they were referred for additional medical care. The 755 students who had “no entry” were students whose outcomes were not entered into the Welligent database.

### **Value of Additional Outside Sources of Funding**

Three of the intervention schools reported receiving grants or other funding subsequent to the establishment of their SBHCs. The three schools received a total of \$562,598 that contributed substantially to the SBHCs' benefit, including \$30,000 in Urban 3, \$332,598 in Urban 1, and \$200,000 in Urban 2 (see Table 30). Because the Healthy Schools/Healthy Communities Grants (\$105,000) were used to support the SBHC start-up, we calculated the created grant value as  $\$562,598 - \$105,000 = \$457,598$ .

## Estimation of the Value of Outcomes as Benefits

We incorporated the aforementioned data into our estimation of the value of the benefits of the SBHCs (see Table 31). We took a societal perspective. We also made the following assumptions and observations:

1. The Health Foundation's funding and the Healthy Schools/Healthy Communities Grants enabled the intervention schools to initiate and maintain personnel, equipment, and space for SBHC activities that otherwise would not have occurred. Total actual operating costs over the three years were \$1,382,260.

2. The SBHCs charged students a copayment for services.

Students enrolled in CHIP, AFDC, and the ABD program had no copayments for SBHC visits.

Students enrolled in Medicaid MCOs and students with private insurance had an estimated copayment of \$10–15 per visit.

Uninsured students who self pay were charged a sliding-scale fee for visits. SBHCs determine these fees based on family income. Students pay a very small amount if their family incomes are low (Bureau of Primary Health Care, 2004).

Because we don't have a complete document, we estimated as \$10 per each SBHC encounter. It was estimated as \$75,720 for copayment.

3. Each school donated space to the SBHCs. We estimated that the market value of this space was \$60,750 over the three years in the four intervention schools.

4. The SBHCs allowed students to receive on-site care that otherwise would not have occurred, and this care has a value equal to the prevailing market for Early Periodic Screening, Diagnosis, and Treatment (EPSDT) services. The estimated value of SBHC office visits was **\$479,929** (see Table 28).
  
5. SBHCs conducted many non-billable health care activities. For example, nurse practitioners spent 30– 50% of their time on non-billable services for teachers and staff, student smoking cessation programs, student health status consultations, staff meetings, etc. The estimated value of non-billable health care activities ranged from **\$143,979** to **\$239,964** over the three years<sup>2</sup>.
  
6. Because students received care in the SBHCs, their parents saved a substantial amount of travel expenses. Based on parent survey data, we estimated that a trip to a physician's office cost \$4.90 per visit in an urban area and \$8.05 per visit in a rural area<sup>3</sup>. Therefore, we estimated the total travel expenses for the 7,572 visits were **\$42,956**.

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<sup>2</sup> Value of non-billable health care activities was estimated as 30–50% of SBHC office visits, i.e.,  $\$479,929 \times 30\% = \$143,979$ , and  $\$479,929 \times 50\% = \$239,964$ .

<sup>3</sup> From parent survey data, the average time to a physician's office was 14 minutes in an urban area (28 minutes round-trip) and 23 minutes in a rural area (46 minutes round-trip). If parents drive 30 miles per hour, the round-trip mileages were 14 miles in urban area, and 23 miles in rural area. Based on a basic rate of \$0.35 per mile, we estimated the travel expenses were  $\$0.35 \times 14 = \$4.9$  per visit in an urban area and  $\$0.35 \times 23 = \$8.05$  per visit in a rural area.



7. Because the SBHCs focused on accessibility of mental health and dental care for students, both mental health service costs and dental care costs increased for students in intervention schools.
- a. For the additional value of mental health services, we calculated the difference of mental health service costs between intervention and comparison Medicaid students as:  $(\$671 - \$495) + (\$1,153 - \$1,058) = \$176 + \$95 = \$271$  per student (see Figure 23), or  $\$271 * 2,153$  students =  $\$583,463$  during the first two-and-one-half years of SBHC operations. Over the first three years, we estimated the increased mental health service benefit as  $(\$583,463 / 2.5) * 3 =$   **$\$700,155.60$** .
  - b. We based another estimation of the value of mental health services on the cohort of students with mental illnesses (N=551, with 402 in the intervention group). From Figure 37, the net difference of total cost was calculated as  $(\$7,200 - \$4,100) - (\$6,500 - \$5,000) = \$3,100 - \$1,500 = \$1,600$  per student in 2.5 years. The estimated total value of mental health care for Medicaid students with mental illnesses was estimated as:  $[(\$1,600 * 402) / 2.5] * 3 = (\$643,200 / 2.5) * 3 =$   **$\$771,840$**  over 3 years for Medicaid students.
  - c. Because Medicaid students accounted for just over 42% of students in intervention schools, we estimated the benefit of mental health services for all students as:  $(\$771,840 / 42.25) * 100 =$   **$\$1,826,840$**  over the first 3 years of SBHC operations.

- d. From Figure 25, we calculated the difference of dental care costs between intervention and comparison students as:  $(\$195 - \$165) + (\$110 - \$110) = \$20$  per student, or  $\$20 * 1,607$  students = **\$32,140** during the 2.5 years period. The increased dental care benefit for Medicaid students was:  $(\$43,060 / 2.5) * 3 =$  **\$38,568** over the first 3 years of SBHC operations.
- e. Again, as just over 42% of students in intervention schools were enrolled in Medicaid, we estimated the benefit of dental care for all students as:  $(\$38,568 / 42.25) * 100 =$  **\$91,285** over the first 3 years of SBHC operations.
8. SBHC staff identified and referred students to additional primary care. These referrals have a value equal to the prevailing market for EPSDT or Medicaid services. SBHC office visits and the subsequent referral visits to outside sources of care were valued at \$69.00 each, based upon EPSDT payment data (see Table 29). The 618 referrals provided an additional **\$42,642** in benefit. Because referrals were not always well documented, this benefit might be under-estimated.
9. SBHCs prevented productivity losses by parents who would otherwise have had to take their children to other sources of care. These episodes would involve between four to eight hours of parent time. We estimated the value of the parent's time in the Cincinnati metropolitan region as equal to the blue and white collar combined average hourly rate of \$17.92. Over the 7,572 SBHC encounters, the SBHCs saved parents between **\$542,761** and **\$1,085,522**.

- a. Half-day productivity savings:  $7,572 * 4 * 17.92 = \$542,761$ ;
- b. Full-day productivity savings:  $7,572 * 8 * 17.92 = \$1,085,522$ .

10. The Foundation's support of the SBHCs attracted **\$457,598** in additional funding from other sources (see Table 30).

11. In this study, we found that students with asthma in intervention schools had significantly less hospitalization compared to students with asthma in comparison schools.

- a. Potential cost-savings for hospitalization were estimated as \$970 per student with asthma (see Figure 34). That is,  $\$970 * 196$  students with asthma in intervention schools = **\$190,120** for all students with asthma in intervention schools during the 2.5-year period. We estimated the savings from less hospitalization as:  $(\$190,120 / 2.5) * 3 = \$228,144$  over 3 years.
- b. Another option of cost-savings for hospitalization was calculated from the asthma cohort's raw data of hospitalization costs in Table 18 (N=196); that is,  $(\$203,981 - \$48,140) - (\$49,997 - \$46,374) = \$152,218$  for all students with asthma in 2.5 years. We estimated these savings as:  $(\$152,218 / 2.5) * 3 = \$182,662$  for all students with asthma over 3 years.
- c. Because Medicaid students accounted for just over 42% of students in intervention schools, we estimated the savings from reduced hospitalization for all

students assuming the same impact for students with private insurance. That is,  $(\$228,144 / 42.25) * 100 = \$539,986$  over the 3 years.

- d. Although we found fewer ED visits for students with asthma in the intervention group, we decided not to estimate the savings of fewer ED visits because there was no statistically significant TIME\*SBHC interaction effect.

12. Because the SBHCs prescribed other treatments or more timely essential medications for students, we found that students in the intervention schools used significantly less prescription drugs than students in the comparison schools.

- a. Potential savings for prescription drugs for students enrolled in Medicaid and the same school for two years (N=2,153) were estimated by the difference between the intervention and comparison groups; that is,  $(\$725 - \$371) - (\$288 - \$164) = \$354 - \$124 = \$230$  per student (see Figure 24). These savings for 2,153 students were estimated as:  $\$230 * 1,607 = \$369,610$  during the 2.5 years period. The total savings of less prescription drug use were estimated as  $(\$369,610 / 2.5) * 3 = \$443,532$  for the first 3 years of SBHC operations.
- b. We assume the impact of prescription drug use was the same for non-Medicaid students. The estimated savings on prescription drug use for all students are  $(\$443,532 / 42.25) * 100 = \$1,049,780$  over three years.

13. We estimated the community multiplier effect from a societal perspective. Greenbaum and Desai (2003) reported that for each dollar Medicaid spent in Ohio, there was a \$3.15

multiplier effect for the community due to contributions from health sector employment and other services. Regardless of other Medicaid payment, there was about \$479,929 \* 42.25% = \$202,770 that Medicaid paid for SBHC encounters at the intervention schools during the study. The community multiplier effect was estimated as \$202,770 \* 3.15 = \$638,726.

These points provide our rationale for valuing the benefits of the SBHCs and are summarized in Table 31 and Figure 39. In as much as they would not have occurred without the Health Foundation's funding, they represent incremental benefits from the program.

### **Net Social Benefit Estimation**

Based on the assumptions made and the calculations performed above, we estimated the SBHC costs and benefits (see Figure 39). The total costs of the SBHCs over the first 3 years were \$1,998,659. We calculated the benefits of the SBHCs over the first 3 years as \$2,552,212, with assumptions of conservative estimations, or \$6,627,123, with high-end estimations (see Table 31). Therefore, the Net Social Benefits of the SBHCs in the four intervention schools ranges from \$553,553 to \$4,628,864 over the first three years.

## *VI. Discussion*

This study was a longitudinal quasi-experimental cohort study based on multiple intervention schools with School-Based Health Centers (SBHCs) and comparison schools without SBHCs. Based on results of data analyses, we discuss selected important findings, limitations, and future research.

### TOTAL COSTS AND EFFECTIVENESS OF SBHCs

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A total Medicaid cost of \$29.8 million was spent for the 5,056 students in this study between September 1997 and February 2003). The average cost per student was \$5,904. The major health care cost components for school-age children in the Medicaid program were mental health services, outpatient care, hospitalizations, physician encounters, prescription drugs, and emergency department (ED) visits. The costs for dental care and Early Periodic Screening, Diagnosis, and Treatment (EPSDT) visits were relatively small components because these services are relatively cheaper.

This study indicated that disabled students had significantly higher total Medicaid, hospitalization, and ED costs than other students (see Tables 4, 5, 6, and 11), and had a 3-fold higher risk of hospitalization and 20% higher risk of ED visits (see Tables 12 and 13). Given the nature of being disabled, it is not unexpected that these students would cost more in health care.

African-American students had lower total and ED costs (see Tables 4, 6, 11) and had a 25% lower risk of ED visits (see Table 13) compared to other students. However, African-American students had a significant SBHC interaction effect for receiving mental health services, EPSDT visits, and dental care (see Tables 7, 8, 10). The quarterly total costs for African-American students increased rapidly after the SBHCs opened (see Figure 27). This suggests that the SBHCs provided increased access to services and reduced health disparities in the African-American community.

Male students had higher total, ED, mental health services, and prescription drug costs (see Tables 4, 6, 7, 9, 11) compared to female students. The quarterly total costs for male students increased more rapidly than female students as age increased and after the SBHCs opened (see Table 11, Figure 25). Given the nature of child development, male students might have greater predisposition towards more trauma and injuries, attention-deficit/hyperactivity disorder (ADHD), and other severe health conditions.

There was no significant SBHC interaction effect for the total Medicaid, hospitalization, and ED costs among all students continuously enrolled in Medicaid (N=2,153) during the study period (see Tables 4-6, Figures 4-6). However, the resource allocation for different services changed after the SBHCs opened:

Students in intervention schools received more mental health services compared to students in comparison schools.

Students in intervention schools received relatively fewer prescription drugs compared to students in comparison schools.

Although African-American students had significantly lower total costs before the SBHCs opened in September 2000 (see Table 11), they received more health care after the SBHCs opened (see Figure 27) and overcame the cost disparity in the later quarters of this study.

There was no difference in cost for physician encounters between intervention and comparison students. (Note: SBHC encounters were counted in this category.)

We found there is a slightly increased cost of dental care for students in intervention schools compared to students in comparison schools. Given that dental care is the number one unmet health care need in Ohio, the SBHCs provided a valuable service for children in low-income families, especially since children received less dental care as the economy contracted during the end of the study period (2000–2003).

If we just look at overall costs without separating them into components, we may not see that the cost of some services (such as ED visits and hospitalizations) went down and the cost of more appropriate services (such as EPSDT visits and outpatient care) went up. This study found that hospitalization and ED costs for students with asthma decreased and costs for mental health services for students with mental illnesses increased. We explore this consideration in the following sections related to outcome measurements for the two separate cohorts: students with asthma and students with mental illnesses.



## EFFECTIVENESS OF SBHC PROGRAM ON HOSPITALIZATION AND ED VISITS FOR ASTHMA COHORT STUDENTS

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Hospitalization and emergency department (ED) visits are the most costly medical services in Medicaid programs, accounting for 23–30% of the total annual Ohio Medicaid expenditures from 1995 to 2000 (ODJFS, 1996-2002). Hospitalization and ED costs accounted for 20% of the total Medicaid costs among the 5,056 students in this study.

After the SBHCs opened, the risk of hospitalization decreased 2.4-fold and the risk of ED visits decreased 34% for students with asthma. Because we found a significant interaction effect for the cost of hospitalization before and after the SBHCs opened, the potential cost-savings for hospitalization was estimated as \$970 per child with asthma (i.e., \$1,150 - \$180 = \$970) (see Figure 4). Although we cannot control the students' asthma severity, we found that the pattern of hospitalization for students in intervention schools changed after the SBHCs opened. In addition, the results in the present study indicate that children enrolled in Medicaid MCOs or in CHIP also had lower risk of ED visits than students enrolled in other programs, such as Medicaid's Aged, Blind, or Disabled (ABD) program. This reflects the fact that students enrolled in Medicaid MCOs or CHIP are healthier than students enrolled in the ABD program. In general, this finding is consistent with previously published SBHC evaluations in Georgia and New York (Adams, 2000; Webber, 2003).

If an SBHC is present in their school, students with asthma are assured better access to health care services and might increase school attendance and performance. Parents might reduce inconvenient appointment times that cause lost time from work or increased travel costs. Due to the decreased hospitalization and ED visits, students, families, and the Ohio Medicaid program may benefit from SBHCs.

#### EFFECTIVENESS OF SBHCs ON ACCESS TO CARE FOR STUDENTS WITH MENTAL ILLNESSES

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Mental health services emerge as a major cost component for school-age children, accounting for roughly 30% of the total health care cost. The cost of mental health services includes Medicaid-paid inpatient hospital, mental health, mental retardation, and support services and psychiatric physician encounters, but excludes prescription drugs or laboratory tests related to mental health treatment. The trend analyses demonstrated that there is a seasonal pattern for the mental health utilization and costs with peaks in fall, winter, and spring quarters, and troughs in the summer, indicating that, in general, children receive more mental health services during the school year. The use of mental health services increased significantly in the intervention schools after the SBHCs opened (see Figures 7, 36, 38). Students in intervention schools received 5.1% more mental health services in urban schools and 7.1% more mental health services in rural schools (see Figure 36). There was also a significant SBHC interaction effect on mental health service costs for students (see Table 7).

In general, children and adolescents with serious and persistent mental illnesses often incur large public expenditures. *Mental Health: A Report of the Surgeon General* (U.S. Surgeon General, 1999) concluded that primary care personnel are paying insufficient attention to children's mental health disorders. Public health policy makers have called for more studies and discussions on child mental health issues (Horwitz et al, 2002). From a recent literature review, about 20% of Boston public high school students had experienced suicidal ideation, while approximately 10% had actually attempted suicide. Medicaid children ages 10-15 years in the Boston area used mental health services and psychiatric emergency departments more than other age groups (Hacker, Drainoni, 2001). Across the border, 14% of children in Canada have clinically important psychiatric disorders at any given time (Waddell et al, 2002). Jones and colleagues (Jones, Dodge, et al. 2002) estimated that early identification and treatment of one high-risk child may result in a net savings to society of nearly \$2 million, not to mention improving the life of that child and his or her family.

Based on the results of this current study, we believe further analyses to gain greater insight into the nature and significance of mental health services and utilization patterns in Medicaid children should be done.

In this study, we calculated both low- and high-end net benefits of the four Ohio intervention schools. The Net Social Benefits ranged from \$553,553 to \$4,628,864 over three years (see Table 31 and Figure 39). Therefore, **the Foundation’s support of the four SBHCs was cost beneficial from a societal perspective.**

Since Medicaid was the primary payer of services to children in the study, we also looked at the cost benefits to Ohio Medicaid of the four intervention schools. We estimated Ohio Medicaid’s benefits from direct and indirect costs and savings, as follows:

As discussed in the findings of Aim #1 (pages 41 – 61), there was no significant SBHC interaction effect for the total costs among all students continuously enrolled in Medicaid (N=2,153) during the study period (see Tables 4-6, Figures 4-6).

However, students in intervention schools used different services after the SBHCs opened, including:

- more mental health services (+ \$771,840),
- more dental care (+ \$51,672),
- less prescription drug use (– \$594,228), and
- less hospitalization for students with asthma (– \$228,144).

Because students could access care in schools and stopped using EDs as often, parents had to travel less to take their students for medical care. Since Medicaid reimburses

parents for travel to and from medical appointments, the estimated \$42,956 in travel costs is a savings to Medicaid, as well. This is probably an underestimation, since this is based on mileage parents would drive and does not take into account bus or taxi fares, which Medicaid also reimburses.

Students visited the four SBHCs 7,572 times. If we assume that 42.25% of those visits were by Medicaid recipients, the estimated Medicaid cost is  $\$479,929 * 42.25\% = \$202,770$  over the three-year period, based on the data in Table 29. This may be an underestimation, as we could not be sure at the time of this report if Medicaid students used the SBHCs more frequently

The Medicaid perspective direct costs and benefits are:

- Total costs to Medicaid program:  $(\$771,840 + \$51,672 + \$202,770) = \$1,026,282$ .
- Total savings:  $(-\$228,144 - \$594,228 - \$42,956) = -\$865,328$ .
- The Net Medicaid Benefit:  $\$1,026,282 - \$865,328 = \$160,954$ .
- In other words, it would cost Medicaid \$160,954 to serve the 3,673 Medicaid students in the four intervention schools through the SBHCs over the three-year period.

Looking at overall Medicaid direct costs and savings without separating them into cost components may hide the fact that inappropriate costs (such as ED visits for routine medical care) are decreasing in favor of an increase in appropriate expenditures (such as mental health services or EPSDT visits). It is quite likely that increased EPSDT visits, mental health services, and dental care would benefit

Medicaid in the future. Because students received services early on, they may not need more expensive services later.

The indirect benefits (non-quantifiable benefits) include at less five aspects:

- 1) SBHCs help minorities and children from low-income families get access to health care. For example, African-American students in intervention schools received significantly more health care after the SBHCs opened.
- 2) About 80% of students in intervention schools returned to class after SBHC encounters during the study period. We believe that healthy students have better attendance and better learning performance. However, because this was beyond our study scope, we were unable to quantify this benefit.
- 3) Increased early mental health services for students in intervention schools might reduce future costly medical treatment for those students. Because of the limited time frame of this study, we were unable to quantify this impact.
- 4) Dental care for students in intervention schools might provide better quality of life for those students, and prevent or reduce future costly dental treatment.
- 5) This study found that students with asthma in intervention schools had a lower risk of hospitalization and ED visits compared to students with asthma in comparison schools. It is possible that students with asthma in intervention schools had better control of medication and received timely primary care. However, we were unable to quantify the benefit related to quality of life and future health care savings.

These indirect benefits might exceed the extra \$160,000 in costs to the Medicaid program. Although we don't know by how much, we still believe it is important for Medicaid to foster improved health care accessibility for minorities and children from low-income families and increase access to children's mental health services, dental care, and other health care.

## HEALTH POLICY IMPLICATIONS

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This present study has relevance to broader health policy issues. Both the Office of the Inspector General (OIG) in 1993 and the General Accounting Office (GAO) in 1994 reported that School-Based Health Centers (SBHCs) provided important primary care for children. They also made recommendations to federal and state governments for improving coordination between SBHCs and state Medicaid programs (Montgomery, 1995; GAO, 1994a & 1994b; Leonard, 1994). Schools with SBHCs in Greater Cincinnati have a large proportion of children who are African-American or from lower income families, ranging from 30– 80%, depending on the school. Given concerns about racial disparities in health status and health care and acknowledged barriers to care for the poor and uninsured, SBHCs are particularly important and beneficial for these children and for children with chronic diseases like asthma.

Despite the growing number of SBHCs, data concerning their benefits are scarce. Because of the limited literature about the impact of SBHCs on students with asthma and mental health problems, this study provides useful information for future SBHC management and operation.

Since state Medicaid programs cover a large proportion of children who are disabled or who are from low-income families, the present findings provide important information for health care decision makers to support future extension and improvement of SBHCs. A greater understanding of SBHCs requires more health outcome assessments and economic evaluations. A particular area of focus should be on children with specific chronic diseases other than asthma and mental illnesses. Further investigation is also warranted to assess children's quality of life, student school attendance, academic performance, and other issues that are associated with the SBHC intervention.

## LIMITATIONS

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This economic study was limited to children enrolled in schools in the Cincinnati, Ohio area who were also enrolled in Ohio Medicaid programs. These results may not be generalizable to other students or other state Medicaid populations. We were unable to evaluate all students in intervention schools because the state Medicaid databases only include students who are enrolled in Medicaid. Also, we did not differentiate between students in the intervention schools who used the SBHCs and those who did not. During the five-and-one-half year study period, the natural history of disease epidemics among school-age children varied along with maturation of students.

It is difficult to verify the accuracy of the ICD-9 codes provided in encounter data, hence it's possible that there are misclassifications of disease diagnoses. Although the SBHCs provided



health services to students in the intervention schools, we were unable to measure what proportion of children with asthma and mental illnesses received care from the SBHCs during the study period. Because our primary data source was the retrospective Medicaid medical claims database, we were unable to assess children with other insurance plans or no insurance, and could not retrieve the clinical parameters of asthma or mental health treatment for these cohorts. Both asthma and mental illness severity and student maturation were uncontrolled.

## CONCLUSIONS

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**In conclusion, the Foundation's support of the SBHCs in the four intervention schools was cost beneficial.** The Net Social Benefits of the four SBHCs was estimated to range from \$553,553 to \$4,628,864 over three years.

A total of \$30 million dollars was spent in the Ohio Medicaid program for the 5,056 students in this study during the 5½ calendar years. The major cost components for students were mental health services, outpatient care, hospitalization and ED visits, physician encounters, and prescription drugs.

Overall, the students in the intervention schools cost the Medicaid program the same amount of money as students in the comparison schools. However, students in intervention schools used more of the less expensive services, such as EPSDT visits, than the students in comparison schools. The hospitalization and ED visits decreased for students with asthma in intervention

schools, possibly due to timely primary care and valuable in-school health care services. Students in intervention schools used significantly more mental health services and dental care and significantly less prescription drugs compared to students in comparison schools. Disabled students in interventions schools received more significant health benefit from being in an intervention school. African-American students in intervention schools also received more mental health care, EPSDT visits, and dental care after the SBHCs opened.

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**Table 1. Summary of Published Major Studies on School-Based Health Centers (SBHCs)**

Author(s), Year	Data Source & Setting	Research Design	Key Findings
Adams, Johnson, 2000	state Medicaid claims database; Atlanta, Georgia	Quasi-experimental design to assess students in both SBHC and comparison schools before and after the SBHC program.	Total Medicaid expense and subcategory costs for non-emergency department transportation, drug, and emergency department visits decreased, while Medicaid EPSDT costs increased.
Kaplan et al., 1999	Parent's survey in Colorado	Cross-sectional design to assess students in both SBHC and comparison schools.	Students in a SBHC had less difficulty obtaining physical health care and less emergency department use than students in a comparable school.
Young, 2001	Medical chart review in Kentucky	Repeated measures before and after the SBHC program.	Major reasons for visits were trauma, otitis media, upper respiratory infections, and gastroenteritis. Non-urgent emergency department visits decreased after the SBHC program. Medicaid-insured children were more likely to use the emergency department than privately insured or uninsured children.
Webber et al. 2003	Parent survey in New York	Cross sectional design to compare student's health utilization in SBHC and non-SBHC schools.	The rate of hospitalization for children with asthma was 50% higher among children in non-SBHC school than those in SBHC school.
Balassone et al., 1991	Child survey in Washington	Descriptive study to analyze the users and nonusers in an SBHC.	Adolescents were at high risk for a variety of psychosocial problems such as drug use, depression, and dropout.



**Table 2. Demographics and Medicaid Enrollment for Students in Intervention and Comparison Schools**

	Overall Students (N=5,056)			Year1&2 Students (N=2,153)		
	Intervention	Comparison	p-value‡	Intervention	Comparison	p-value‡
<b>Number of Students</b>	3,673	1,383		1,607	547	
Gender						
female	48.10%	49.60%		47.80%	46.80%	
male	51.90%	50.40%	0.3145	52.20%	53.20%	0.7074
Average Age• (range)	8.41 (3 - 15)	8.04 (3 - 15)	<0.0001	8.41 (4 - 14)	8.25 (5 - 13)	0.1515
Race						
White	53.00%	52.90%	0.9174	56.90%	51.40%	0.0231
Black	45.30%	44.30%	0.508	41.80%	45.70%	0.0252
Hispanic	0.50%	0.30%		0.30%	0.00%	
Asian	0.10%	0.00%		~0%	0.00%	
Natives	0.10%	0.00%		~0%	0.00%	
Other	1.00%	2.50%		0.90%	2.90%	
Average Months Enrolled (SD‡)	40.3 (18.1)	38.4 (18.0)	0.0007	45.2 (15.2)	44.14 (15.2)	0.1533
Months enrolled before SBHC (SD)	NA	NA		23.0 (12.9)	23.9 (12.8)	0.7524
Months enrolled after SBHC (SD)	NA	NA		27.5 (5.4)	27.2 (5.2)	0.2397
State Children Health Insurance Plan (CHIP) (SD)	32.5% (0.35)	37.3% (0.37)	<0.0001	25.5% (0.36)	26.5% (0.35)	0.5812
Aid to Disabled (SD)	4.2% (0.18)	4.5% (0.18)	0.6129	2.2% (0.13)	3.4% (0.17)	0.0796
Managed Care Organization (MCO) (SD)	24.8% (0.27)	14.6% (0.27)	<0.0001	26.7% (0.28)	14.4% (0.25)	<0.0001
Temporary Assistance for Needy Families (TANF) (SD)	94.5% (0.20)	93.5% (0.21)	0.1442	93.6% (0.23)	91.5% (0.26)	0.0169

• Age was calculated as (September 30, 2000 - Date of Birth)/365.25.

‡ Students in SBHC schools compared to students in non-SBHC using Student's t-test for age and months enrolled, and chi-square test for other variables. SD refers to standard deviation.

**Table 3. Costs for All Students Enrolled in Medicaid and Schools from 9/1997 to 2/2003 (N=5,056)**

<b>Category</b>	<b>Cost (\$)</b>	<b>Adj. Cost (\$)<sup>1</sup></b>	<b>Number of Units</b>	<b>Adj. Cost per unit (\$)<sup>1</sup></b>
Hospitalization	3,804,294	4,235,218	669	6,331
Physician Encounters	3,019,535	3,337,432	39,874	84
Emergency Dept. Visits	1,327,836	1,459,975	9,237	158
Outpatient & Other Medical Care	6,609,752	7,362,353	N/A	N/A
Mental Health	8,150,260	8,877,603	33,550	265
Prescription Drug	2,624,678	2,831,796	63,545	45
Dental Care	1,158,497	1,265,663	12,053	105
EPSDT	433,777	481,849	7,023	69
<b>Total</b>	<b>27,128,629</b>	<b>29,851,889</b>		

<sup>1</sup> Adjusted Costs with inflation adjusted discount factors as 2002 dollar value.

**Table 4. Repeated Measures ANCOVA of Means of Total Costs for Students in Intervention and Comparison Schools (N =2,153)**

Source	df	Mean Square	F	Sig.
<b>Tests of Within-Subjects</b>				
TIME	1	30,244,088	1.431	.232
TIME * AGE	1	12,969,058	.614	.434
TIME * MCO	1	42,238,657	1.998	.158
TIME * CHIP	1	72,844	.003	.953
TIME * DISABLED	1	6,578,569	.311	.577
TIME * SEX	1	221,295,506	10.470	.001
TIME * RACE	1	2,303,626	.109	.741
TIME * SBHC	1	44,206,972	2.092	.148
<b>Tests of Between-Subjects Effects</b>				
AGE	1	157,845,709	3.534	.060
MCO	1	47,357,616	1.060	.303
CHIP	1	1,327,735	.030	.863
DISABLED	1	13,207,728,417	295.665	.000
SEX	1	149,196,858	3.340	.068
RACE	1	198,053,450	4.434	.035
SBHC	1	2,369,149	.053	.818
SEX * RACE	1	7,482,285	.167	.682
SEX * SBHC	1	1,059,518	.024	.878
RACE * SBHC	1	369,971,531	8.282	.004

a Measure: Total Cost

b Model Design TotalCost = Intercept+AGE +MCO +CHIP +DISABLED +SEX +RACE+SBHC +SEX \* RACE+SEX \* SBHC+RACE \* SBHC; Within Subjects Design: TIME

Table 5. Repeated Measures ANCOVA of Hospitalization Costs for Students in Intervention and Comparison Schools (N =2,153)

Source	df	Mean Square	F	Sig.
<b>Tests of Within-Subjects Effects</b>				
TIME	1	6,546,814	1.136	.287
TIME * AGE1	1	1,802,695	.313	.576
TIME * MCO	1	6,361,499	1.104	.294
TIME * CHIP	1	9,380,587	1.628	.202
TIME * DISABLED	1	18,286,606	3.173	.075
TIME * SEX	1	7,986,443	1.386	.239
TIME * RACE	1	7,395,627	1.283	.257
TIME * SBHC	1	7,732,138	1.342	.247
<b>Tests of Between-Subjects Effects</b>				
Intercept	1	23,344,278	3.148	.076
AGE1	1	57,841	.008	.930
MCO	1	17,206,910	2.321	.128
CHIP	1	624,155	.084	.772
DISABLED	1	536,654,538	72.379	.000
SEX	1	1,557	.000	.988
RACE	1	69,865	.009	.923
SBHC	1	9,077,564	1.224	.269
SEX * RACE	1	31,399	.004	.948
SEX * SBHC	1	673,757	.091	.763
RACE * SBHC	1	33,643,641	4.538	.033

a Measure: Hospitalization Cost

b Model Design Hospitalization Cost = Intercept+AGE +MCO +CHIP +DISABLED +SEX +RACE+SBHC +SEX \* RACE+SEX \* SBHC+RACE \* SBHC; Within Subjects Design: TIME

**Table 6. Repeated Measures ANCOVA of Emergency Department Costs for Students in Intervention and Comparison Schools (N =2,153)**

Source	df	Mean Square	F	Sig.
Tests of Within-Subjects Contrasts				
TIME	1	29,844	.519	.471
TIME * AGE	1	369,042	6.418	.011
TIME * MCO	1	509,640	8.864	.003
TIME * CHIP	1	137,763	2.396	.122
TIME * DISABLED	1	747,213	12.996	.000
TIME * SEX	1	25,999	.452	.501
TIME * RACE	1	21,272	.370	.543
TIME * SBHC	1	27,489	.478	.489
Tests of Between-Subjects Effects				
AGE	1	3,838	.034	.854
MCO	1	8,974,232	78.824	.000
CHIP	1	1,350,855	11.865	.001
DISABLED	1	3,359,548	29.508	.000
SEX	1	404,361	3.552	.060
RACE	1	1,359,340	11.940	.001
SBHC	1	1,710,959	15.028	.000
SEX * RACE	1	181,425	1.594	.207
SEX * SBHC	1	531,553	4.669	.031
RACE * SBHC	1	3,646,195	32.026	.000

a Measure: ER Cost

b Model Design ER Cost = Intercept+AGE +MCO +CHIP +DISABLED +SEX +RACE+SBHC +SEX \* RACE+SEX \* SBHC+RACE \* SBHC; Within Subjects Design: TIME

**Table 7. Repeated Measures ANCOVA of Mental Health Service Costs for Students in Intervention and Comparison Schools (N =2,153)**

Source a	df	Mean Square	F	Sig.
Tests of Within-Subjects Effects b				
TIME	1	15,595,973	2.569	.109
TIME * AGE	1	464,942	.077	.782
TIME * MCO	1	1,119,712	.184	.668
TIME * CHIP	1	1,645,371	.271	.603
TIME * DISABLED	1	100,058,406	16.480	.000
TIME * SEX	1	28,698,383	4.727	.030
TIME * RACE (1=Black, 0=other)	1	2,999,282	.494	.482
TIME * SBHC	1	25,239,382	4.157	.042
Tests of Between-Subjects Effects				
AGE	1	251,449,681	22.482	.000
MCO	1	891,860	.080	.778
CHIP	1	4,239,441	.379	.538
DISABLED	1	1,659,392,279	148.365	.000
SEX	1	255,128,994	22.811	.000
RACE	1	1,067,182	.095	.757
SBHC	1	3,481,499	.311	.577
SEX * RACE	1	359,014	.032	.858
SEX * SBHC	1	38,715,598	3.462	.063
RACE * SBHC	1	70,319,369	6.287	.012

a Measure: Costs for Mental Health Services

b Model Design: Mental Cost = Intercept+AGE+MCO+CHIP+DISABLED+SEX+RACE+SBHC+SEX \* RACE+SEX \* SBHC+RACE \* SBHC; Within Subjects Design: TIME

**Table 8. Repeated Measures ANCOVA of EPSDT Costs for Students in Intervention and Comparison Schools (N=2,153)**

Source	df	Mean Square	F	Sig.
Tests of Within-Subjects Contrasts				
TIME	1	223,853	46.896	.000
TIME * AGE1	1	339,822	71.190	.000
TIME * MCO	1	6,383	1.337	.248
TIME * CHIP	1	169	.035	.851
TIME * DISABLED	1	7,694	1.612	.204
TIME * SEX	1	714	.149	.699
TIME * RACE	1	74,752	15.660	.000
TIME * SBHC	1	219	.046	.830
Tests of Between-Subjects Effects				
AGE1	1	357,530	51.661	.000
MCO	1	959,566	138.652	.000
CHIP	1	13,863	2.003	.157
DISABLED	1	426,680	61.653	.000
SEX	1	11,587	1.674	.196
RACE	1	671,851	97.079	.000
SBHC	1	122,038	17.634	.000
SEX * RACE	1	1,691	.244	.621
SEX * SBHC	1	1,550	.224	.636
RACE * SBHC	1	53,319	7.704	.006

a Measure: EPSDT Costs

b Model Design: EPSDT Cost = Intercept+AGE+MCO+CHIP+DISABLED+SEX+RACE+SBHC+SEX \* RACE+SEX \* SBHC+RACE \* SBHC; Within Subjects Design: TIME

**Table 9. Repeated Measures ANCOVA of Prescription Costs for Students in Intervention and Comparison Schools (N=2,153)**

Source	df	Mean Square	F	Sig.
Tests of Within-Subjects Effects				
TIME	1	7,562,410	7.735	.005
TIME * AGE	1	291,725	.298	.585
TIME * MCO	1	4,980,790	5.095	.024
TIME * CHIP	1	2,117,359	2.166	.141
TIME * DISABLED	1	8,140,486	8.326	.004
TIME * SEX	1	12,975,556	13.272	.000
TIME * RACE	1	497,134	.508	.476
TIME * SBHC	1	4,890,661	5.002	.025
Tests of Between-Subjects Effects				
AGE	1	2,598,439	1.203	.273
MCO	1	15,105,309	6.992	.008
CHIP	1	4,863,532	2.251	.134
DISABLED	1	182,490,422	84.476	.000
SEX	1	11,048,944	5.115	.024
RACE	1	25,339,192	11.730	.001
SBHC	1	22,367,562	10.354	.001
SEX * RACE	1	1,318,597	.610	.435
SEX * SBHC	1	1,665,642	.771	.380
RACE * SBHC	1	3,694,203	1.710	.191

a Measure: RX Costs

b Model Design: Rx Cost = Intercept+AGE+MCO+CHIP+DISABLED+SEX+RACE+SBHC+SEX \* RACE+SEX \* SBHC+RACE \* SBHC; Within Subjects Design: TIME



**Table 10. Repeated Measures ANCOVA of Dental Care Costs for Students in Intervention and Comparison Schools (N=2,153)**

Source	df	Mean Square	F	Sig.
Tests of Within-Subjects Contrasts				
TIME	1	1,721,092	31.425	.000
TIME * AGE	1	244,215	4.459	.035
TIME * MCO	1	1,253,158	22.881	.000
TIME * CHIP	1	610	.011	.916
TIME * DISABLED	1	442,721	8.084	.005
TIME * SEX	1	21,154	.386	.534
TIME * RACE	1	22,691	.414	.520
TIME * SBHC	1	154,207	2.816	.093
Tests of Between-Subjects Effects				
AGE	1	187,505	2.825	.093
MCO	1	10,345,691	155.847	.000
CHIP	1	345,485	5.204	.023
DISABLED	1	39,594	.596	.440
SEX	1	1,448	.022	.883
RACE	1	181,169	2.729	.099
SBHC	1	208,184	3.136	.077
SEX * RACE	1	127,108	1.915	.167
SEX * SBHC	1	18,547	.279	.597
RACE * SBHC	1	782,346	11.785	.001

a Measure: Dental Costs

b Model Design: Dental Cost = Intercept+AGE+MCO+CHIP+DISABLED+SEX+RACE+SBHC+SEX \* RACE+SEX \* SBHC+RACE \* SBHC; Within Subjects Design: TIME

**Table 11. Final Estimation of Effects of SBHC on the Growth Trends of the Quarterly Total Medical Costs (N=5,056)**

Fixed Effect		Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
<b>Initial Status, B<sub>0</sub></b>						
INTRCPT2,	G <sub>00</sub>	193.269653	50.308100	3.842	5048	0.000
SEX,	G <sub>01</sub>	48.979374	32.813731	1.493	5048	0.135
RACE,	G <sub>02</sub>	-86.095468	46.009714	-1.871	5048	0.061
AGE1,	G <sub>03</sub>	13.190391	5.968687	2.210	5048	0.027
SBHC,	G <sub>04</sub>	-48.476834	37.823513	-1.282	5048	0.200
MCO,	G <sub>05</sub>	-12.986945	47.546628	-0.273	5048	0.785
CHIP,	G <sub>06</sub>	10.519846	38.257287	0.275	5048	0.783
DISABLED,	G <sub>07</sub>	1,825.470693	290.678489	6.280	5048	0.000
<b>Linear Growth, B<sub>1</sub></b>						
INTRCPT2,	G <sub>10</sub>	-9.859399	9.688378	-1.018	74565	0.309
SEX,	G <sub>11</sub>	5.372777	5.242528	1.025	74565	0.306
RACE,	G <sub>12</sub>	-0.148408	6.708704	-0.022	74565	0.983
AGE1,	G <sub>13</sub>	2.481589	1.050082	2.363	74565	0.018
SBHC,	G <sub>14</sub>	8.337875	5.962487	1.398	74565	0.162
MCO,	G <sub>15</sub>	-8.412034	8.163590	-1.030	74565	0.303
CHIP,	G <sub>16</sub>	-3.020437	6.037913	-0.500	74565	0.616
DISABLED,	G <sub>17</sub>	-9.770528	34.610945	-0.282	74565	0.778
<b>Quadratic Growth, B<sub>2</sub></b>						
INTRCPT2,	G <sub>20</sub>	-0.614978	0.660348	-0.931	74565	0.352
SEX,	G <sub>21</sub>	-0.083513	0.400685	-0.208	74565	0.835
RACE,	G <sub>22</sub>	0.731726	0.552404	1.325	74565	0.185
AGE1,	G <sub>23</sub>	0.043826	0.084099	0.521	74565	0.602
SBHC,	G <sub>24</sub>	0.711005	0.503877	1.411	74565	0.158
MCO,	G <sub>25</sub>	-0.553042	0.767908	-0.720	74565	0.471
CHIP,	G <sub>26</sub>	-0.127098	0.572008	-0.222	74565	0.824
DISABLED,	G <sub>27</sub>	-7.968567	2.277016	-3.500	74565	0.001
<b>Cubic Growth, B<sub>3</sub></b>						
INTRCPT2,	G <sub>30</sub>	-0.004313	0.102855	-0.042	74565	0.967
SEX,	G <sub>31</sub>	-0.009960	0.057378	-0.174	74565	0.863
RACE,	G <sub>32</sub>	0.056768	0.075204	0.755	74565	0.450
AGE1,	G <sub>33</sub>	-0.007632	0.012303	-0.620	74565	0.535
SBHC,	G <sub>34</sub>	-0.009960	0.071364	-0.140	74565	0.889
MCO,	G <sub>35</sub>	-0.003527	0.100917	-0.035	74565	0.972
CHIP,	G <sub>36</sub>	-0.089036	0.076818	-1.159	74565	0.247
DISABLED,	G <sub>37</sub>	-0.067396	0.300900	-0.224	74565	0.823

Final estimation of variance components:

Random Effect		Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1,	U <sub>0</sub>	755.56156	570,873.27659	5048	33,761.65716	0.000
level-1,	R	1,240.04148	1,537,702.87849			

**Table 12: Poisson Repeated Measures (Generalized Estimation Equation Regression) of Hospitalization Rates for Students in Intervention and Comparison Schools (N=2,153)**

Variable	Hospitalization Odds Ratio (95% CI) <sup>a</sup>	p-value <sup>b</sup>
Non-SBHC vs. SBHC	0.852 (0.461 – 1.578)	0.611
Non-SBHC * TIME(before) <sup>c</sup>	1.018 (0.517 – 2.004)	0.959
SBHC * TIME(before) <sup>c</sup>	1.148 (0.754 – 1.748)	0.519
Sex (male =1)	1.208 (0.778 – 1.996)	0.399
Age (years)	1.043 (0.951 – 1.145)	0.369
Race (African-American=1)	1.331 (0.814 – 2.174)	0.254
Disabled <sup>c</sup>	3.015 (1.644 – 5.529)	0.0004
MCO <sup>c</sup>	0.138 (0.062 – 0.309)	<0.0001
CHIP <sup>c</sup>	0.756 (0.441 – 1.295)	0.308
Model Fit	Scaled Deviance =0.358 Log likelihood = -478.44	

<sup>a</sup>95% Confidence Interval

<sup>b</sup>p-value

<sup>c</sup> TIME refers to before and after the SBHC intervention. Enrollment categories of Disabled, MCO, and CHIP are time-dependent covariates.

**Table 13: Poisson Repeated Measures (Generalized Estimation Equation Regression) of Emergency Department Visits for Students in Intervention and Comparison Schools (N=2,153)**

Variable	ED Visits Odds Ratio (95% CI) <sup>a</sup>	p-value <sup>b</sup>
Non-SBHC vs. SBHC	1.505 (1.306 – 1.735)	<0.0001
Non-SBHC * TIME <sup>c</sup>	0.801 (0.632 – 0.936)	0.034
SBHC * TIME <sup>c</sup>	1.063 (0.958 – 1.178)	0.246
Sex (male =1)	0.935 (0.832 – 1.049)	0.251
Age (years)	0.982 (0.956 – 1.009)	0.183
Race (African-American=1)	0.754 (0.656 – 0.867)	<0.0001
Disabled <sup>c</sup>	1.205 (0.975 – 1.488)	0.084
MCO <sup>c</sup>	0.151 (0.122 – 0.186)	<0.0001
CHIP <sup>c</sup>	0.796 (0.688 – 0.921)	0.002
Model Fit	Scaled Deviance =0.8167 Log likelihood = -1362.39	

<sup>a</sup> 95% Confidence Interval

<sup>b</sup> p-value

<sup>c</sup> TIME refers to before and after the SBHC intervention. Enrollment categories of Disabled, MCO, and CHIP are time-dependent covariates.

**Table 14: Baseline Characteristics for Children with Asthma in Intervention and Comparison Schools (N=273)**

Variable	SBHC (N=196)	Non-SBHC (N=77)	p-value <sup>1</sup>
Mean Age (SD <sup>2</sup> ), years	8.3(2.3)	8.2 (2.3)	0.7851
Female, %	38.3	52.0	0.0543
Race			
White, %	59.2	48.1	0.0954
African-American, %	40.3	45.4	0.4376
Other, %	0.5	6.5	0.0024
Mean Months Enrolled (SD <sup>2</sup> )	58.9 (12.2)	60.1 (11.3)	0.5078
Months enrolled before SBHC (SD <sup>2</sup> )	26.4 (11.1)	26.7 (10.7)	0.6160
Months enrolled after SBHC (SD <sup>2</sup> )	28.4 (4.2)	28.9 (3.4)	0.1940
Enrollment Categories <sup>3</sup> , %			
Disabled	6.2	8.8	0.3883
Families/Dependent Children (AFDC)	92.2	89.3	0.3729
Child Health Insurance Plan (CHIP)	37.0	30.3	0.1416
Managed Care Organization (MCO)	20.1	9.8	0.0005
Asthma Comorbidity <sup>4</sup> , %			
Obesity	1.1	2.6	0.3291
Depression	4.6	5.2	0.8333
Allergies	24.5	13.0	0.0365
Sinusitis	15.3	10.4	0.2909
Gastro-esophageal reflux disease (GERD)	1.1	1.3	0.8427
Attention Deficit Hyperactive Disorder (ADHD)	12.8	18.2	0.2489

<sup>1</sup> Children in SBHC schools compared to children in non-SBHC using Student's t-test for age and months enrolled, and chi-square test for other variables.

<sup>2</sup> SD = standard deviation

<sup>3</sup> The percentage of enrollment months that a child enrolled in each category. Children could have been in multiple programs during the study period.

<sup>4</sup> Diagnosis of comorbidity was based on primary diagnoses for each child before the SBHC intervention in September 2000.

**Table 15: Odds Ratios of Hospitalization and Emergency Department Visits for Children with Asthma in Intervention and Comparison Schools (N=273)**

Variable	Hospitalization Odds Ratio (95% CI) <sup>a</sup>	ED Visits Odds Ratio (95% CI) <sup>a</sup>
Non-SBHC vs. SBHC	1.960 (0.631 – 5.884)	1.430 <sup>b</sup> (1.0924 – 1.865)
Non-SBHC * TIME(before) <sup>c</sup>	1.146 (0.368 – 3.631)	1.221 (0.909 – 1.637)
SBHC * TIME(before) <sup>c</sup>	3.403 <sup>b</sup> (1.536 – 8.473)	1.335 <sup>b</sup> (1.059 – 1.684)
Sex (male =1)	1.782 (0.924 – 3.646)	1.084 (0.901 – 1.308)
Age (years)	1.040 (0.906 – 1.194)	0.970 (0.931 – 1.010)
Race (African-American=1)	1.551 (0.774 – 3.140)	0.916 (0.738 – 1.133)
Disabled <sup>c</sup>	2.165 (0.768 – 5.575)	0.693 (0.459 – 1.016)
MCO <sup>c</sup>	0.962 (0.913 – 1.007)	0.943 <sup>b</sup> (0.927 – 0.959)
CHIP <sup>c</sup>	0.915 (0.355 – 2.239)	0.764 <sup>b</sup> (0.591 – 0.982)
Model Fit	Scaled Deviance =0.626, Log likelihood = -116.23	Scaled Deviance =0.985, Log likelihood = -75.09

<sup>a</sup>95% Confidence Interval

<sup>b</sup>p-value < 0.05

<sup>c</sup> TIME refers to before and after the SBHC intervention. Enrollment categories of Disabled, MCO, and CHIP are time-dependent covariates.

**Table 16: Frequency of Hospitalization for Children with Asthma in Intervention and Comparison Schools (N=273)**

ICD9 Code	Description of Disease	Before SBHC	After SBHC	p-value <sup>a</sup>
<b><u>Children in Intervention schools (N=196)</u></b>		<b><u>(n=36)</u></b>	<b><u>(n=12)</u></b>	
493	Asthma	14	4	0.0027
290 - 314	Mental Disorders	13	3	0.0015
460 - 519	Sinusitis, Bronchitis, Pneumonia	5	1	0.083
280 - 289	Blood Diseases	2	1	1.000
800 - 999	Injury and Poisoning	2	1	1.000
656, 754	Pregnancy Labor Abnormalities, Congenital Musculoskeletal Deformities	0	2	---
<b><u>Children in Comparison Schools (N=77)</u></b>		<b><u>(n=11)</u></b>	<b><u>(n=10)</u></b>	
493	Asthma	3	3	1.000
290 - 314	Mental Disorders	2	2	1.000
280 - 289	Blood Diseases	2	3	1.000
460 - 519	Sinusitis, Bronchitis, Pneumonia	2	1	1.000
800 - 999	Injury and Poisoning	2	1	1.000

<sup>a</sup> Yate's Continuity Adjusted Chi-square tests were used to compare the frequency of hospitalization before and after the SBHCs opened in either intervention or comparison schools.

**Table 17: Frequency of Emergency Department Visits for Children with Asthma in Intervention and Comparison Schools (N=273)**

ICD9 Code	Description of Disease	Before SBHC	After SBHC	p-value <sup>a</sup>
<b>Children in intervention schools (N=196)</b>		<b>(n=344)</b>	<b>(n=307)</b>	
493	Asthma	47	40	0.2885
800 - 999	Injury and Poisoning	95	85	0.2918
460 - 519	Sinusitis, Bronchitis, Other Respiratory Diseases	61	46	0.0403
780 - 799	Chest and abdomen symptoms	27	34	0.2050
380 - 382	Otitis media	21	11	0.0124
009 - 079	Infectious diseases	18	20	0.6464
290 - 314	Mental disorders	11	10	1.000
---	Other diseases	64	61	0.7043
<b>Children in comparison Schools (N=77)</b>		<b>% (n=200)</b>	<b>% (n=210)</b>	
493	Asthma	23	30	0.1739
800 - 999	Injury and Poisoning	44	42	0.7604
460 - 519	Sinusitis, Bronchitis, Other Respiratory Diseases	36	27	0.1088
780 - 799	Chest and abdomen symptoms	61	69	0.3211
380 - 382	Otitis media	13	15	0.5930
009 - 079	Infectious diseases	3	6	0.1573
290 - 314	Mental disorders	2	5	0.1088
---	Other disease	18	16	0.6276

<sup>a</sup> Chi-square tests were used to compare the frequency of emergency department visits before and after the SBHCs opened in either intervention or comparison schools.



**Table 18: Costs of Hospitalization and Emergency Department Visits for Children with Asthma in Intervention and Comparison Schools (N=273).**

Group	Hospitalizations			Emergency Department Visits		
	Total Cost	Number	Cost per Hospitalization	Total Cost	Number	Cost per ED Visit
<b>Intervention (N=196)</b>						
Before SBHC	\$203,981	36	\$5,666	\$56,269	344	\$164
After SBHC	\$48,140	12	\$4,012	\$52,734	307	\$172
<b>Comparison (N=77)</b>						
Before SBHC	\$49,997	11	\$4,545	\$26,178	200	\$131
After SBHC	\$46,374	10	\$4,637	\$27,765	210	\$132

**Table 19: Summary of Repeated Measures ANCOVA of Hospitalization Costs for Students with Asthma (N=273)**

<b>Effect<sup>a</sup></b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>p-value</b>
<b>Tests of Within-Subjects Effects<sup>b</sup></b>				
TIME	1	1198.1	0.000	0.989
TIME * SBHC	1	24,582,457.1	4.115	<b>0.044</b>
TIME * RACE	1	31,053,663.6	5.198	<b>0.023</b>
TIME * SEX	1	401,806.5	0.067	0.796
TIME * AGE	1	4,273,766.9	0.715	0.398
TIME * DISABLED	1	2,225,215.9	0.372	0.542
TIME * CHIP	1	287,181.5	0.048	0.827
TIME * MCO	1	12,103,162.9	2.026	0.156
<b>Tests of Between-Subjects Effects</b>				
SBHC	1	501,779.9	0.049	0.824
RACE (African-American=1)	1	16,483,642.5	1.622	0.204
SEX (male =1)	1	16,579,851.7	1.631	0.203
AGE (years)	1	2,495,793.6	0.246	0.621
Disabled	1	47,773,082.8	4.701	<b>0.031</b>
CHIP	1	93.1	0.000	0.998
MCO	1	3,565,471.2	0.351	0.554

<sup>a</sup> Measure: Hospitalization Cost

<sup>b</sup> Design: Intercept+SBHC+RACE+SEX+AGE+DISABLED+CHIP+MCO. Within Subjects Design: TIME

**Table 20: Summary of Repeated Measures ANCOVA of Costs of Emergency Department Visits for Students with Asthma (N=273)**

<b>Effect<sup>a</sup></b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>p-value</b>
<b>Tests of Within-Subjects Effects<sup>b</sup></b>				
TIME	1	4,445.9	0.029	0.865
TIME * SBHC	1	77,669.1	0.507	0.477
TIME * SEX	1	106,907.8	0.697	0.404
TIME * RACE	1	1,371.5	0.009	0.925
TIME * AGE	1	42,808.5	0.279	0.598
TIME * DISABLED	1	377,670.6	2.463	0.118
TIME * CHIP	1	166,422.8	1.085	0.298
TIME * MCO	1	35,874.6	0.234	0.629
<b>Tests of Between-Subjects Effects</b>				
SBHC	1	4,678,895.537	19.848	<b>0.000</b>
SEX (male=1)	1	75,797.144	0.322	0.571
RACE (African-American=1)	1	529,305.584	2.245	0.135
AGE (years)	1	151,626.047	0.643	0.423
Disabled	1	16,584.839	0.070	0.791
CHIP	1	553.188	0.002	0.961
MCO	1	378,073.193	1.604	0.206

<sup>a</sup> Measure: Hospitalization Cost

<sup>b</sup> Design: Intercept+SBHC+RACE+SEX+AGE+DISABLED+CHIP+MCO. Within Subjects Design: TIME

**Table 21. Frequency of Diagnosed Mental Illnesses during Hospitalization or Hospital Outpatient Visits (N=1,200)**

Ranking	ICD9 Code	Description of Disease	COUNTS	%
1	314	Hyperkinetic syndrome of childhood	536	30.95%
2	296	Affective psychoses	223	12.88%
3	312	Disturbance of conduct NEC	214	12.36%
4	309	Adjustment reaction	186	10.74%
5	313	Disturbance of emotions specific to childhood and adolescence	162	9.35%
6	315	Specific delays in development	88	5.08%
7	300	Neurotic disorders	87	5.02%
8	311	Depressive Disorder NEC	68	3.93%
9	307	Special symptoms or syndromes NEC	30	1.73%
10	298	Other nonorganic psychoses	25	1.44%
11	299	Psychoses with origin specific to childhood	19	1.10%
12	317	Mild Mental Retardation	15	0.87%
13	305	Nondependent abuse of drugs	13	0.75%
14	301	Personality disorders	10	0.58%
15	310	Specific non-psychotic mental disorders due to organic brain damage	8	0.46%
16	318	Other specified mental retardation	8	0.46%
17	316	Psychic Factor w other disorder	7	0.40%
18	292	Drug psychoses	5	0.29%
19	294	Other organic psychotic conditions (chronic)	5	0.29%
20	304	Drug addiction	5	0.29%
21	308	Acute reaction to stress	5	0.29%
22	319	Mental Retardation NOS	5	0.29%
23	295	Schizophrenic disorders	4	0.23%
24	297	Paranoid states	3	0.17%
25	293	Transient organic psychotic conditions	1	0.06%
Total			1,732	100%

**Table 22. Frequency of Diagnosed Mental Illnesses during Medical Office Visits (N=1,200)**

Ranking	ICD9 Code	Description of Mental Illness	Counts	%
1	314	Hyperkinetic syndrome of childhood	2,857	63.29%
2	309	Adjustment reaction	1,555	34.45%
3	313	Disturbance of emotions specific to childhood and adolescence	644	14.27%
4	312	Disturbance of conduct NEC	633	14.02%
5	296	Affective psychoses	534	11.83%
6	300	Neurotic disorders	247	5.47%
7	315	Specific delays in development	232	5.14%
8	311	Depressive Disorder NEC	227	5.03%
9	299	Psychoses with origin specific to childhood	128	2.84%
10	307	Special symptoms or syndromes NEC	112	2.48%
11	298	Other nonorganic psychoses	70	1.55%
12	305	Nondependent abuse of drugs	47	1.04%
13	310	Specific non-psychotic mental disorders due to organic brain damage	23	0.51%
14	308	Acute reaction to stress	14	0.31%
15	304	Drug addiction	12	0.27%
16	301	Personality disorders	8	0.18%
17	317	Mild Mental Retardation	6	0.13%
18	294	Other organic psychotic conditions (chronic)	5	0.11%
19	295	Schizophrenic disorders	5	0.11%
20	316	Psychic Factor w other disorder	4	0.09%
21	293	Transient organic psychotic conditions	3	0.07%
22	292	Drug psychoses	1	0.02%
23	297	Paranoid states	1	0.02%
24	302	Sexual Disorders	1	0.02%
25	303	Alcohol dependence syndrome	1	0.02%
26	319	Mental Retardation NOS	1	0.02%
Total			4,514	100%

**Table 23: Summary of Repeated Measures ANCOVA of Total Costs for Students with Mental Health Illnesses (N=551)**

Source	df	Mean Square	F	Sig.
<b>Tests of Within-Subjects Effects<sup>b</sup></b>				
TIME	1	201,169,713	2.998	.084
TIME * AGE1	1	7,459,605	.111	.739
TIME * MCO	1	52,395,374	.781	.377
TIME * CHIP	1	7,916,865	.118	.731
TIME * DISABLED	1	2,245,628	.033	.855
TIME * SEX	1	234,660,265	3.497	.062
TIME * RACE	1	4,4031,625	.656	.418
TIME * SBHC	1	76,511,812	1.140	.286
<b>Tests of Between-Subjects Effects</b>				
AGE1	1	569,437,944	5.685	.017
MCO	1	59,811,157	.597	.440
CHIP	1	26,490,234	.264	.607
DISABLED	1	3,771,931,476	37.656	.000
SEX	1	202,154,678	2.018	.156
RACE	1	14,569,237	.145	.703
SBHC	1	12,294,538	.123	.726
SEX * RACE	1	338,016	.003	.954
SEX * SBHC	1	180,916,558	1.806	.180
RACE * SBHC	1	585,804,163	5.848	.016

<sup>a</sup> Measure: Mental Health Service Costs

<sup>b</sup> Design: Intercept+SBHC+RACE+SEX+AGE+DISABLED+CHIP+MCO. Within Subjects Design: TIME

**Table 24: Summary of Repeated Measures ANCOVA of Mental Health Service Costs for Students with Mental Health Illnesses (N=551)**

Source	df	Mean Square	F	Sig.
Tests of Within-Subjects Effects <sup>b</sup>				
TIME	1	36,185,680	1.791	.181
TIME * AGE1	1	1,226,208	.061	.805
TIME * MCO	1	2,531,611	.125	.723
TIME * CHIP	1	2,001,288	.099	.753
TIME * DISABLED	1	47,787,526	2.365	.125
TIME * SEX	1	16,699,994	.827	.364
TIME * RACE	1	4,396,571	.218	.641
TIME * SBHC	1	54,991,039	2.722	.100
Tests of Between-Subjects Effects <sup>a</sup>				
AGE1	1	452,824,706	14.087	.000
MCO	1	14,712,287	.458	.499
CHIP	1	1,704,195	.053	.818
DISABLED	1	629,587,867	19.586	.000
SEX	1	188,880,245	5.876	.016
RACE	1	51,883,570	1.614	.204
SBHC	1	4,859,409	.151	.698
SEX * RACE	1	9,693,092	.302	.583
SEX * SBHC	1	158,200,561	4.922	.027
RACE * SBHC	1	122,183,282	3.801	.052

<sup>a</sup> Measure: Mental Health Service Costs

<sup>b</sup> Design: Intercept+SBHC+RACE+SEX+AGE+DISABLED+CHIP+MCO. Within Subjects Design: TIME

**Table 25: Total Health Foundation Support and Actual Operating Costs for Four School-Based Health Centers (Total Amount \$1,382,260)**

School/Item	Health Foundation Grant Amounts			3-Year Total	Actual Costs
	2000 - 2001	2001 - 2002	2002 - 2003		
<b>Rural School 1</b>	Y1	Y2	Y3		
Salaries	79,500	81,885	65,456	226,841	308,283
Benefits	11,130	11,464		22,594	38,415
Consultants					737
Professional fees					769
Travel					10,796
Equipment	29,332	5,000		34,332	1400
Supplies	12,000	12,000		24,000	19,969
Laboratory fees	4,500	2,588		7,088	
Printing/copying					9,238
Postage					
Rent					
Other	9,182	4,442		13,624	1,227
Contingency	2,821			2,821	
<b>Column TOTALS</b>	<b>148,465</b>	<b>117,379</b>	<b>65,456</b>	<b>331,300</b>	<b>390,834</b>
<b>Urban School 1</b>	Y1	Y2	Y3	TOTAL	ACTUAL
Salaries	66,008	95,136	91,890	253,034	278,233
Benefits	13,201	19,028	18,378	50,607	57,199
Consultants					
Professional fees					
Travel	1,000	1,000	1,000	3,000	2,908
Equipment	8,411			8,411	4,665
Supplies	3,500	2,808	2,918	9,226	15,203
Laboratory fees					
Printing/copying					
Postage					
Rent	3,900	2,288	2,380	8,568	2,693
Other	5,068	5,618	5,618	16,304	23,301
Contingency					
<b>Column TOTALS</b>	<b>101,088</b>	<b>125,878</b>	<b>122,184</b>	<b>349,150</b>	<b>384,202</b>
<b>Urban School 2</b>	Y1	Y2	Y3	TOTAL	ACTUAL <sup>1</sup>
Salaries	60,500	48,400	41,400	150,300	
Benefits	13,000	15,000	12,000	40,000	
Consultants	10,000			10,000	
Professional fees					
Travel	900	5,000	5,000	10,900	
Equipment	8,600		2,500	11,100	
Supplies					
Laboratory fees					
Printing/copying					
Postage					
Rent					
Other					
Contingency					
<b>Column TOTALS</b>	<b>93,000</b>	<b>68,400</b>	<b>60,900</b>	<b>222,300</b>	<b>332,979</b>
<b>Urban School 3</b>	Y1	Y2	Y3	TOTAL	ACTUAL <sup>1</sup>
Salaries	70,529	73,208	75,515	219,252	
Benefits	9,975	16,609	17,138	43,722	
Consultants	8,000	1,500	1,000	10,500	
Professional fees					
Travel	4,100	2,883	1,000	7,983	
Equipment		4,000	4,000	8,000	
Supplies	1,600	1,800	1,347	4,747	
Laboratory fees					
Printing/copying					
Postage					
Rent	5,000			5,000	
Other					
Contingency	403			403	
<b>Column TOTALS</b>	<b>99,607</b>	<b>100,000</b>	<b>100,000</b>	<b>299,607</b>	<b>274,245</b>

<sup>1</sup> Urban School #1 and #3 did not turn in detailed actual operating costs.



**Table 26. Student Enrollment Data in Four School-Based Health Centers (N=7,608)**

<b>Student Involvement</b>	<b>Urban 1</b>	<b>Rural 1</b>	<b>Urban 2</b>	<b>Urban 3</b>	<b>Totals</b>
Total Students	1,018	3,338	648	2,604	<b>7,608</b>
Students enrolled in SBHCs	652	1,592	503	1,389	4,136
Students not enrolled in SBHCs	366	1,746	145	1,215	3,472
Students with Office Visits in SBHCs	461	614	410	829	2,314

**Table 27: SBHC Primary Care Encounters for Students in 3 Years (N=2,314 students, 7,572 office visits)**

<b>Health Problem</b>	<b>Urban 1</b>	<b>Rural 1</b>	<b>Urban 2</b>	<b>Urban 3</b>	<b>Sub-Total</b>
Communicable Disease	45	2	4	12	63
Other miscellaneous	455	332	656	401	1,844
Eye/Ear/Nose/Throat	179	656	265	481	1,581
Neurological	179	0	239	34	452
Gastrointestinal	49	18	236	89	392
Dermatological	137	51	124	200	512
Respiratory	31	177	131	112	451
Endocrine	0	2	0	5	7
Immune System allergy	45	32	13	29	119
Parasites/Infections	9	4	2	13	28
Nutrition/Metabolic	73	0	7	9	89
Musculo-Skeletal	50	29	79	253	411
Psychosocial	501	541	48	37	1,127
<b>Total Encounters</b>	<b>1,963</b>	<b>1,858</b>	<b>1,949</b>	<b>1,802</b>	<b>7,572</b>

**Table 28: Estimated Values of SBHC Office Visit (N=2,314 students, 7,572 office visits)**

<b>Health Problem</b>	<b>Sub-Total in Four SBHCs</b>	<b>Cost per unit (\$)*</b>	<b>Estimated Benefit</b>
Communicable Disease	63	69	\$4,347.00
Other miscellaneous	1,844	69	\$127,236.00
Eye/Ear/Nose/Throat	1,581	69	\$109,089.00
Neurological	452	69	\$31,188.00
Gastrointestinal	392	69	\$27,048.00
Dermatological	512	69	\$35,328.00
Respiratory	451	69	\$31,119.00
Endocrine	7	69	\$483.00
Immune System allergy	119	69	\$8,211.00
Parasites/Infections	28	69	\$1,932.00
Nutrition/Metabolic**	89	80.67	\$7,179.63
Musculo-Skeletal	411	69	\$28,359.00
Psychosocial**	1,127	60.7	\$68,408.90
<b>Total Encounters</b>	<b>7,572</b>		<b>\$479,928.53</b>

Note: Data Source was based on Welligent® SBHC encounter data.

\*Cost per unit was based on average payment amount of Medicaid EPSDT visits in 2002 dollars.

\*\*Cost per unit for nutrition/metabolic and psychosocial visits were based on published Medicare payment fee schedules for Ohio recipients in 2002. We used Medicare fee schedules because we could not find standard Medicaid fee schedules.

**Table 29: Outcomes of SBHC Office Visits and Medical Referrals in SBHCs (N=2,314**

students, 7,572 office visits)

<b>Outcome</b>	<b>Urban 1</b>	<b>Rural 1</b>	<b>Urban 2</b>	<b>Urban 3</b>	<b>Totals</b>	<b>\$ per unit</b>	<b>Estimated \$Benefit</b>
<b>Rested</b>	21	2	55	4	82		
<i>Returned to class</i>	<i>1,564</i>	<i>1,591</i>	<i>1,316</i>	<i>1,544</i>	<i>6015</i>		
<b>Dismissed after referrals*</b>	44	235	112	227	618	<b>\$69</b>	<b>\$42,642*</b>
<b>Others</b>	7	17	72	2	98		
<b>No entry</b>	327	13	394	21	755		

Note: Data source was based on Welligent<sup>®</sup> SBHC encounter data.

\*Medical referral data were not well documented. We estimated this benefit based on \$69 per visit (average reimbursement payment of Medicaid EPSDT claims in 2002 dollars).

**Table 30: Other Service or Research Grants Obtained in Three SBHCs**

<b>School</b>	<b>Grant/Fund Name</b>	<b>Amount</b>	<b>Sub-Total</b>
Urban 1	Health Grant	3,384	
	Health Grant	9,150	
	Health Grant	3,000	
	Health Grant	5,000	
	Health Grant	50,000	
	Health Grant	16,195	
	Health Grant	3,000	
	Health Grant	5,000	
	Health Grant	50,000	
	Health Grant	2,869	
	Health Grant*	5,000	
	Health Grant	180,000	
Urban 2	Health Grant	25,000	
	Health Grant	25,000	
	Health Grant	50,000	
	Health Grant*	100,000	
			200,000
Urban 3	Health Grant	30,000	
			30,000
<b>Total</b>			<b>\$562,598</b>

Note: Data collected from SBHC Coordinator Survey in December 2003.

\*Healthy School Healthy Community Grants (\$105,000) were used by two schools to support SBHC operations. The created grant value was calculated as \$562,598 - \$105,000 = \$457,598.

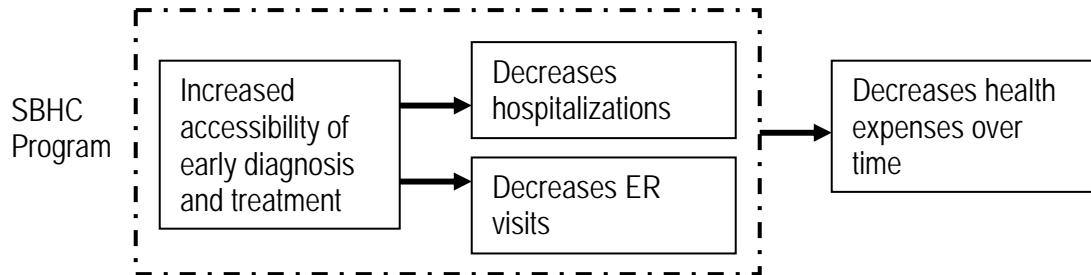
**Table 31: Estimation of Net Social Benefit of the SBHC Program in Four Ohio Schools.**

Variable	Cost	Benefit_Low	Benefit_High1 <sup>1</sup>	Benefit_High2 <sup>1</sup>
Actual SBHC operation cost	\$1,382,260			
SBHC Co-payment	\$75,720			
Facility Space Donated	\$60,750			
Office visits	\$479,929			
Medicaid students: Mental health care		\$700,156	\$771,840	\$0
All SBHC students <sup>2</sup> : Mental health care		\$0	\$0	\$1,826,840
Medicaid students: Dental care		\$38,568	\$38,568	\$0
All SBHC students <sup>2</sup> : Dental care		\$0	\$0	\$122,301
Non-Billible SBHC activities (30%-50%)		\$143,979	\$239,964	\$239,964
Created value		\$457,598	\$457,598	\$457,598
Medicaid students: Asthma hospitalization		\$182,662	\$228,144	\$0
All SBHC students <sup>2</sup> : Asthma hospitalization		\$0	\$0	\$539,986
Medicaid students: Rx drugs		\$443,532	\$443,532	\$0
All SBHC students <sup>2</sup> : Rx drugs		\$0	\$0	\$1,406,457
Medical Referral Benefit		\$0	\$0	\$42,642
Parent's productivity		\$542,761	\$1,309,653	\$1,309,653
Travel benefit		\$42,956	\$42,956	\$42,956
Community multiplier effect		\$0	\$0	\$638,726
Total	\$1,998,659	\$2,552,212	\$3,532,255	\$6,627,123
<b>Net Social Benefit</b>		<b>\$553,553</b>	<b>\$1,533,596</b>	<b>\$4,628,864</b>

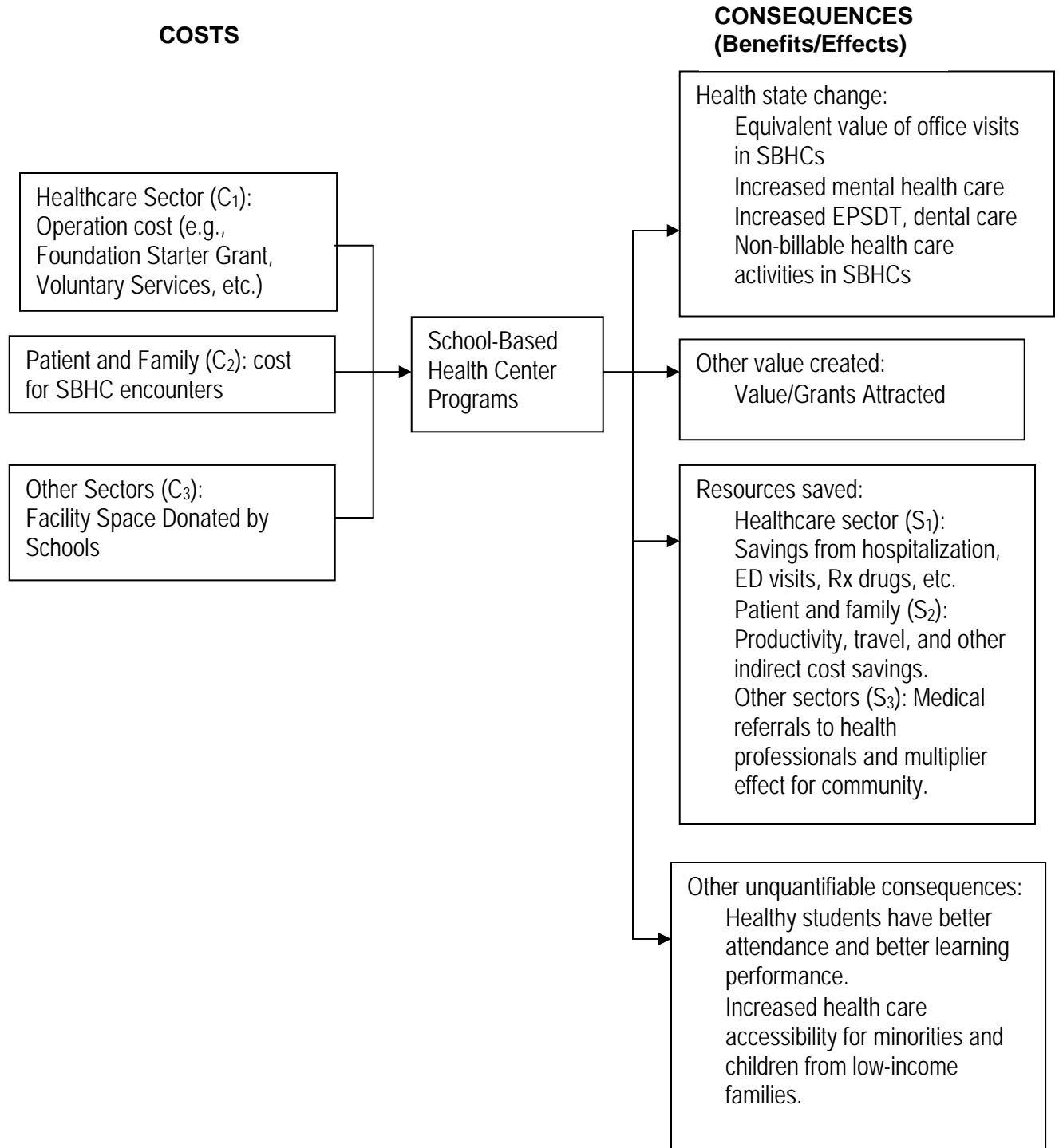
<sup>1</sup> Benefit\_High1 only includes Medicaid students in the intervention schools and does not include the community multiplier effect. Benefit\_High2 includes all students, both Medicaid and non-Medicaid recipients, in the intervention schools and the community multiplier effect.

<sup>2</sup> "All SBHC students" includes both Medicaid and non-Medicaid students in schools with SBHCs.

**Figure 1. Health Economic Framework of School-Based Health Centers**

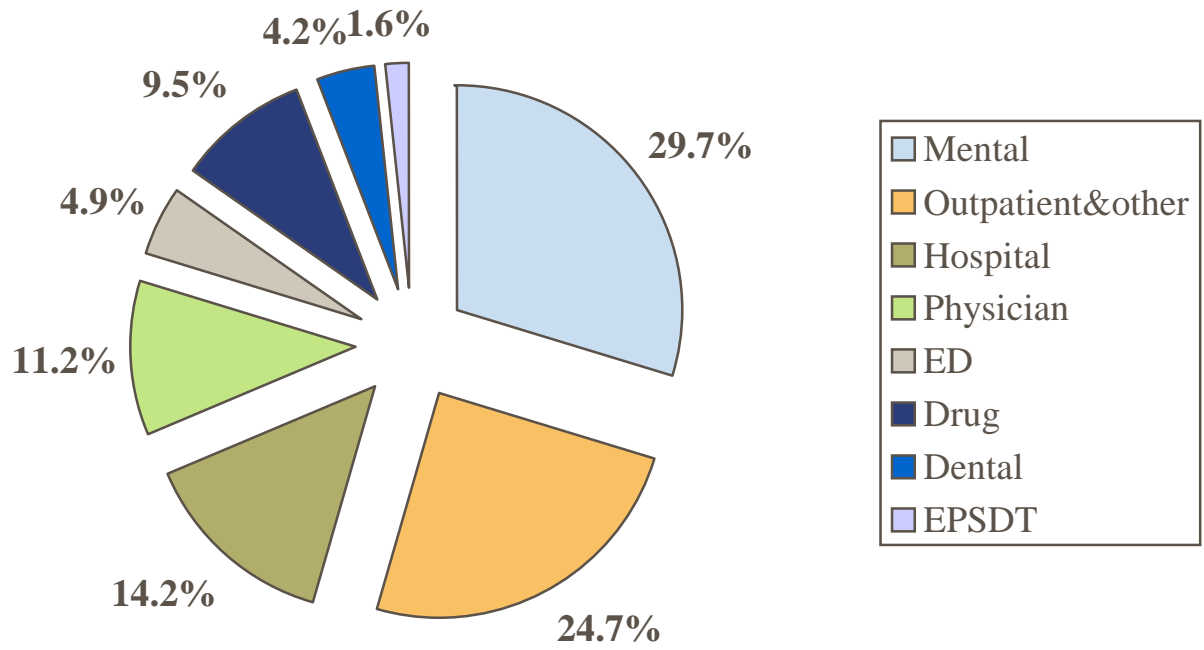


**Figure 2. CBA Theoretical Framework: Components of Health Economic Evaluation**

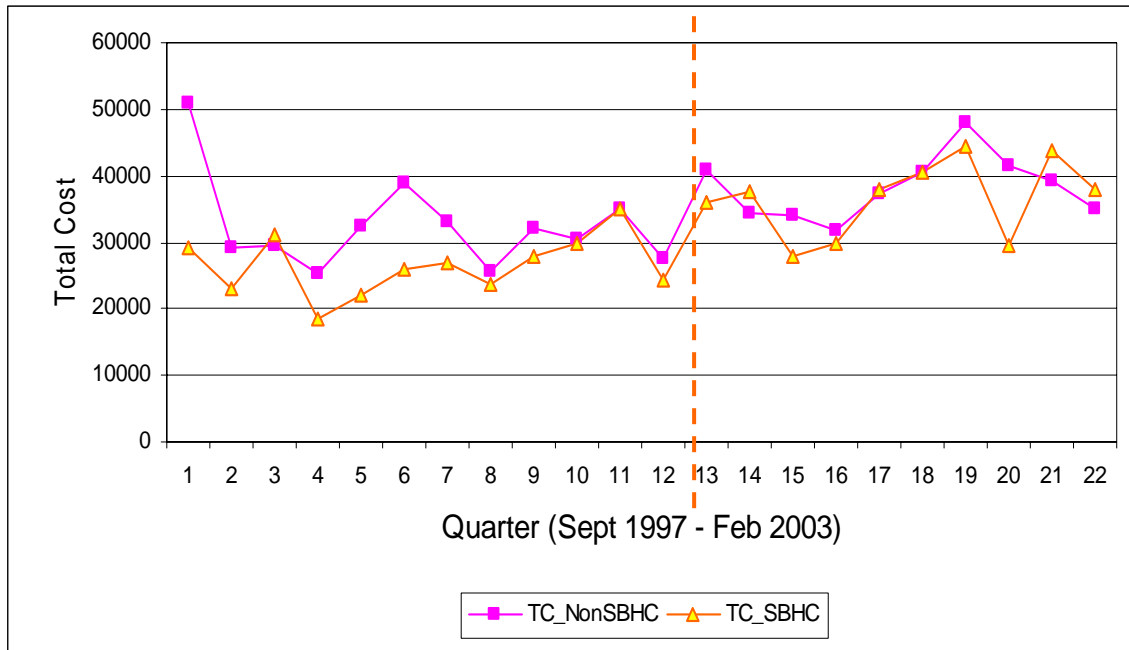




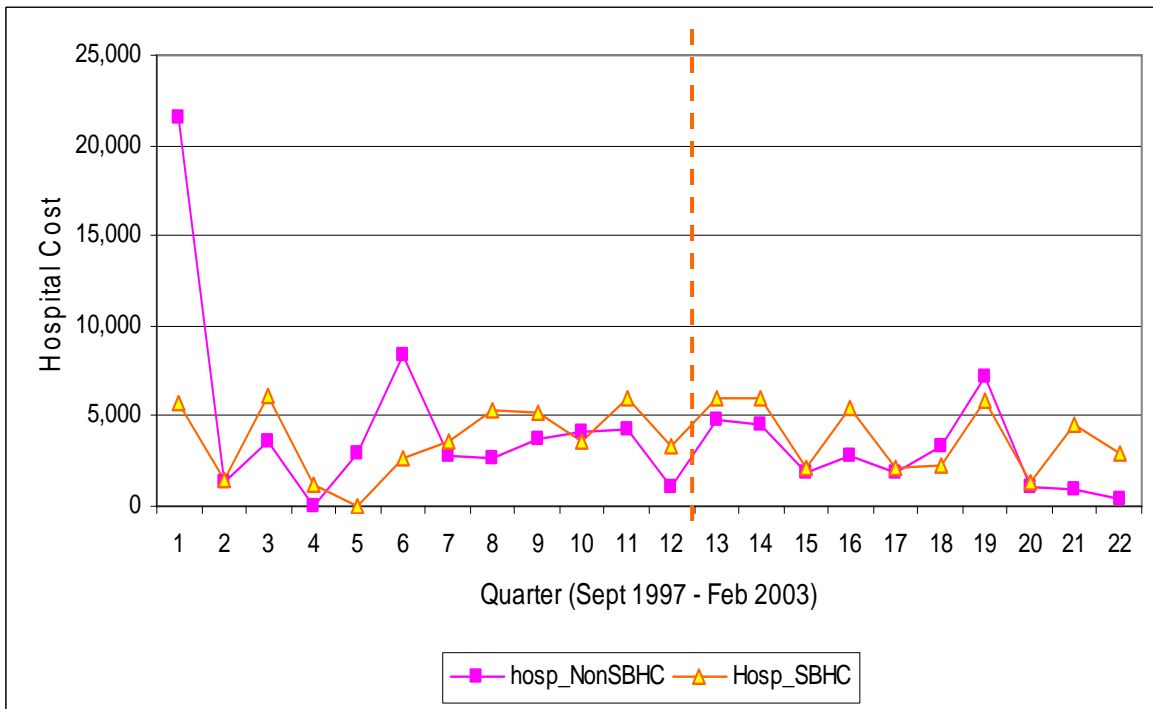
**Figure 3. Health Care Costs (Medicaid Expenses) by Categories for Students (N=5,506)**



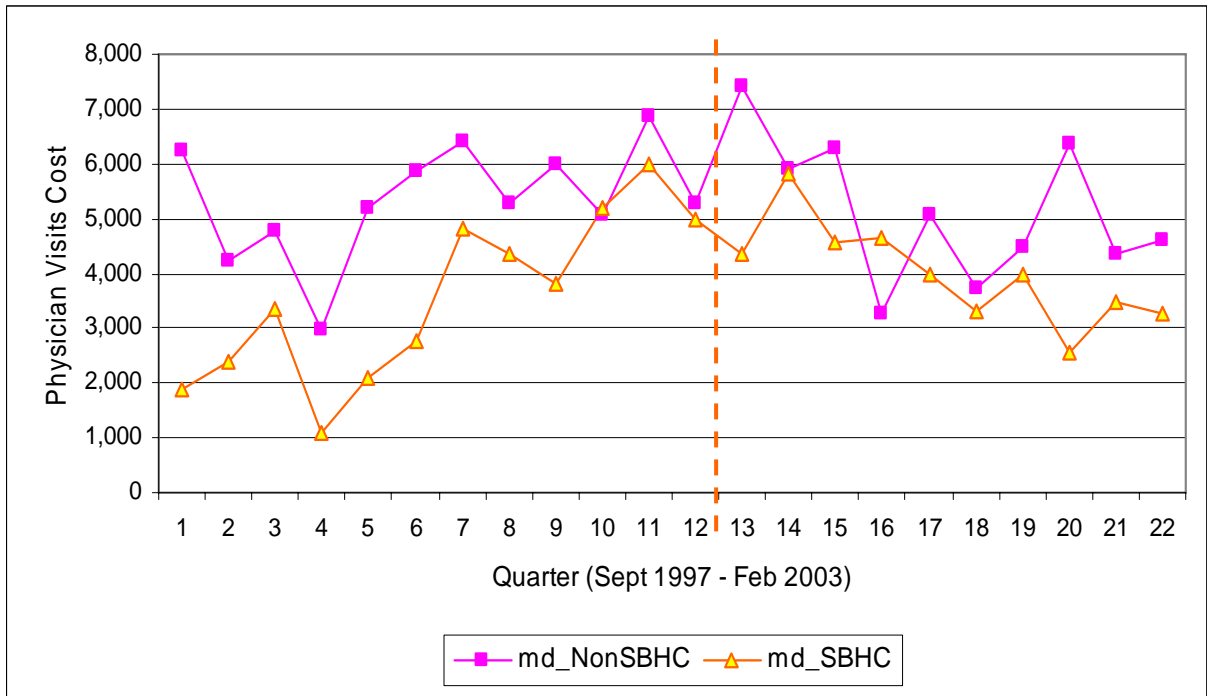
**Figure 4. Trend of Total Medicaid Costs per 100 Students (N=2,153)**



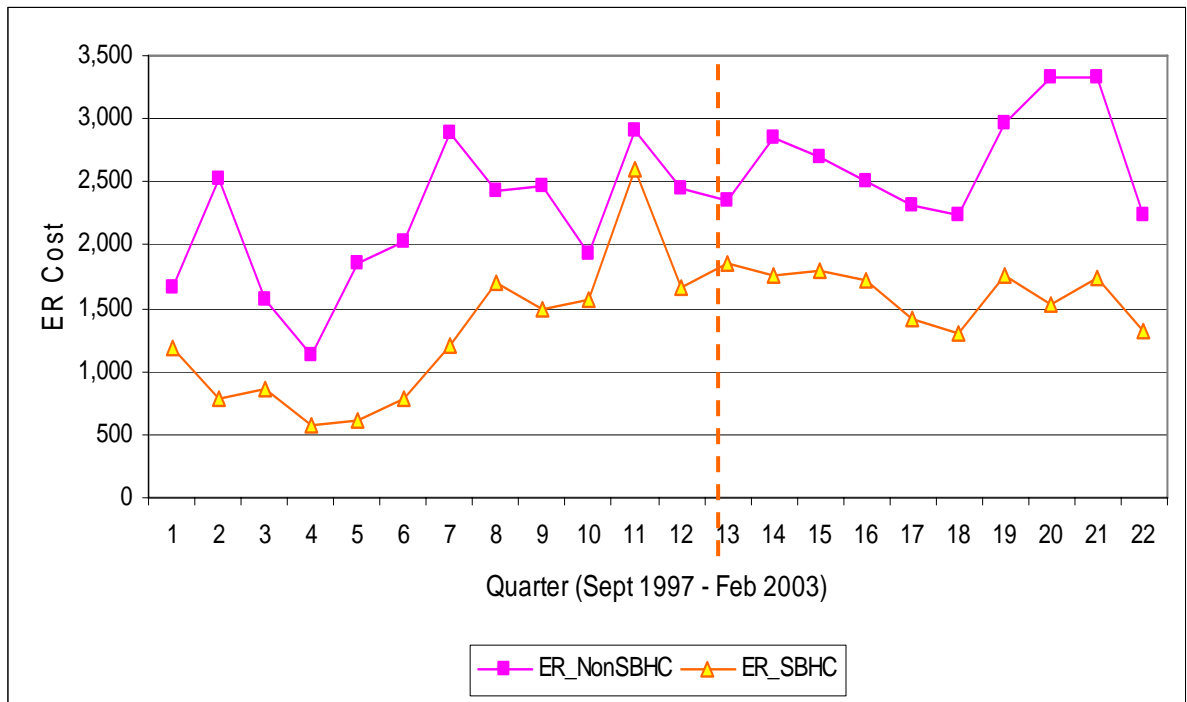
**Figure 5. Trend of Hospitalization Cost per 100 Students (N=2,153)**



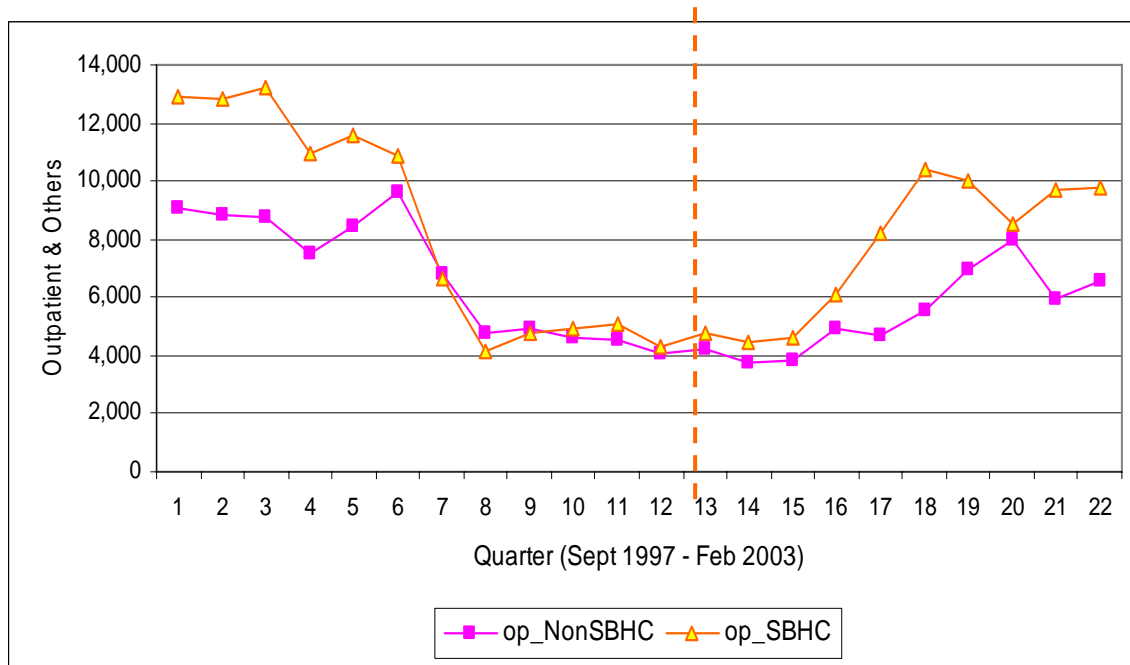
**Figure 6. Trend of Physician Encounter Costs per 100 Students (N=2,153)**



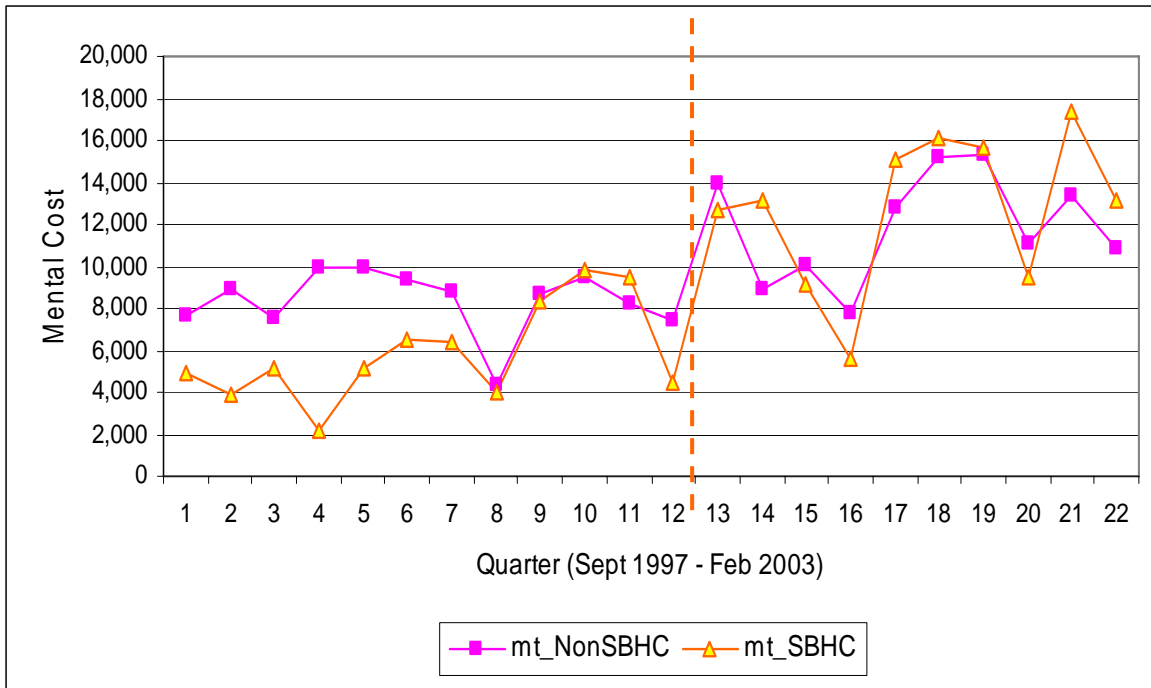
**Figure 7. Trend of Emergency Department Costs per 100 Students (N=2,153)**



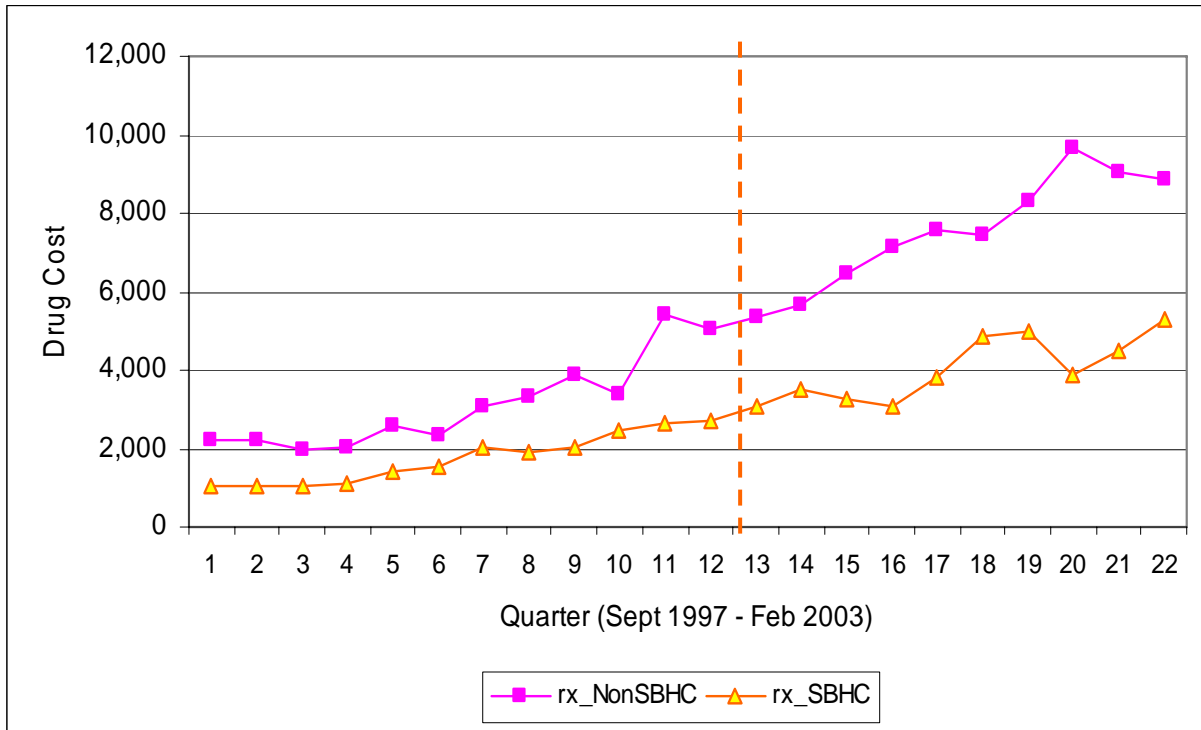
**Figure 8. Trend of Costs for Outpatient & Other Medical Care per 100 Students (N=2,153)**



**Figure 9. Trend of Mental Health Service Costs per 100 Students (N=2,153)**

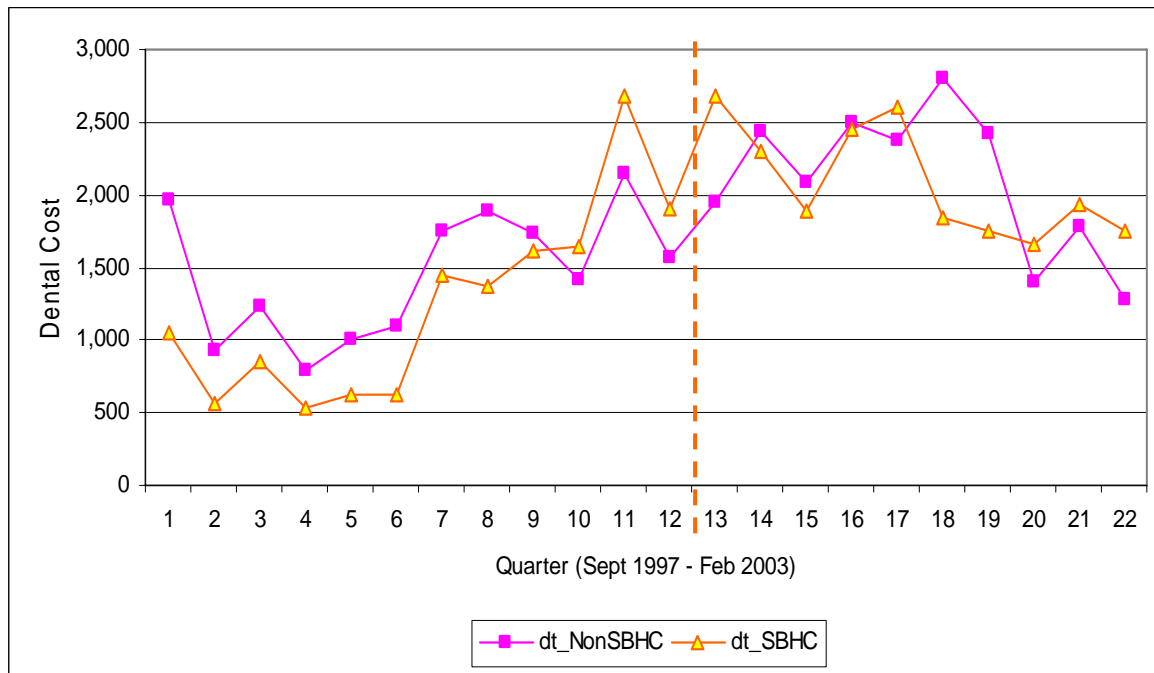


**Figure 10. Trend of Prescription Drug Costs per 100 Students (N=2,153)**

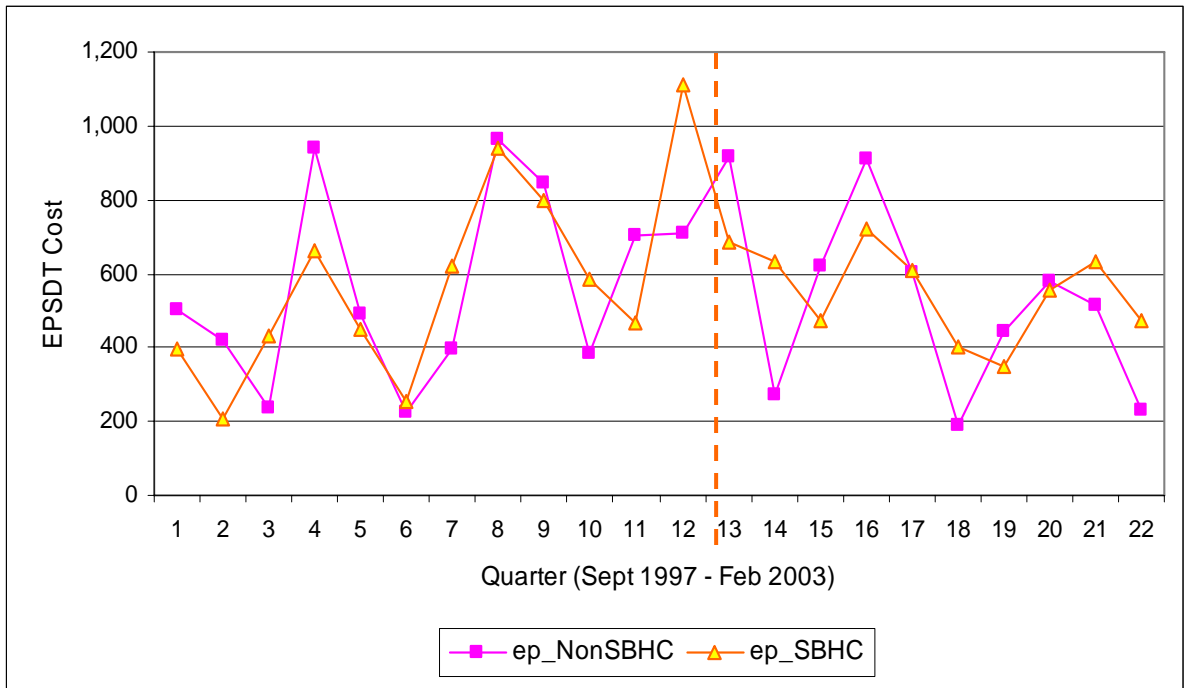




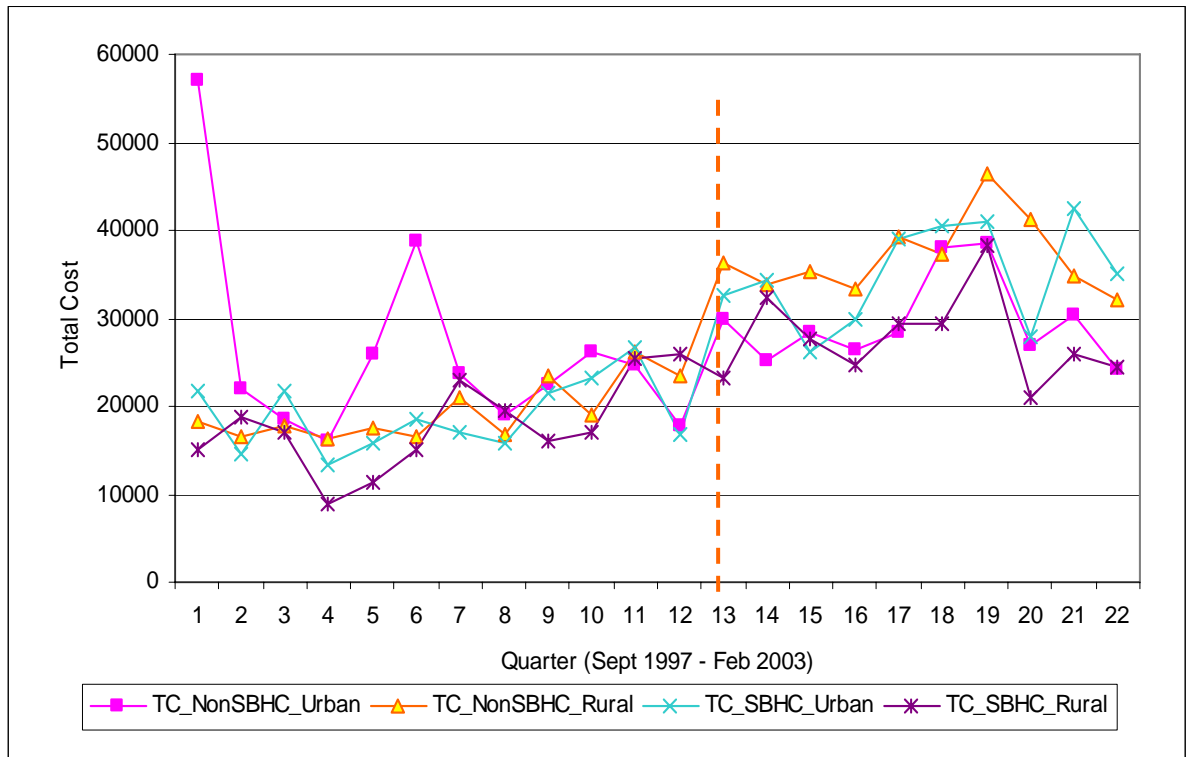
**Figure 11. Trend of Dental Care Costs per 100 Students (N=2,153)**



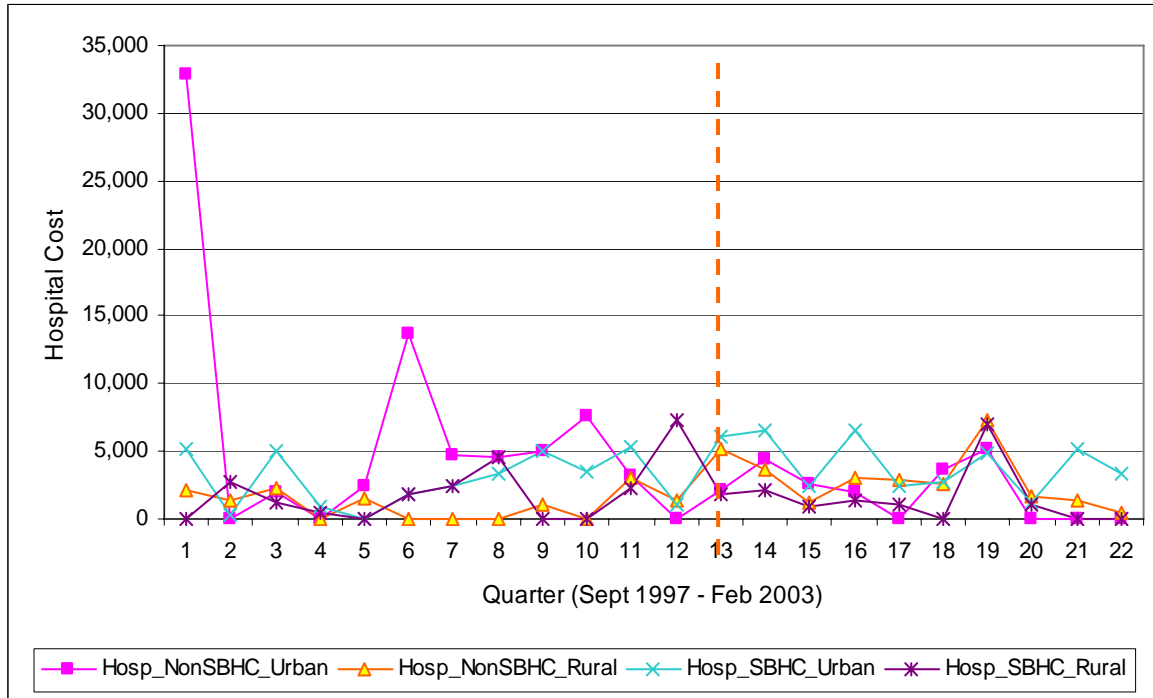
**Figure 12. Trend of EPSDT Costs per 100 Students (N=2,153)**



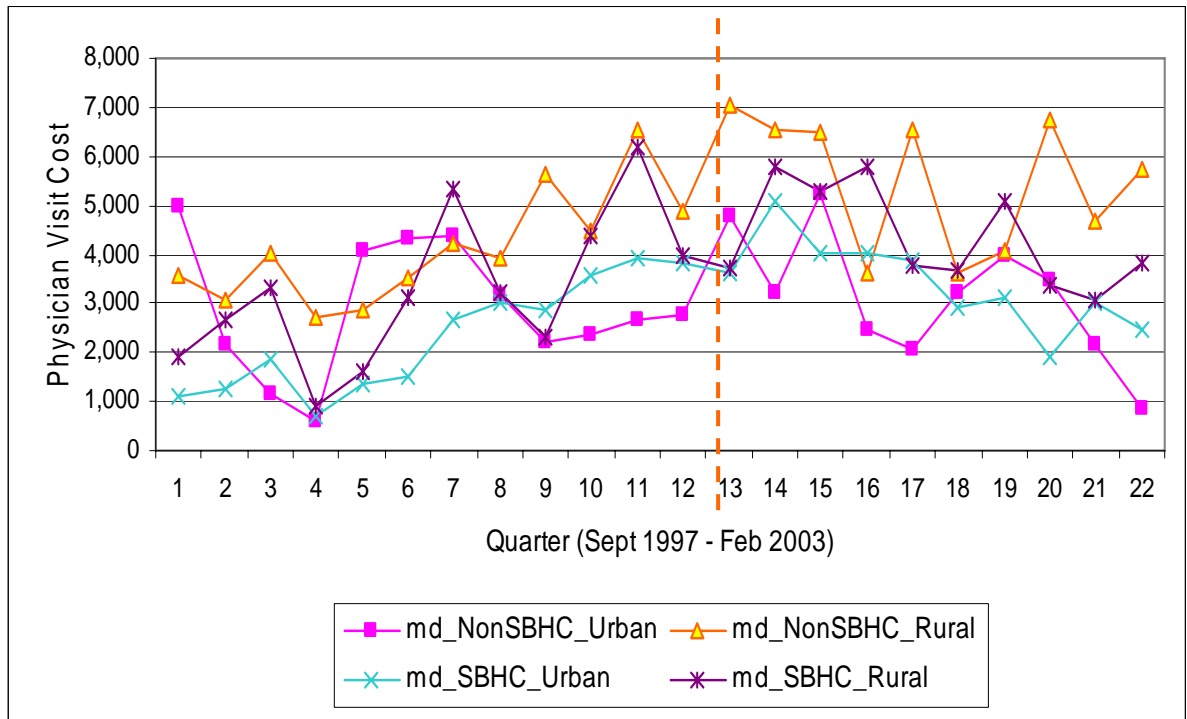
**Figure 13. Trend of Total Medicaid Costs, Urban vs. Rural per 100 Students (N=2,153)**



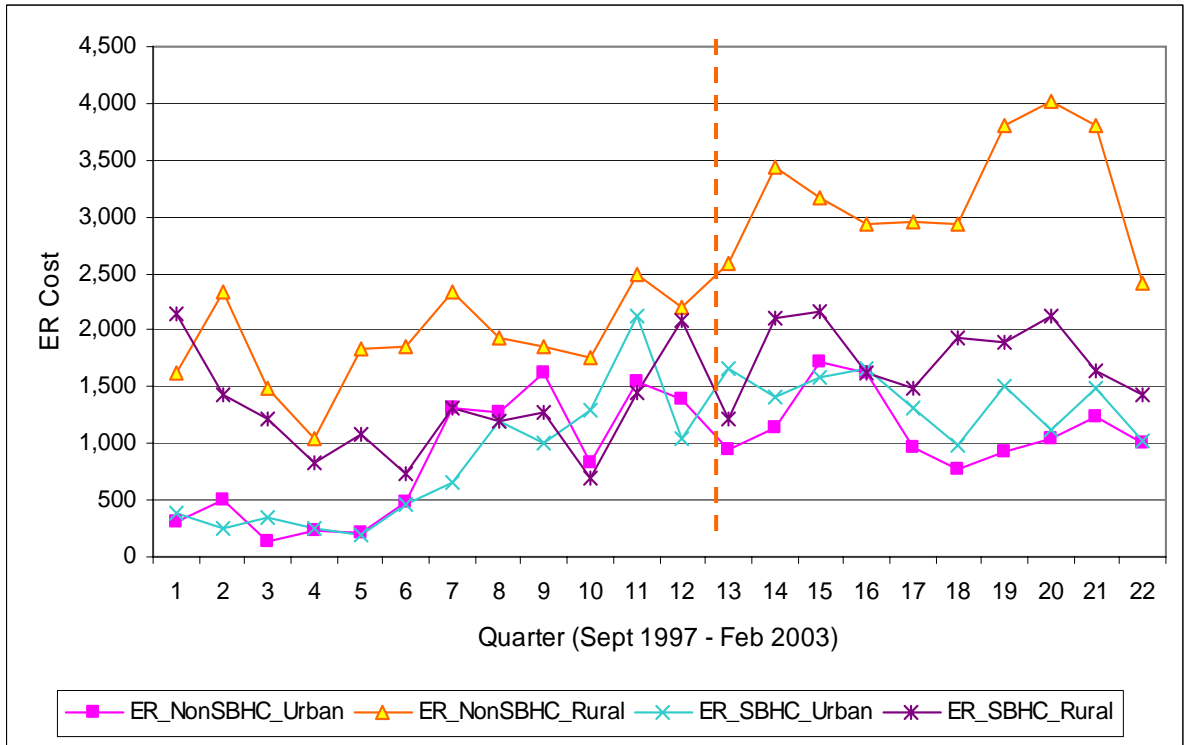
**Figure 14. Trend of Hospitalization Costs, Urban vs. Rural per 100 Students (N=2,153)**



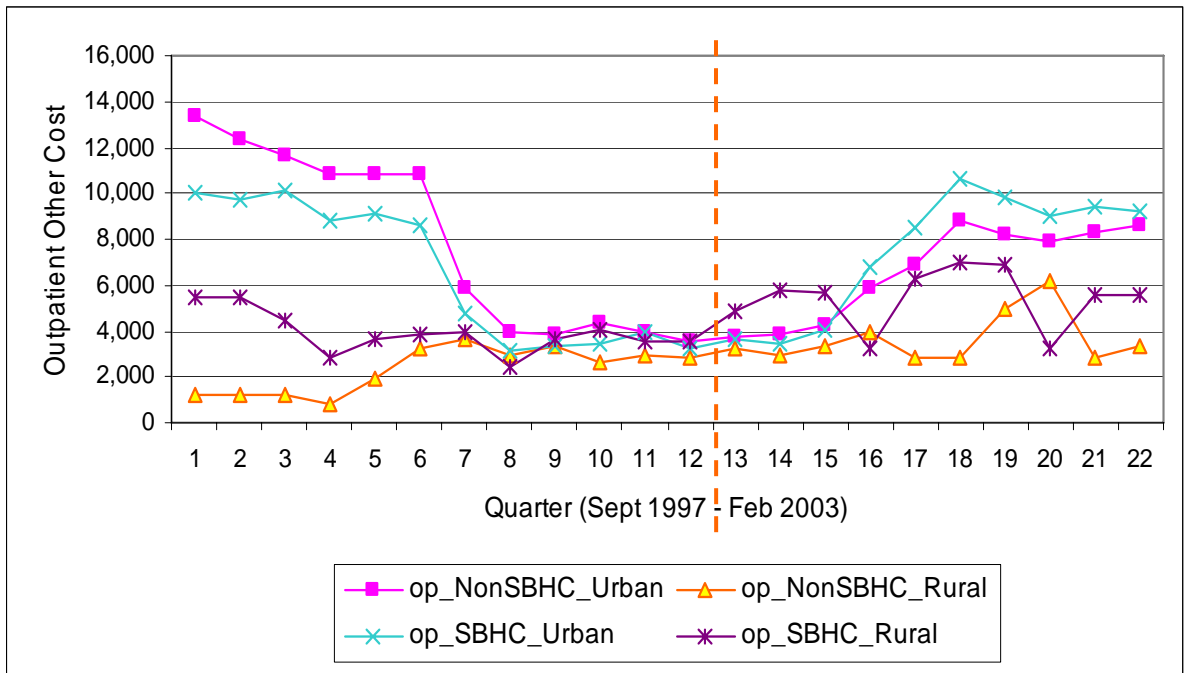
**Figure 15. Trend of Physician Encounter Costs, Urban vs. Rural per 100 Students (N=2,153)**



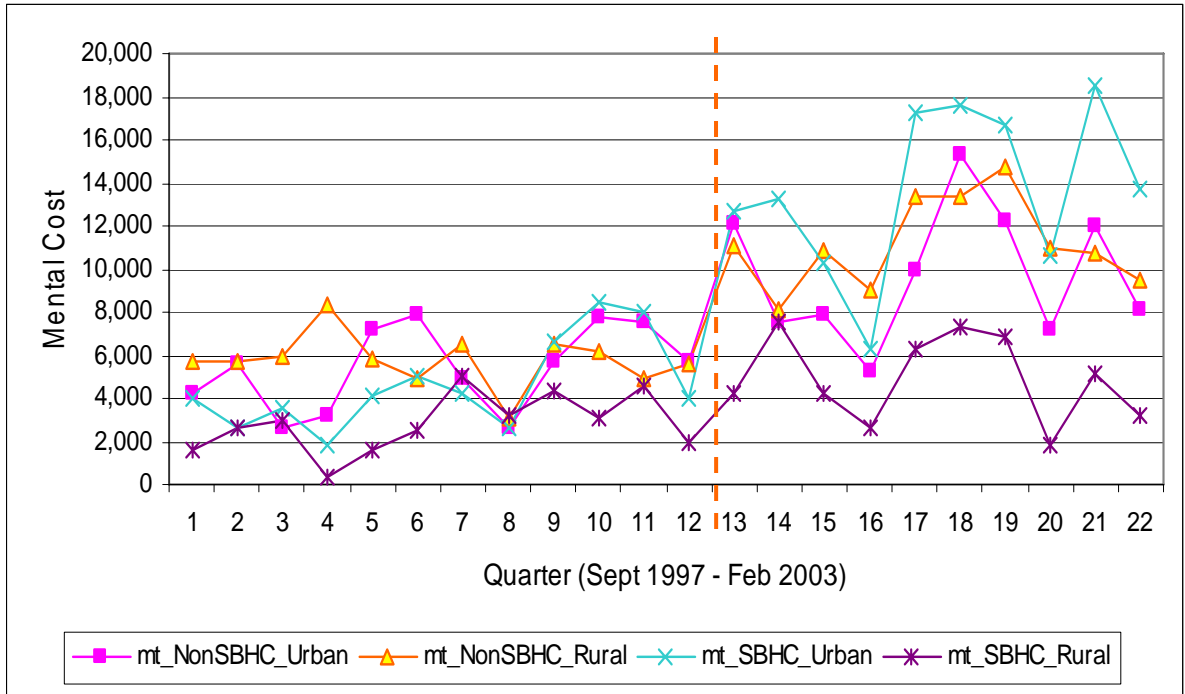
**Figure 16. Trend of Emergency Department Costs, Urban vs. Rural per 100 Students (N=2,153)**



**Figure 17. Trend of Costs for Outpatient & Other Medical Care, Urban vs. Rural per 100 Students (N=2,153)**

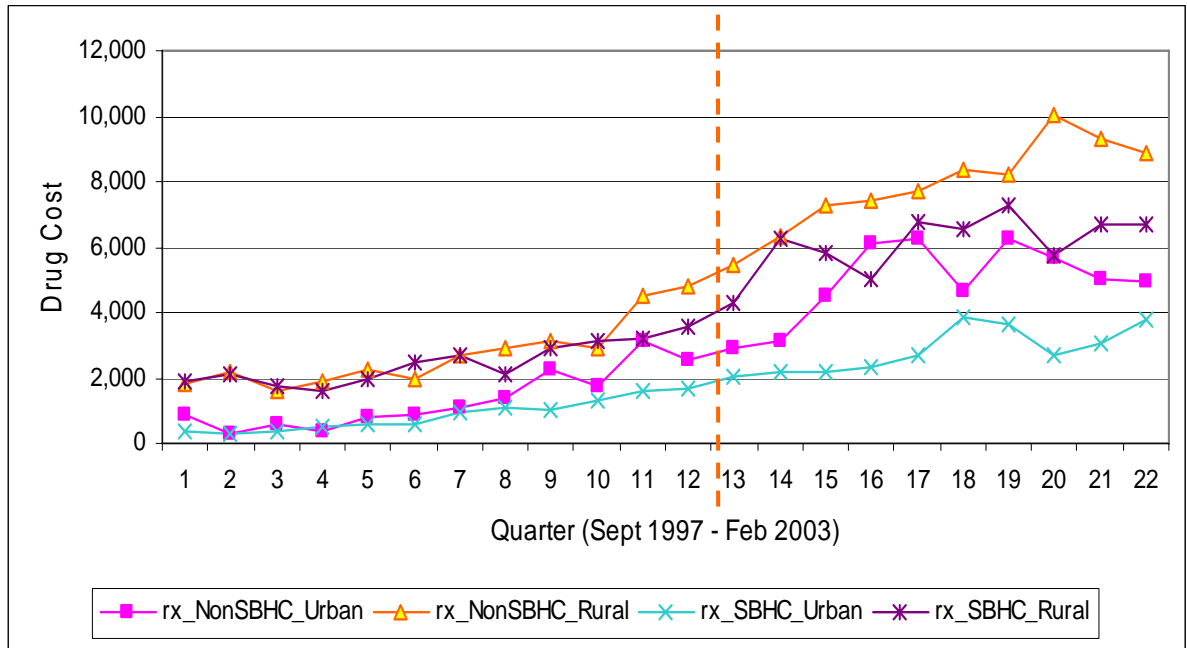


**Figure 18. Trend of Mental Health Service Costs, Urban vs. Rural per 100 Students (N=2,153)**

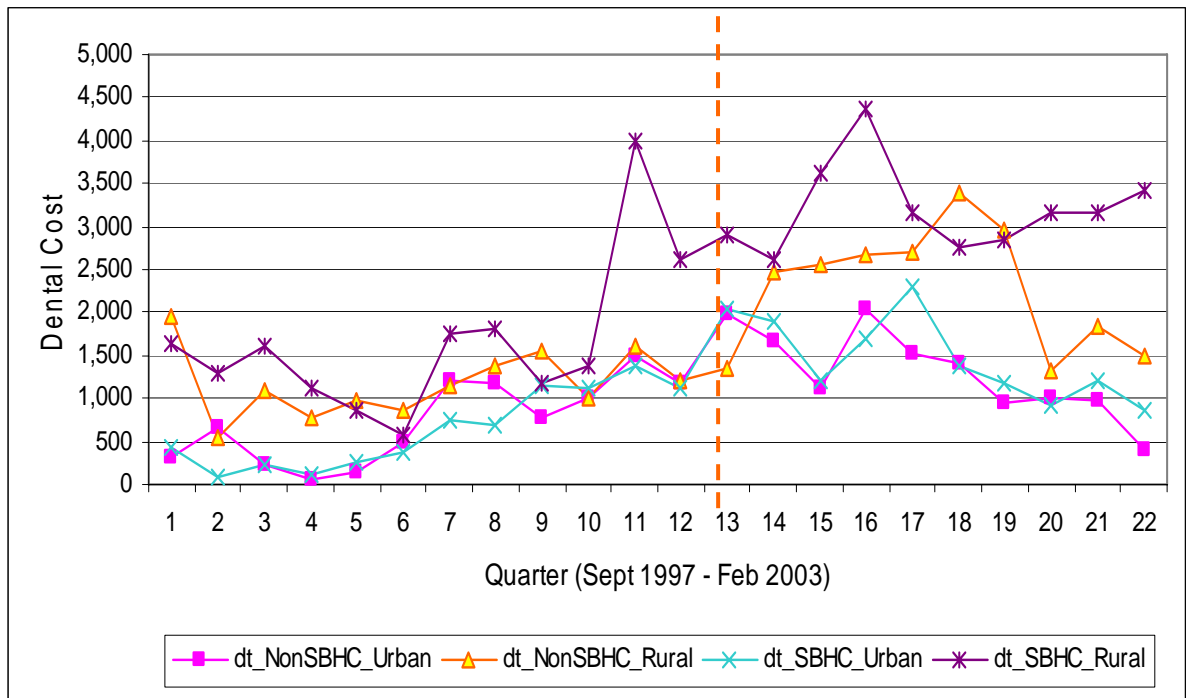




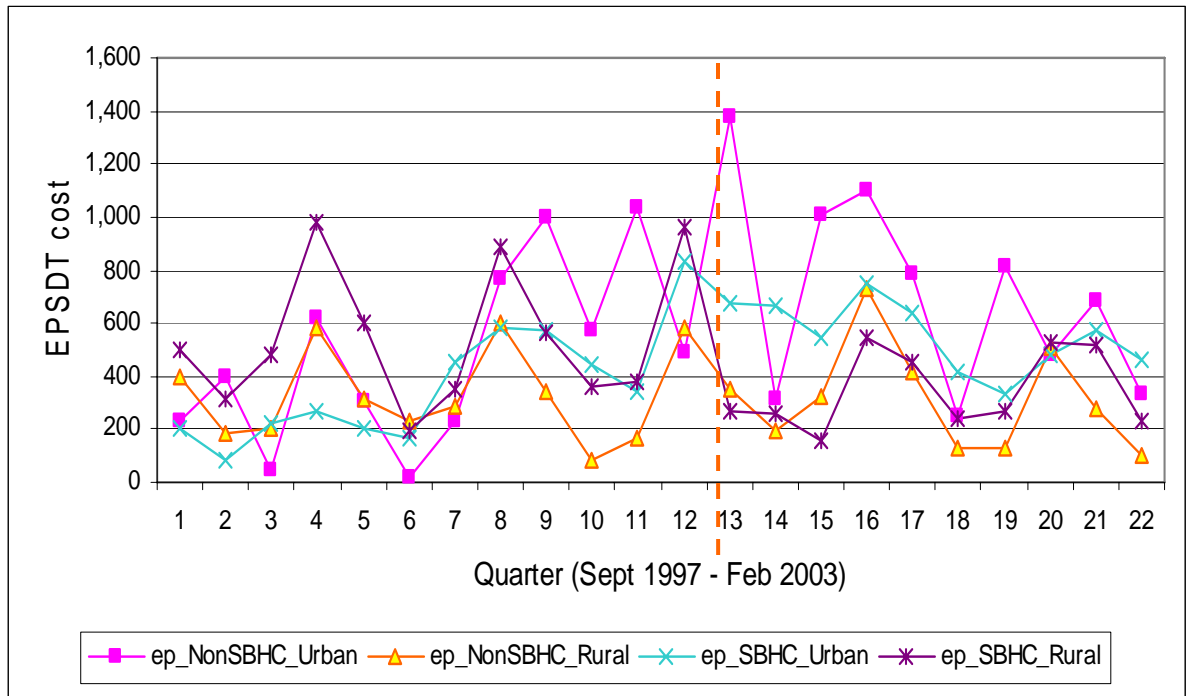
**Figure 19. Trend of Prescription Costs, Urban vs. Rural per 100 Students (N=2,153)**



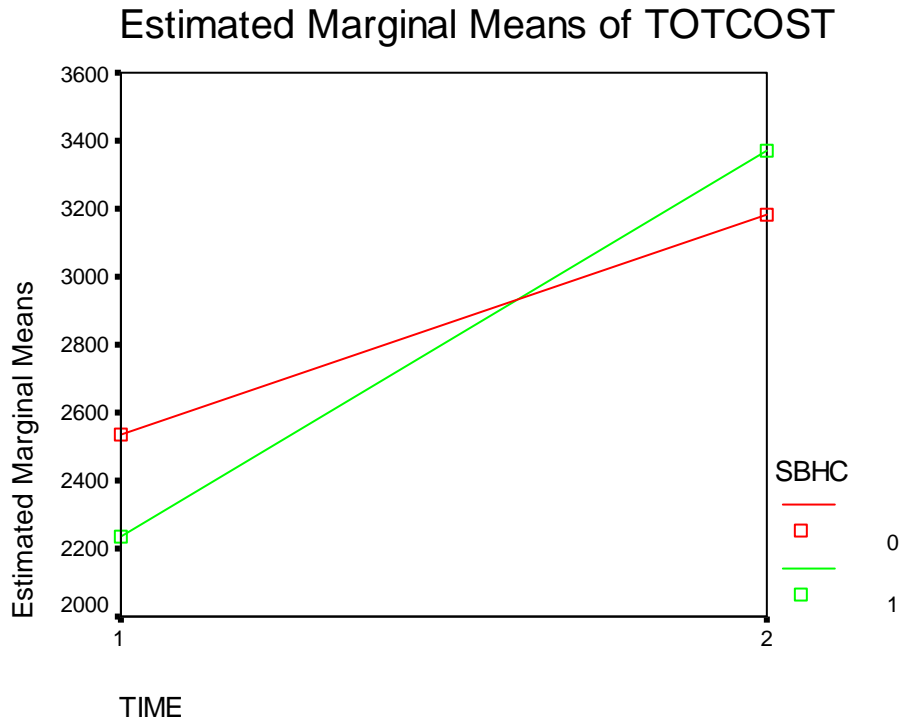
**Figure 20. Trend of Dental Care Costs, Urban vs. Rural per 100 Students (N=2,153)**



**Figure 21. Trend of EPSDT Costs, Urban vs. Rural per 100 Students (N=2,153)**

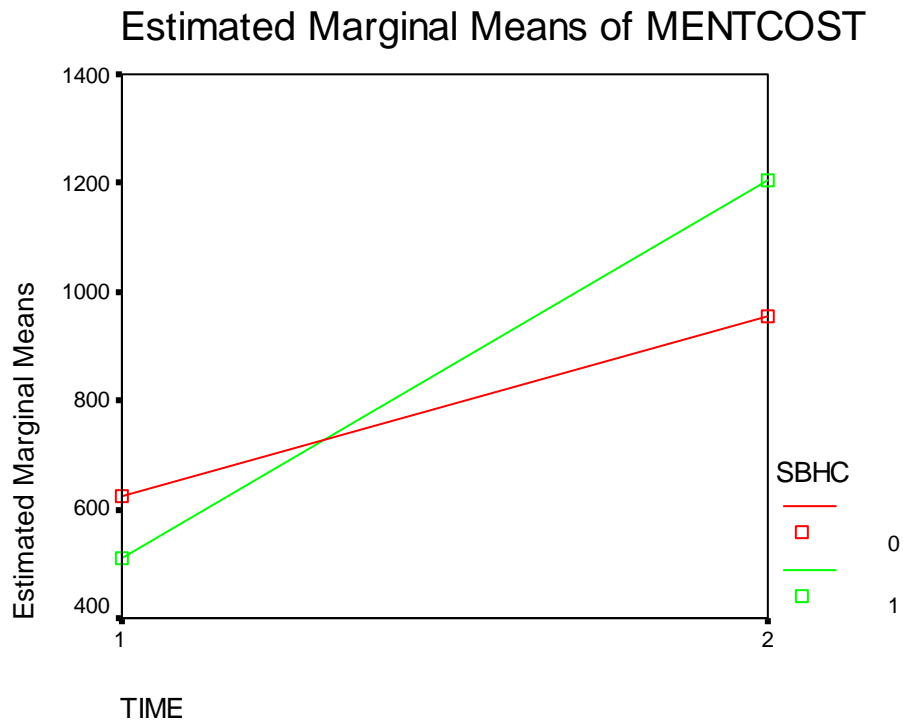


**Figure 22. Means of Total Costs (Medicaid Costs) per Student Before and After the SBHCs )pened (N=2,153)**



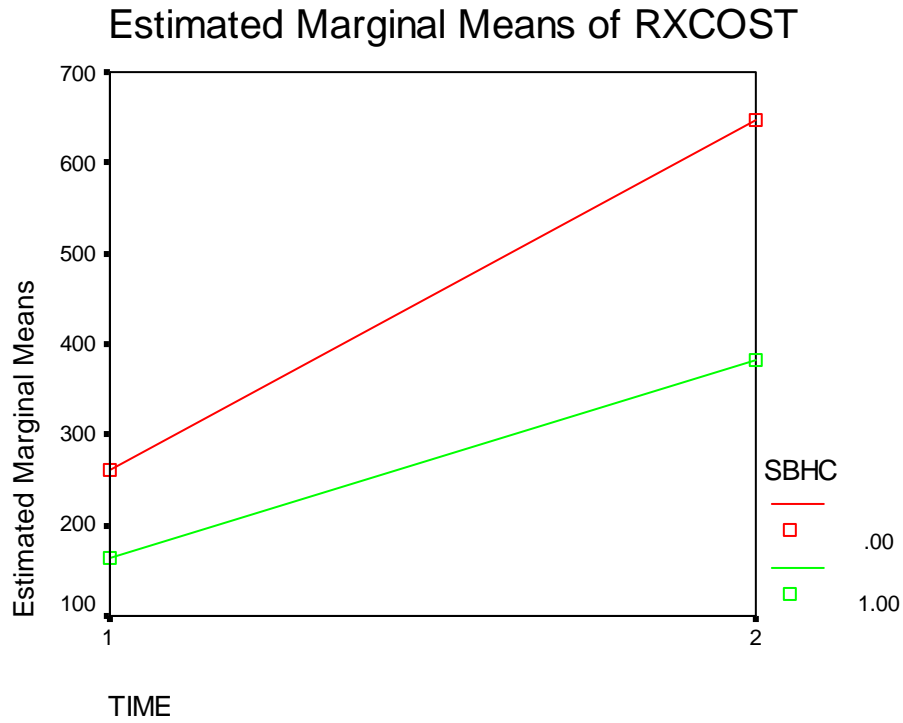
SBHC=1 (intervention schools), SBHC=0 (comparison schools).  
Marginal means are average total costs per student.  
Time1 refers to before the SBHCs opened; Time2 refers to after the SBHCs opened.

**Figure 23. Means of Mental Health Service Costs per Student Before and After the SBHCs Opened(N=2,153)**



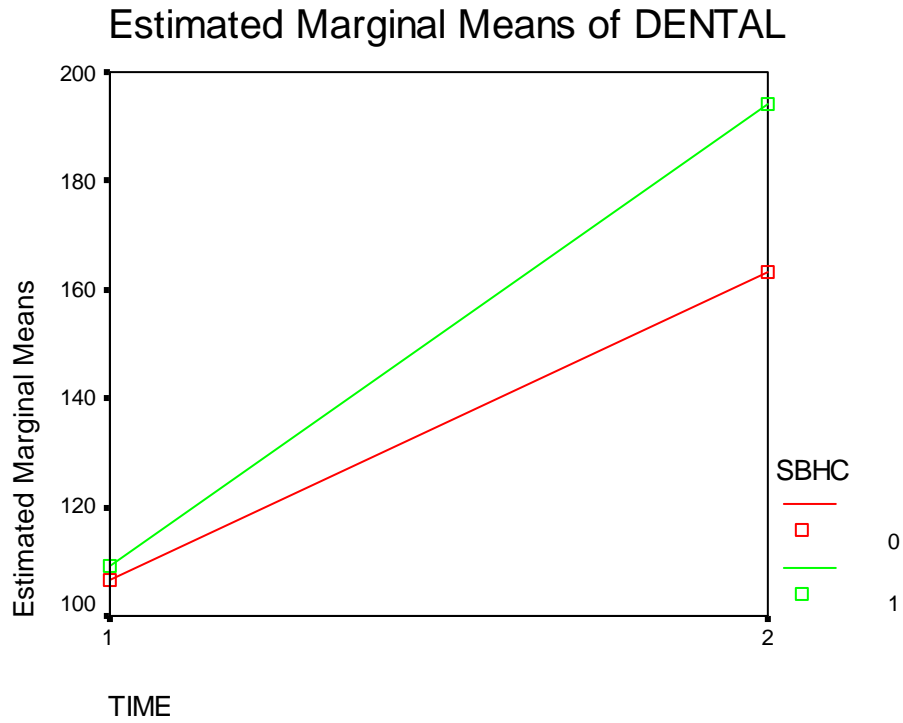
SBHC=1 (intervention schools), SBHC=0 (comparison schools).  
Marginal means are average mental health service costs per student.  
Time1 refers to before the SBHCs opened; Time2 refers to after the SBHCs opened.

**Figure 24. Means of Prescription Drug Costs per Student Before and After the SBHCs Opened (N=2,153)**



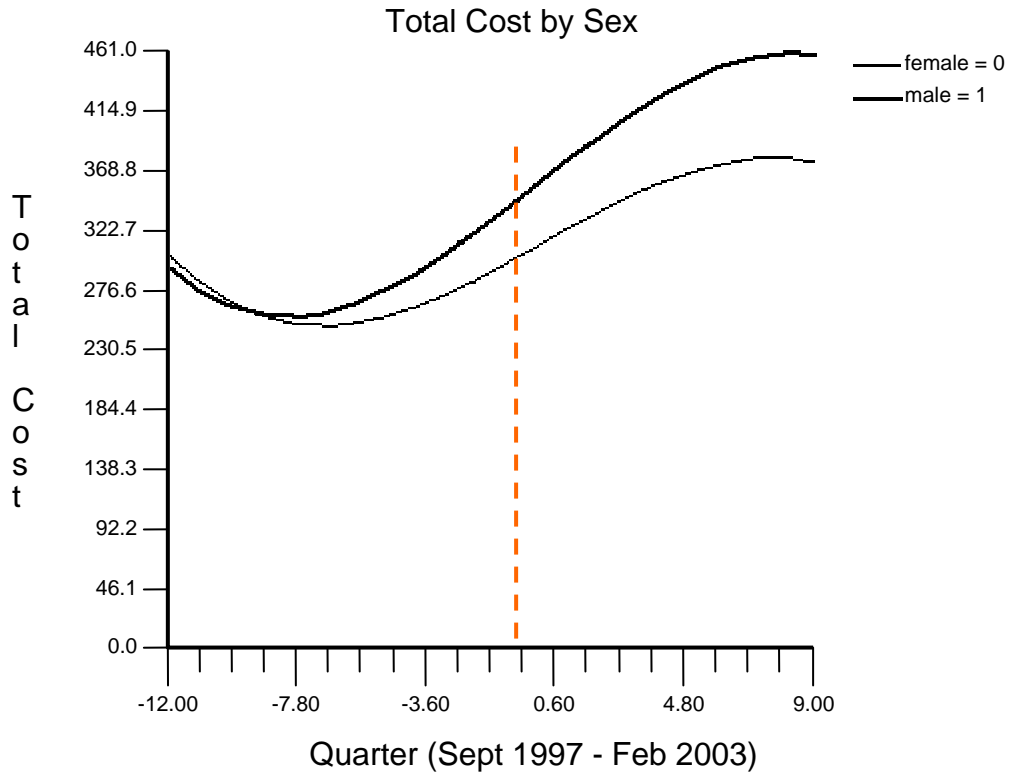
SBHC=1 (intervention schools), SBHC=0 (comparison schools).  
Marginal means are average costs of prescription drugs per student.  
Time1 refers to before the SBHCs opened; Time2 refers to after the SBHCs opened.

**Figure 25. Means of Dental Care Costs per Student Before and After the SBHCs Opened (N=2,153)**



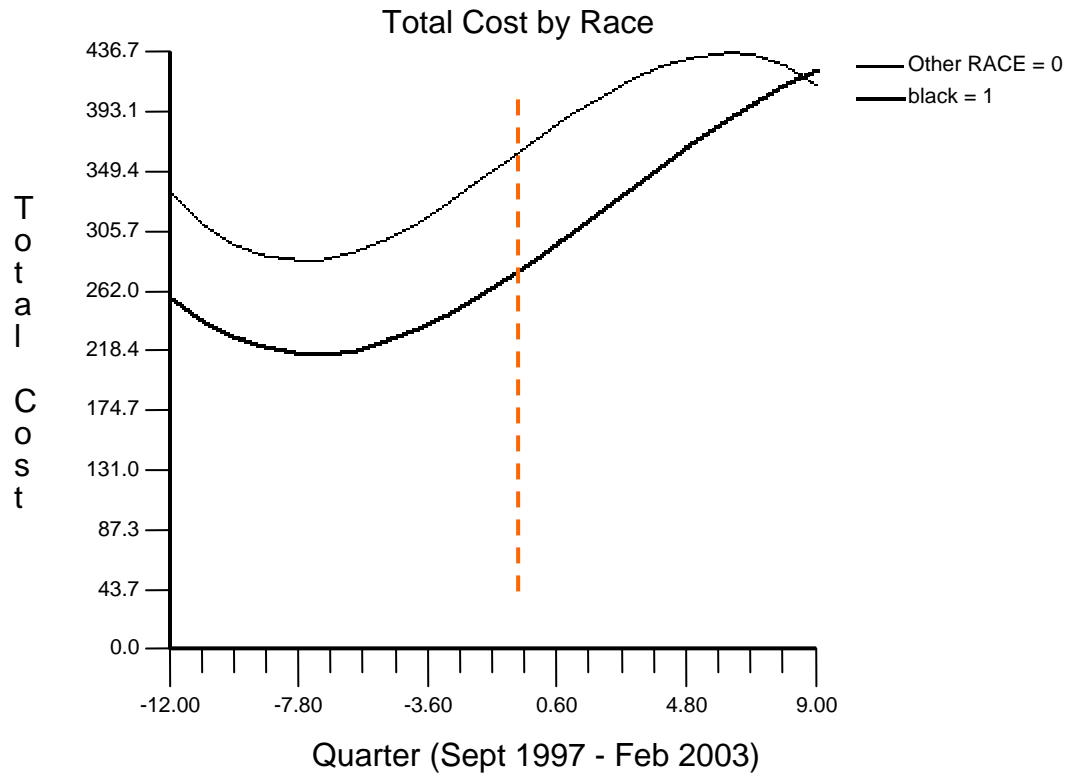
SBHC=1 (intervention schools), SBHC=0 (comparison schools).  
Marginal means are average costs of dental care per student.  
Time1 refers to before the SBHCs opened; Time2 refers to after the SBHCs opened.

**Figure 26. Growth Trend of Quarterly Total Costs by Sex (N=5,056)**

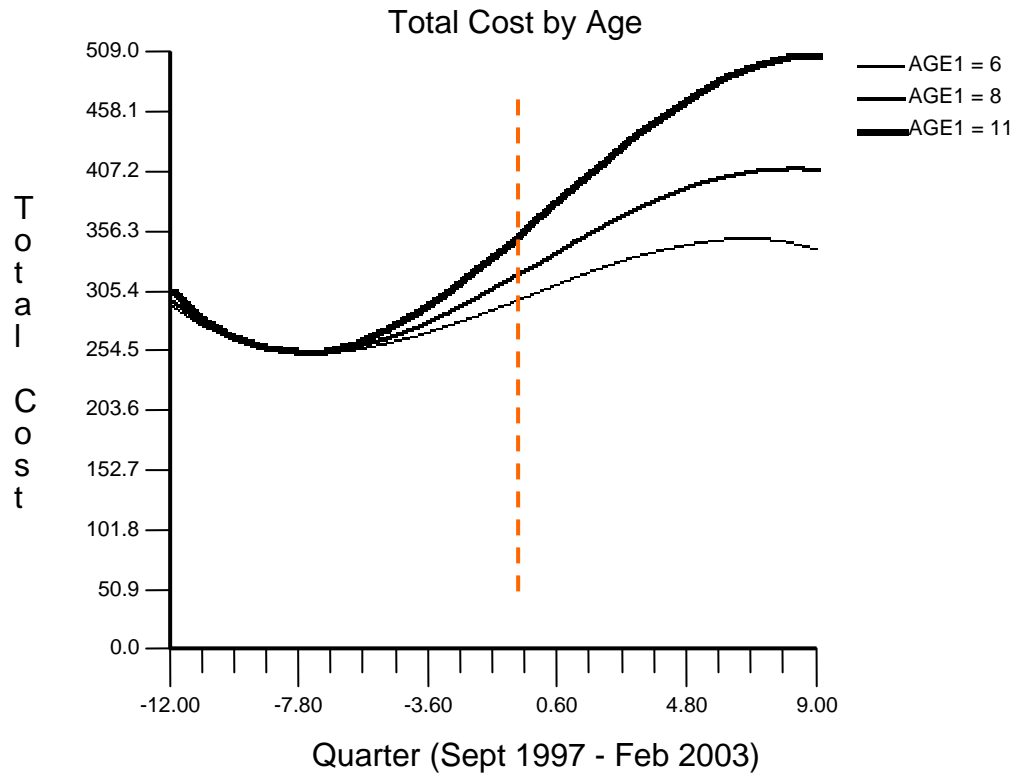




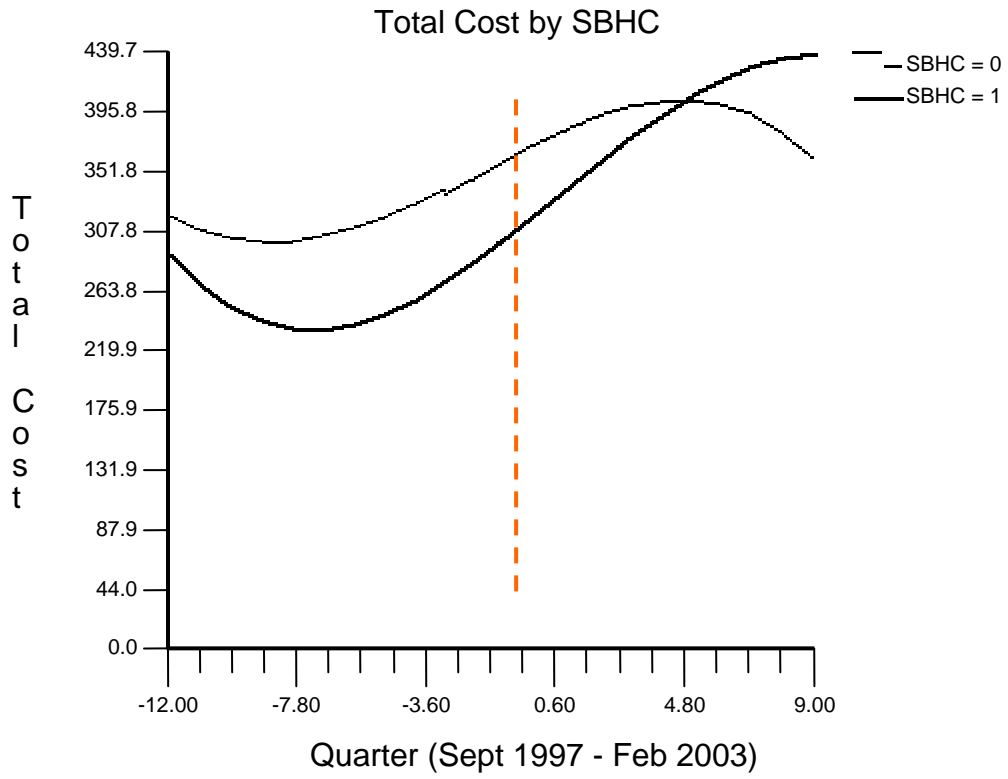
**Figure 27. Growth Trend of Quarterly Total Costs by Race (N=5,056)**



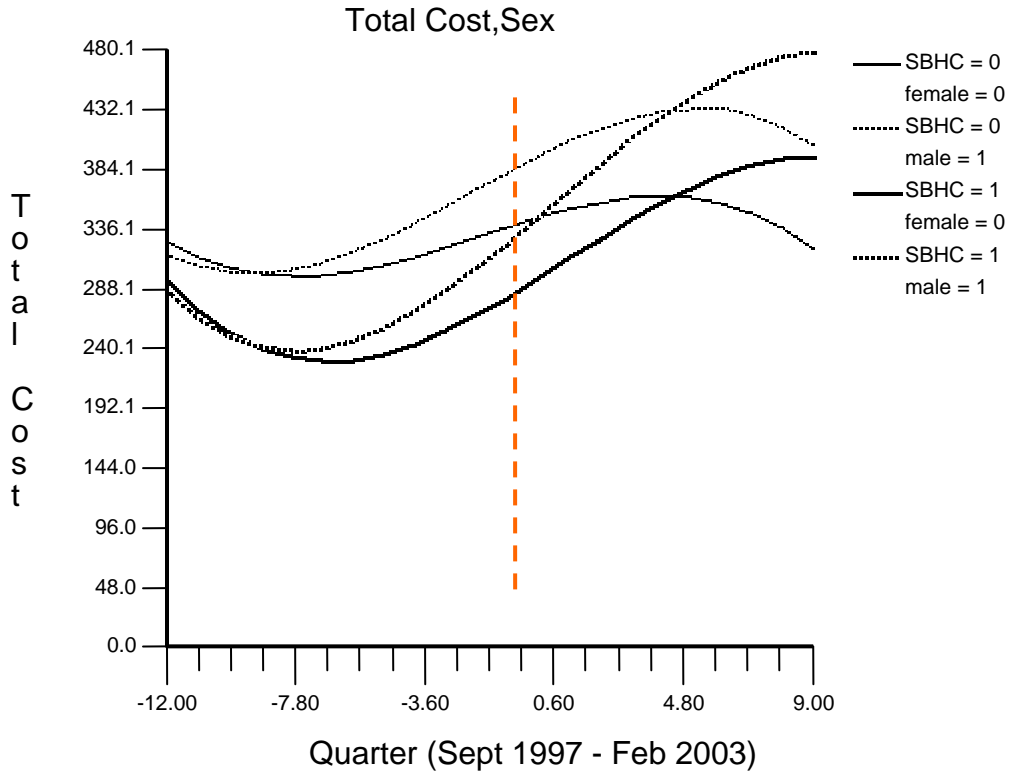
**Figure 28. Growth Trend of Quarterly Total Costs by Age Groups (N=5,056)**



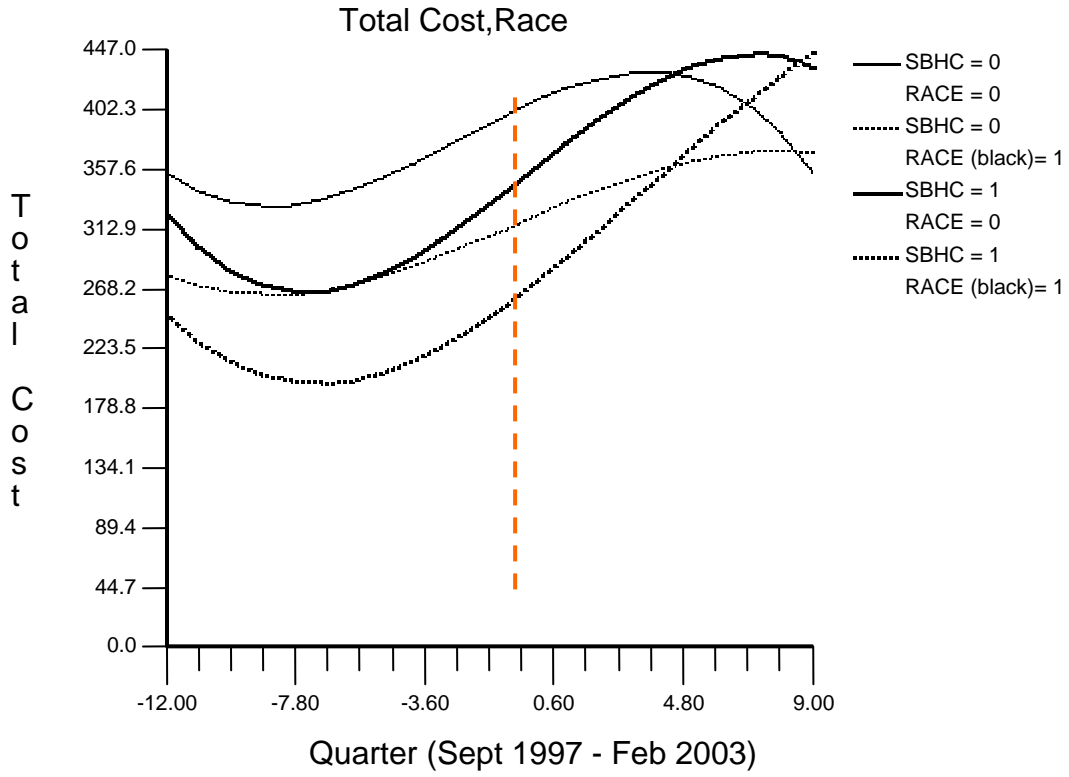
**Figure 29. Growth Trend of Quarterly Total Costs (N=5,056)**



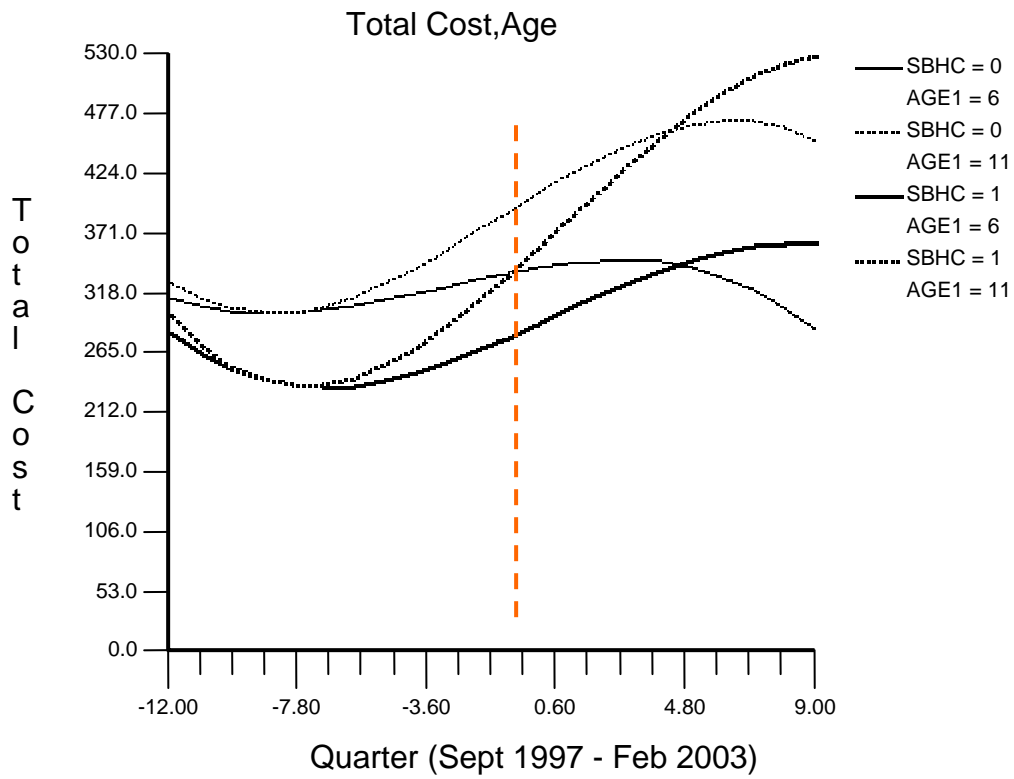
**Figure 30. Growth Trend of Quarterly Total Costs by Sex (N=5,056)**



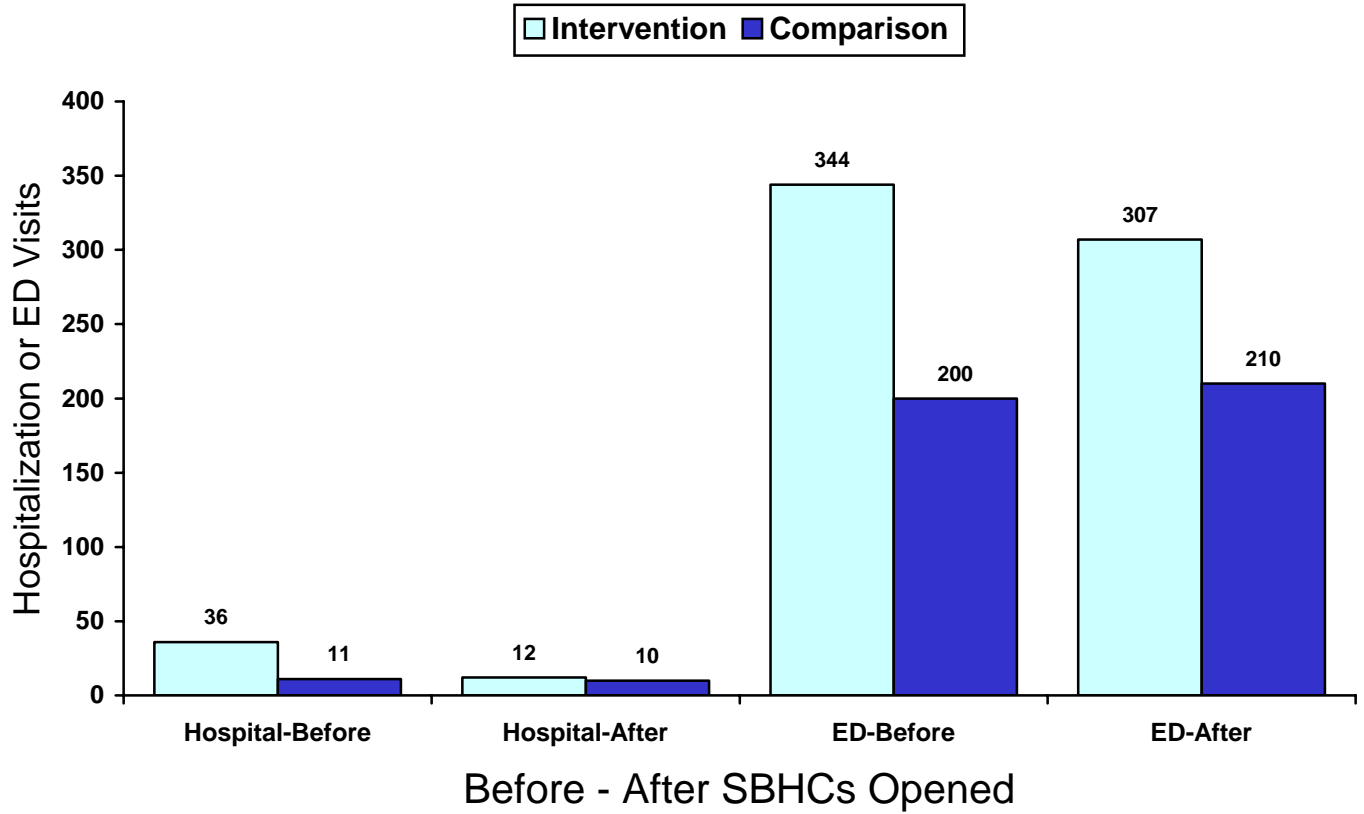
**Figure 31. Growth Trend of Quarterly Total Costs by Race (N=5,056)**



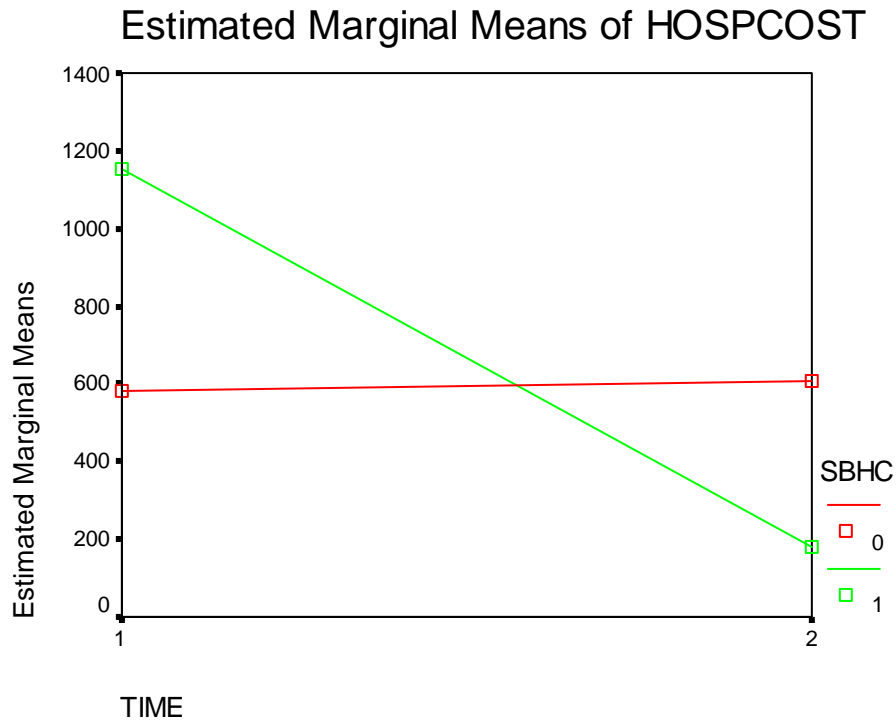
**Figure 32. Growth Trend of Quarterly Total Costs by Age (N=5,056)**



**Figure 33: Numbers of Hospitalization and ED Visits for Children with Asthma in Intervention Schools (N=196) and Comparison Schools (N=77).**



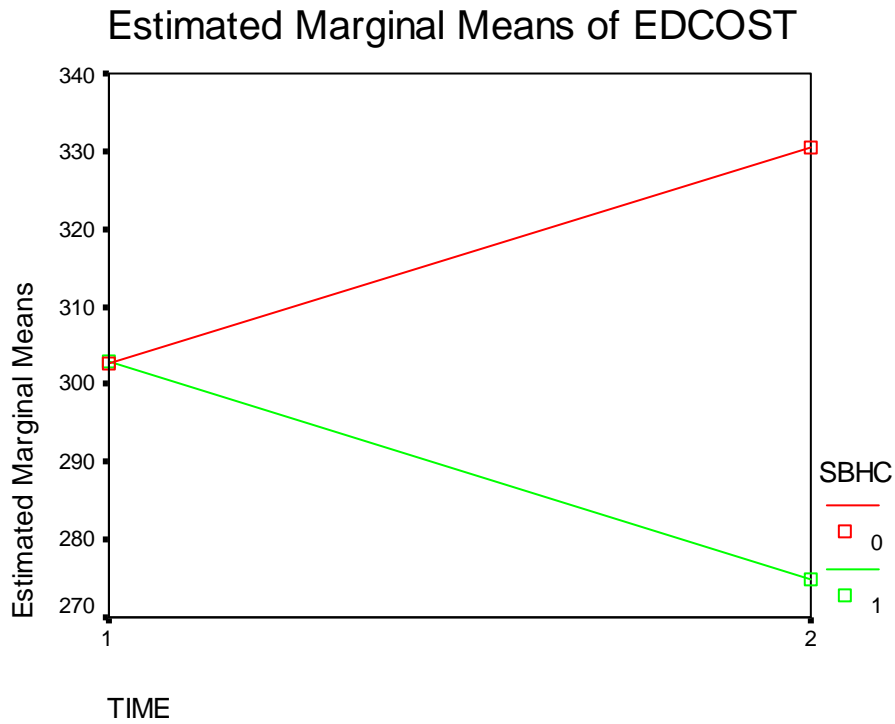
**Figure 34. Hospitalization Costs Before and After SBHCs Opened for Students with Asthma (N=273)**



SBHC=1 (intervention schools), SBHC=0 (comparison schools). HospCost is cost for hospitalization per child. Marginal means are average costs of hospitalization per child. Time1 refers to before the SBHCs opened; Time2 refers to after the SBHCs opened.

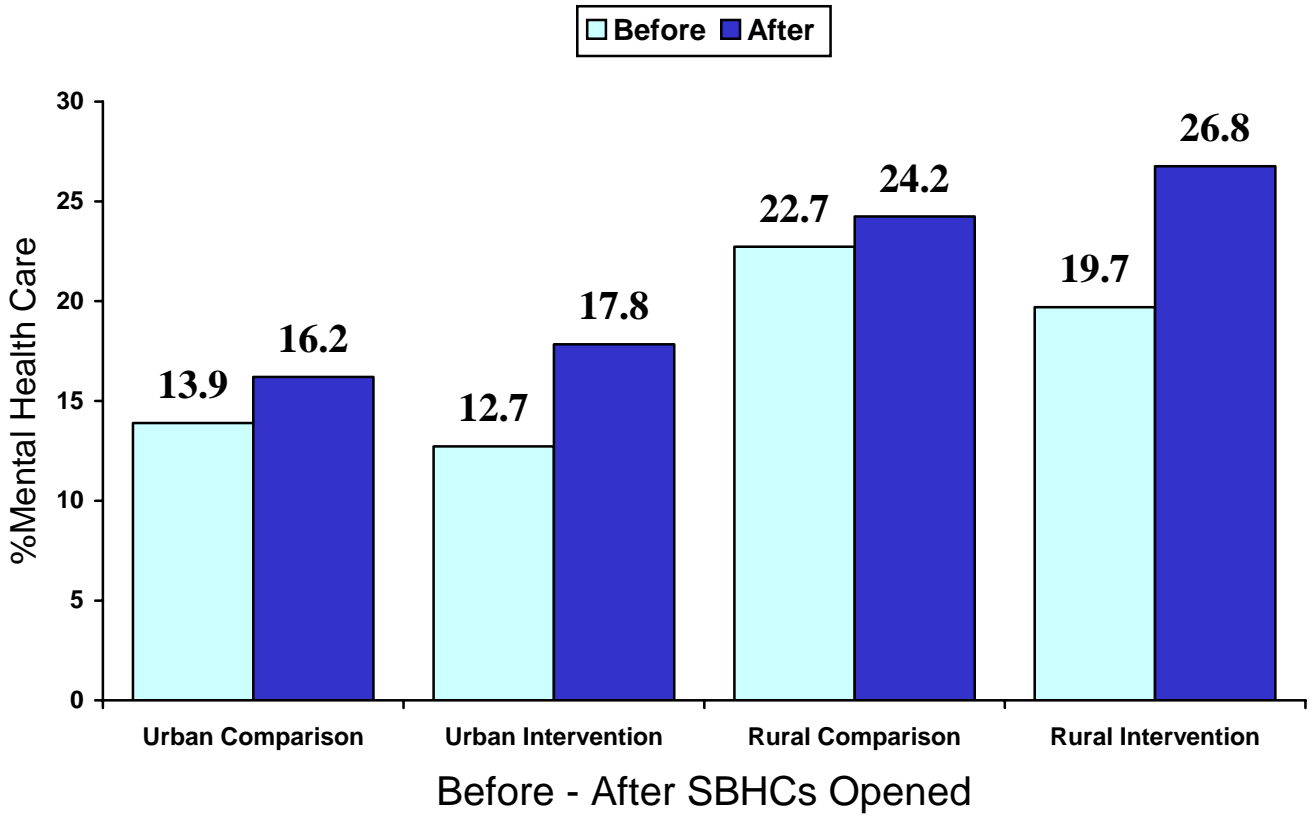


**Figure 35. Emergency Department Costs Before and After SBHCs Opened for Students with Asthma (N=273)**

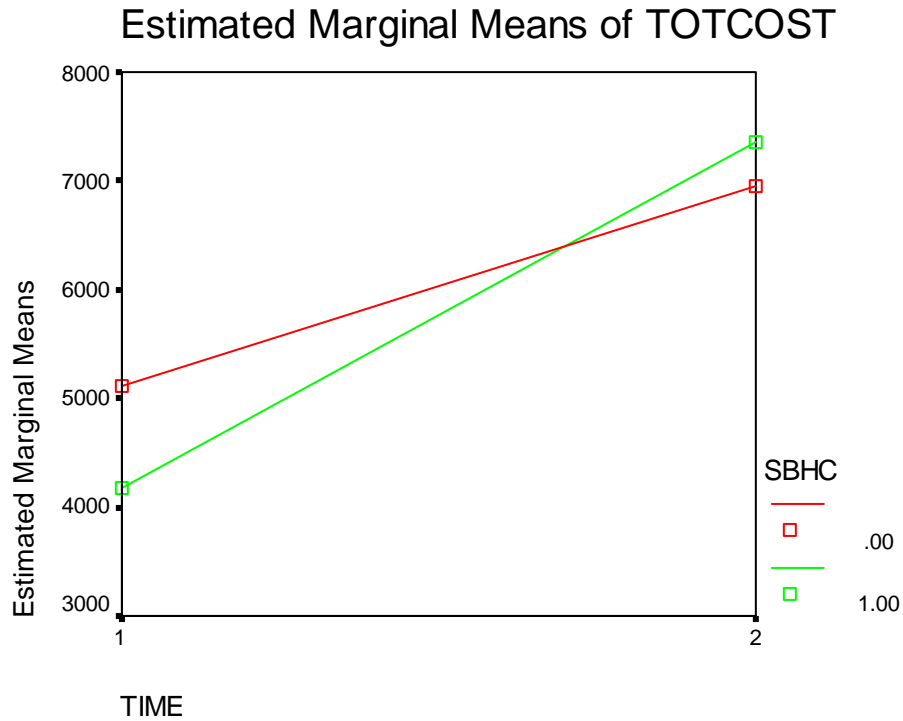


SBHC=1 (intervention schools), SBHC=0 (comparison schools).  
EDCost is cost for emergency department visits per child. Marginal means are average costs of ED visits per child.  
Time1 refers to before the SBHCs opened; Time2 refers to after the SBHCs opened.

**Figure 36: Percentage of Students Who Received Mental Health Services, Urban vs. Rural before and after the SBHCs Opened (N=2,153).**

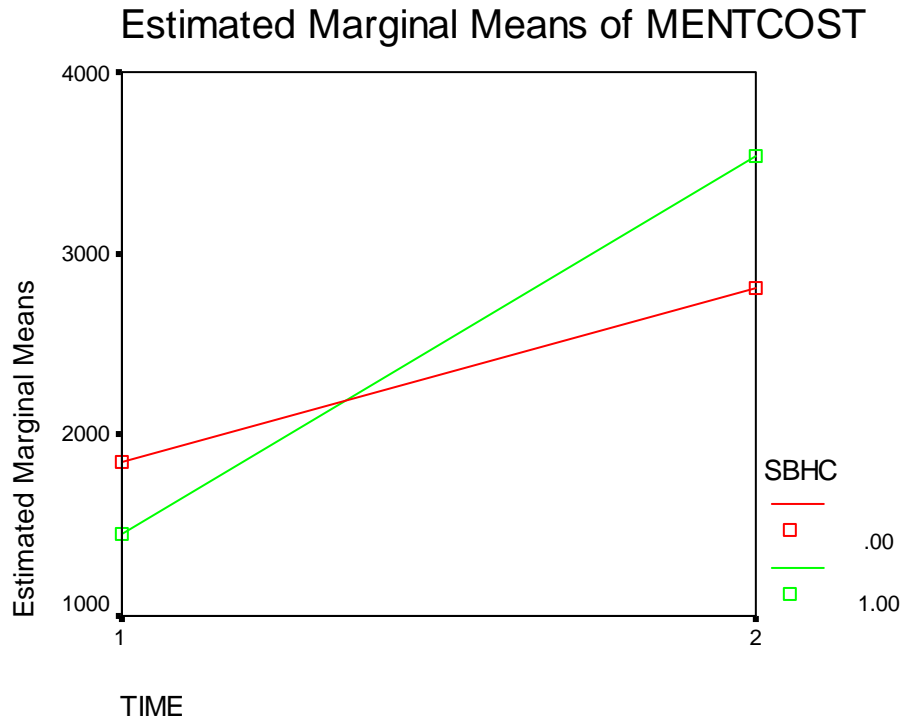


**Figure 37. Total Costs before and after the SBHCs Opened for Students with Mental Health Problems (N=551)**



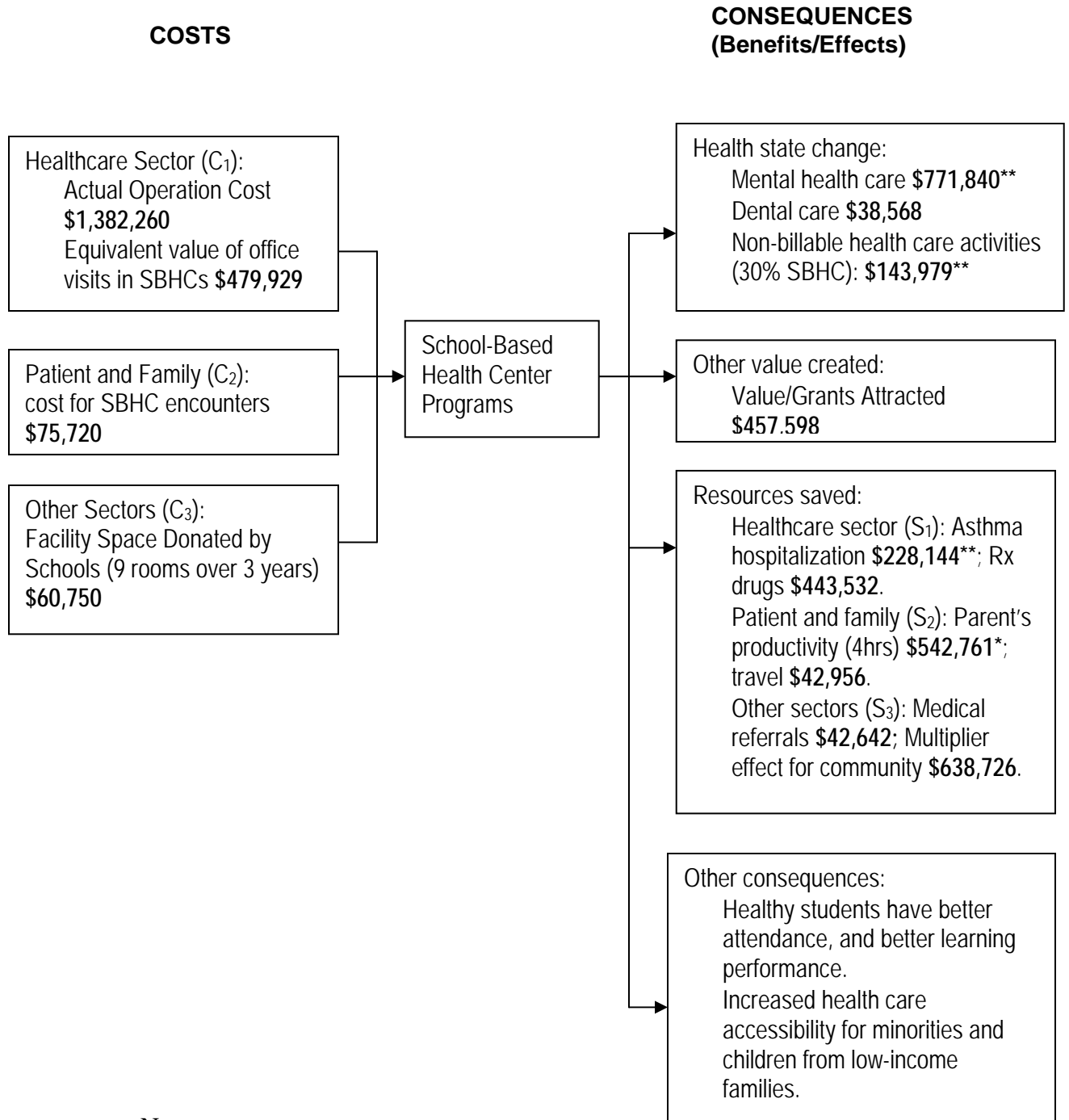
SBHC=1 (intervention schools), SBHC=0 (comparison schools).  
TotCost is cost for total costs per student. Marginal means are average total costs per student.  
Time1 refers to before the SBHCs opened; Time2 refers to after the SBHCs opened.

**Figure 38. Mental Health Service Costs before and after the SBHCs Opened for Students with Mental Health Problems (N=551)**



SBHC=1 (intervention schools), SBHC=0 (comparison schools).  
Mentcost is cost for mental health services per student. Marginal means are average mental health service costs per student.  
Time1 refers to before the SBHCs opened; Time2 refers to after the SBHCs opened.

**Figure 39. Estimated Net Social Benefit with Components of Costs and Benefits over the Three Year Period**



Note:  
 \*minimum/lower estimation.  
 \*\*maximum/higher estimation.

**Appendix A. Parent Survey Questionnaire**

**IPR ID #** \_\_\_\_\_

**SCHOOL BASED HEALTH CENTER EVALUATION PROJECT PARENT SURVEY—FINAL VERSION 2/25/01**

“Hello, may I speak with (FILL IN RESPONDENT’S NAME)?”

“Hello, my name is \_\_\_\_\_. I am calling from the Institute for Policy Research at the University of Cincinnati. I am working with Children’s Hospital Medical Center. Children’s Hospital is participating with the Health Foundation of Greater Cincinnati and area local schools in a school based health center evaluation project. You should have received a letter in the mail informing you that someone would call you about this project.

**IF NECESSARY:** “May I please speak to the person who makes health care decisions for (CHILD’S NAME)?”

**IF NECESSARY:** “If you would like to speak to someone about this study, you can call Terri Byczkowski (BIZ-COW-SKI) at 556-5075.”

“I’d like to ask you some questions about your child’s general health.”

Q1a. “First, I need to verify some information about your child. Your child (CHILD’S NAME) attends \_\_\_\_\_ school and is in the \_\_\_\_\_ grade?”

INDICATE CHILD’S SCHOOL:

- 1. School A
- 9. OTHER:  
PLEASE SPECIFY \_\_\_\_\_ (TERMINATE)

Q1b. INDICATE CHILD’S GRADE:

- 0. Kindergarten
- 1. 1<sup>st</sup>
- 2. 2<sup>nd</sup>
- 3. 3<sup>rd</sup>
- 4. 4<sup>th</sup>
- 5. 5<sup>th</sup>
- 6. 6<sup>th</sup>
- 9. OTHER:  
PLEASE SPECIFY \_\_\_\_\_ (TERMINATE)

Q1c. “What is (CHILD’S NAME) date of birth?” \_\_\_\_\_

Q2. “In general, how would you rate (CHILD’S NAME)’s health .... excellent, very good, good, fair, or poor?”

- 1. EXCELLENT
- 2. VERY GOOD
- 3. GOOD
- 4. FAIR
- 5. POOR
- 8. DK (PROBE: “In general . . .”)
- 9. NA

Q3. “Has a doctor or other health care professional ever told you that (CHILD NAME) has (FILL IN CONDITION)?”

(REPEAT FOR EACH CONDITION) (IF DK: DO NOT PROBE)

<b><u>CONDITION</u></b>	<b><u>YES</u></b>	<b><u>NO</u></b>	<b><u>DK</u></b>	<b><u>NA</u></b>
a. Asthma	1	2	8	9
b. ADHD (Attention Deficit Hyperactivity disorder) or ADD (Attention Deficit Disorder)	1	2	8	9
c. Learning disability	1	2	8	9
d. Developmental delay or mental retardation	1	2	8	9
e. Sickle Cell	1	2	8	9
f. Seizure disorder or epilepsy	1	2	8	9
g. Headaches	1	2	8	9
h. Diabetes	1	2	8	9

**ASK Q4a ONLY IF YES TO Q3a (ASTHMA).**

Q 4a “Does (CHILD NAME) currently take prescription medication for his/her asthma?”

1. YES
2. NO
  
8. DK (PROBE: REPEAT QUESTION)
9. NA
0. INAP

**ASK Q4b ONLY IF YES TO Q3b (ADHD).**

Q 4b. “Does (CHILD NAME) currently take prescription medication for his/her ADHD or ADD?”

1. YES
2. NO
  
8. DK (PROBE: REPEAT QUESTION)
9. NA
0. INAP

Q5. “Next, does (CHILD NAME) have (FILL IN CONDITION) that affects how well he/she does at school? ”

(REPEAT FOR EACH CONDITION)

<b><u>CONDITION</u></b>	<b><u>YES</u></b>	<b><u>NO</u></b>	<b><u>DK</u></b>	<b><u>NA</u></b>
a. Behavioral problems	1	2	8	9
b. Attention problems	1	2	8	9

Q6. “Next, not including the dental sealant program that may be offered at your child’s school, how long ago was (CHILD’S NAME)’s last visit to a dentist . . . (READ 1 TO 5) . . .

1. Less than 6 months ago,
2. Between 6-12 months ago,
3. 13–24 months ago,
4. More than 24 months ago, or
5. Never?”

8. DK (PROBE: REREAD QUESTION)
9. NA

**“For the next few questions, please think back to the last school year . . . that is, the 1999 to 2000 school year.”**

Q7. “Was there a particular clinic, health center, doctor’s office or other place that you usually went to during the last school year if (CHILD NAME) was sick, needed health advice, or routine medical health care?”

1. YES
2. NO (SKIP TO Q12)

8. DK (SKIP TO Q12)
9. NA (SKIP TO Q12)

Q8. “Which of the following categories best describes the doctor or health care provider that you usually went to during the last school year if (CHILD’S NAME) was sick, needed health advice, or routine healthcare . . . (READ 1 TO 4) . . .

1. Pediatrician,
2. Family physician or general practitioner,
3. Nurse practitioner, or
4. Emergency room physician?”

7. OTHER (VOL.) \_\_\_\_\_  
“What is the name and location of that doctor or health care provider?”

8. DK \_\_\_\_\_  
“What is the name and location of that doctor or health care provider?”

9. NA
0. INAP

Q9. “Which of the following categories best describes the type of practice this health care provider is in . . . (READ 1 TO 4) . . .

1. Private practice,
2. Community based clinic or health center,
3. Hospital based clinic, or
4. Emergency room physician?”

7. OTHER (VOL.) \_\_\_\_\_

“What is the name and location of the clinic or doctor’s office your child’s healthcare provider is in?”

8. DK \_\_\_\_\_  
“What is the name and location of the clinic or doctor’s office your child’s health care provider is in?”

9. NA
0. INAP



Q10. “Still thinking about the last school year . . . .

“How many times did you take (CHILD NAME) to an appointment to see his/her doctor or health care provider for well-child care?”

---

(RECORD RESPONSE)

- 95. NONE
- 98. DK
- 99. NA
- 00. INAP

Q11. “How many times did you take (CHILD NAME) to an appointment to see his/her doctor or health care provider when (CHILD NAME) was sick?”

---

(RECORD RESPONSE)

- 95. NONE
- 98. DK
- 99. NA
- 00. INAP

Q12. “Still thinking about the last school year . . . . how much of a problem, if any, was it to get care for your child that you believed necessary . . . a big problem, a small problem or not a problem?”

- 1. A BIG PROBLEM
- 2. A SMALL PROBLEM
- 3. NOT A PROBLEM
- 4. CHILD DID NOT NEED CARE (VOLUNTEERED)
  
- 8. DK
- 9. NA

Q13. “Next, how many times during the last school year did you take (CHILD NAME) to a hospital emergency room about his/her health (this includes visits that resulted in a hospital admission)?”

- 1. ONCE
- 2. 2 - 3 TIMES
- 3. 4 - 9 TIMES
- 4. 10 - 12 TIMES
- 5. 13 OR MORE TIMES
  
- 7. NONE
- 8. DK (PROBE: “Approximately, how many times . . . “)
- 9. NA

“On another topic . . . “

Q14. “Which one of the following best describes the type of health insurance you currently have for (CHILD’S NAME) . . . Medicare, Medicaid, CHIP, KCHIP, Healthy Start, private insurance, no insurance, or some other insurance?”

1. MEDICARE (SKIP TO Q 21)
2. MEDICAID (SKIP TO Q 21)
3. CHIP (SKIP TO Q 21)
4. KCHIP (SKIP TO Q 21)
5. HEALTHY START (SKIP TO Q 21)
6. PRIVATE INSURANCE (SKIP TO Q 21)
7. SOME OTHER INSURANCE (SKIP TO Q 21)
8. SOME COMBINATION (PROBE: “What is (CHILD’S NAME) primary type of insurance?”) (SKIP TO Q21)

97. NO INSURANCE

98. DK (SKIP TO Q21)

99. NA

Q15. “What is the main reason you do not have health insurance for (CHILD’S NAME)?”

(PROBE: “What is the main reason . . . ?)

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(RECORD ANSWER VERBATIM)

98. DK

99. NA

00. INAP

Q 16 LEAVE BLANK

Q 17 LEAVE BLANK

Q 18 LEAVE BLANK

Q 19 LEAVE BLANK

Q 20 LEAVE BLANK

Q21. “What is the age of (CHILD)?” \_\_\_\_\_  
RECORD AGE

**Q22. ASK 22a THRU 22w FOR CHILDREN 5 - 7 YEARS OF AGE ONLY, OTHERWISE SKIP TO Q23.**

“Now, thinking about your child’s daily activities . . .

“In the past **one** month, how much of a **problem** has your child had with . . . (READ a - w) . . . never, almost never, sometimes, often, or almost always?”

		NEVE R	ALMO ST NEVER	SOME - TIME S	OFTE N	ALMOS T ALWAY S	INA P	D K	N A
a	Walking more than one block	1	2	3	4	5	0	8	9
b	Running	1	2	3	4	5	0	8	9
c	Participating in sports activity or exercise	1	2	3	4	5	0	8	9
d	Lifting something heavy	1	2	3	4	5	0	8	9
e	Taking a bath or shower by him or herself	1	2	3	4	5	0	8	9
f	Doing chores, like picking up his or her toys	1	2	3	4	5	0	8	9
g	Having hurts or aches	1	2	3	4	5	0	8	9
h	Low energy level	1	2	3	4	5	0	8	9
i	Feeling afraid or scared	1	2	3	4	5	0	8	9
j	Feeling sad or blue	1	2	3	4	5	0	8	9
k	Feeling angry	1	2	3	4	5	0	8	9
l	Trouble sleeping	1	2	3	4	5	0	8	9
m	Worrying about what will happen to him or her	1	2	3	4	5	0	8	9
n	Getting along with other children	1	2	3	4	5	0	8	9
o	Other kids not wanting to be his or her friend	1	2	3	4	5	0	8	9
p	Getting teased by other children	1	2	3	4	5	0	8	9
q	Not able to do things that other children his or her age can do	1	2	3	4	5	0	8	9
r	Keeping up when playing with other children	1	2	3	4	5	0	8	9
s	Paying attention in class	1	2	3	4	5	0	8	9
t	Forgetting things	1	2	3	4	5	0	8	9

u	Keeping up with school activities	1	2	3	4	5	0	8	9
v	Missing school because of not feeling well	1	2	3	4	5	0	8	9
w	Missing school to go to the doctor or hospital	1	2	3	4	5	0	8	9

**SKIP TO Q25**

**Q23. ASK 23a THRU 23w FOR CHILDREN 8- 12 YEARS OF AGE ONLY, OTHERWISE SKIP TO Q24.**

“Now, thinking about your child’s daily activities . . .

“In the past **one** month, how much of a **problem** has your child had with . . . (READ a - w) . . . . never, almost never, sometimes, often, or almost always?”

		NEVER	ALMOST NEVER	SOME-TIMES	OFTEN	ALMOST ALWAYS	INAPPROPRIATE	DISK	NA
a	Walking more than one block	1	2	3	4	5	0	8	9
b	Running	1	2	3	4	5	0	8	9
c	Participating in sports activity or exercise	1	2	3	4	5	0	8	9
d	Lifting something heavy	1	2	3	4	5	0	8	9
e	Taking a bath or shower by him or herself	1	2	3	4	5	0	8	9
f	Doing chores around the house	1	2	3	4	5	0	8	9
g	Having hurts or aches	1	2	3	4	5	0	8	9
h	Low energy level	1	2	3	4	5	0	8	9
i	Feeling afraid or scared	1	2	3	4	5	0	8	9
j	Feeling sad or blue	1	2	3	4	5	0	8	9
k	Feeling angry	1	2	3	4	5	0	8	9
l	Trouble sleeping	1	2	3	4	5	0	8	9
m	Worrying about what will happen to him or her	1	2	3	4	5	0	8	9
n	Getting along with other children	1	2	3	4	5	0	8	9
o	Other kids not wanting to be his or her friend	1	2	3	4	5	0	8	9
p	Getting teased by other children	1	2	3	4	5	0	8	9
q	Not able to do things that other children his or her age can do	1	2	3	4	5	0	8	9
r	Keeping up when playing with other children	1	2	3	4	5	0	8	9
s	Paying attention in class	1	2	3	4	5	0	8	9
t	Forgetting things	1	2	3	4	5	0	8	9

u	Keeping up with schoolwork	1	2	3	4	5	0	8	9
v	Missing school because of not feeling well	1	2	3	4	5	0	8	9
w	Missing school to go to the doctor or hospital	1	2	3	4	5	0	8	9

**SKIP TO Q25**

**Q24. ASK 24a THRU 24w FOR CHILDREN 13 - 18 YEARS OF AGE ONLY, OTHERWISE SKIP TO Q25.**

“Now, thinking about your child’s daily activities . . .

“In the past **one** month, how much of a **problem** has your teen had with . . . (READ a - w) . . . . never, almost never, sometimes, often, or almost always?”

		NEVE R	ALMO ST NEVER	SOME - TIME S	OFTE N	ALMOS T ALWAY S	INA P	D K	N A
a	Walking more than one block	1	2	3	4	5	0	8	9
b	Running	1	2	3	4	5	0	8	9
c	Participating in sports activity or exercise	1	2	3	4	5	0	8	9
d	Lifting something heavy	1	2	3	4	5	0	8	9
e	Taking a bath or shower by him or herself	1	2	3	4	5	0	8	9
f	Doing chores around the house	1	2	3	4	5	0	8	9
g	Having hurts or aches	1	2	3	4	5	0	8	9
h	Low energy level	1	2	3	4	5	0	8	9
i	Feeling afraid or scared	1	2	3	4	5	0	8	9
j	Feeling sad or blue	1	2	3	4	5	0	8	9
k	Feeling angry	1	2	3	4	5	0	8	9
l	Trouble sleeping	1	2	3	4	5	0	8	9
m	Worrying about what will happen to him or her	1	2	3	4	5	0	8	9
n	Getting along with other teens	1	2	3	4	5	0	8	9
o	Other teens not wanting to be his or her friend	1	2	3	4	5	0	8	9
p	Getting teased by other	1	2	3	4	5	0	8	9

	teens								
q	Not able to do things that other teens his or her age can do	1	2	3	4	5	0	8	9
r	Keeping up with other teens	1	2	3	4	5	0	8	9
s	Paying attention in class	1	2	3	4	5	0	8	9
t	Forgetting things	1	2	3	4	5	0	8	9
u	Keeping up with schoolwork	1	2	3	4	5	0	8	9
v	Missing school because of not feeling well	1	2	3	4	5	0	8	9
w	Missing school to go to the doctor or hospital	1	2	3	4	5	0	8	9

Q25. “Now, thinking about your own health . . .”

“The first question is about your health and your current daily activities. Please try to answer as accurately as you can.”

“In general, how would you say your health is . . . excellent, very good, good, fair, or poor?”

1. EXCELLENT
2. VERY GOOD
3. GOOD
4. FAIR
5. POOR
  
8. DK (PROBE: “In general . . .”)
9. NA

“Now I am going to read a list of activities that you might do during a typical day. As I read each item, please tell me if your health now limits you a lot, limits you a little, or does not limit you at all in these activities . . .

Q26. “. . .first, moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf. Does your health now limit you a lot, a little, or not at all?”

1. A LOT
2. A LITTLE
3. NOT AT ALL
  
8. DK (PROBE: “In general . . .”)
9. NA

(IF RESPONDENT SAYS S/HE DOES NOT DO ACTIVITY, PROBE: “Is that because of your health . . .”

1. YES, LIMITED A LOT
2. YES, LIMITED A LITTLE
3. NO, NOT LIMITED AT ALL

Q27. “. . . strenuous activities such as climbing several flights of stairs. Does your health now limit you a lot, a little, or not at all?”

1. A LOT
2. A LITTLE
3. NOT AT ALL
  
8. DK (PROBE: “In general . . . )
9. NA

(IF RESPONDENT SAYS S/HE DOES NOT DO ACTIVITY, PROBE: “Is that because of your health . . .”

1. YES, LIMITED A LOT
2. YES, LIMITED A LITTLE
3. NO, NOT LIMITED AT ALL

“The following two questions ask about your physical health and your daily activities.”

Q28. “During the past 4 weeks, have you accomplished less than you would like as a result of your physical health?”

1. YES
2. NO
  
8. DK (REREAD QUESTION)
9. NA

Q29. “During the past 4 weeks, were you limited in the kind of work or other regular daily activities you do as a result of your physical health?”

1. YES
2. NO
  
8. DK (REREAD QUESTION)
9. NA

“The following two questions ask you about your emotions and daily activities”

Q30. “During the past 4 weeks, have you accomplished less than you would like as a result of any emotional problems, such as feeling depressed or anxious?”

1. YES
2. NO
  
8. DK (REREAD QUESTION)
9. NA



Q31. “During the past 4 weeks, did you not do work or other regular activities as carefully as usual as a result of any emotional problems, such as feeling depressed or anxious?”

- 1. YES
- 2. NO
  
- 8. DK (REREAD QUESTION)
- 9. NA

Q32. “During the past 4 weeks, how much did pain interfere with your normal work, including both work outside the home and housework? Did it interfere . . . (READ 1 TO 5) . . .

- 1. Not at all,
- 2. A little bit,
- 3. Moderately,
- 4. Quite a bit, or
- 5. Extremely?”
  
- 8. DK (REREAD QUESTION)
- 9. NA

Q33. “During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities, like visiting with friends or relatives. Has it interfered..... (READ 1 TO 5) . . .

- 1. All of the time,
- 2. Most of the time,
- 3. Some of the time,
- 4. A little of the time, or
- 5. None of the time?”
  
- 8. DK (REREAD QUESTION)
- 9. NA

Q34. “The next questions are about how you feel and how things have been with you during the past 4 weeks. As I read each statement, please give me the one answer that comes closest to the way you have been feeling.”

“How much of the time during the past 4 weeks (FILL IN STATEMENT) . . . is it all of the time, most of the time, a good bit of the time, some of the time, a little of the time or none of the time”

<u>Statement</u>	<u>All</u>	<u>Mos</u> <u>t</u>	<u>Goo</u> <u>d</u> <u>Bit</u>	<u>Som</u> <u>e</u>	<u>A</u> <u>Littl</u> <u>e</u>	<u>Non</u> <u>e</u>	<u>DK</u>	<u>NA</u>
a. Have you felt calm and peaceful	1	2	3	4	5	6	8	9
b. Did you have a lot of energy	1	2	3	4	5	6	8	9
c. Have you felt downhearted and blue	1	2	3	4	5	6	8	9

“Now a few final questions.”

Q35. “Which category best describes your relationship to (CHILD’S NAME) . . . (READ 1 TO 8) . . .

1. Birth parent,
2. Step-parent,
3. Foster parent,
4. Adoptive parent,
5. Grandparent,
6. Aunt/Uncle,
7. Guardian, or
8. Some other relationship?"

98. DK
99. NA

Q36. "Are you currently married, widowed, divorced, separated, or have you never been married?"

1. MARRIED AND LIVING WITH SPOUSE (INCLUDE COMMON LAW MARRIAGE & SPOUSE AWAY IN SERVICE)
2. WIDOWED
3. DIVORCED
4. SEPARATED
5. NEVER MARRIED (INCLUDING ANNULMENTS)
6. PARTNERS NOT MARRIED (VOL.)
9. NA

Q37. "What is your age?" \_\_\_\_\_  
(RECORD RESPONSE)

95. NINETY-FIVE YEARS OF AGE OR OLDER
97. REFUSED
98. DK
99. NA

Q38. "What was the highest grade or level of school that you have completed?" (DO NOT READ)

1. 8<sup>TH</sup> GRADE OR LESS
2. SOME HIGH SCHOOL, BUT DID NOT GRADUATE
3. HS GRADUATE OR GED
4. SOME COLLEGE OR 2-YEAR DEGREE
5. 4-YEAR COLLEGE GRADUATE
6. MORE THAN 4-YEAR COLLEGE DEGREE
9. NA

Q39. "What is your race? Is it black, white or some other race?"

1. BLACK OR AFRICAN AMERICAN
2. WHITE
3. HISPANIC
4. NATIVE AMERICAN
5. ASIAN-PACIFIC ISLANDER
6. MULTI RACIAL
7. OTHER (PROBE)
9. NA

Q40. "Last week . . . were you working full-time, part-time, going to school, keeping house, or what?"

**(CIRCLE ONE CODE ONLY. IF MORE THAN ONE RESPONSE, GIVE PREFERENCE TO SMALLEST [LOWEST] CODE NUMBER THAT APPLIES.)**

1. WORKING FULL-TIME
2. WORKING PART-TIME
3. WITH A JOB BUT NOT AT WORK BECAUSE OF TEMPORARY ILLNESS, VACATION, STRIKE
4. UNEMPLOYED, LAID OFF, LOOKING FOR WORK (SKIP TO Q42)
5. DISABLED, TOO ILL TO WORK (PERMANENT) (SKIP TO Q42)
6. RETIRED (SKIP TO Q42)
7. IN SCHOOL (SKIP TO Q42)
8. KEEPING HOUSE (SKIP TO Q42)
9. NA (SKIP TO Q42)

Q41a. "About how many days, during the past four weeks, have you missed work because (CHILD'S NAME) was sick?"

\_\_\_\_\_ (FILL IN NUMBER OF DAYS) (ROUND TO NEAREST WHOLE DAY)

97. NONE
98. DK
99. NA
00. INAP

Q41b. "Now, overall, about how many days do you think, during the past 12 months, you have missed work because (CHILD'S NAME) was sick?"

\_\_\_\_\_ (FILL IN NUMBER OF DAYS) (ROUND TO NEAREST WHOLE DAY)

- 97. NONE
- 98. DK
- 99. NA
- 00. INAP

Q42. "How many of the persons who currently live in your household are under 18 years of age, including babies and small children?"

RECORD# : \_\_\_\_\_

- 95. NONE
- 99 NA

Q43. "Including yourself, how many people aged 18 or older, currently live in your household?"

RECORD# : \_\_\_\_\_

- 99 NA

Q44. "How much total income did you and your family receive in 2000, not just from wages or salaries but from all sources -- that is, before taxes and other deductions were made? I will read some categories please stop me when I get to yours."  
(READ CATEGORIES)

	<u>MONTHLY EQUIVALENT</u>
01. Less than \$5,000	Less than \$417
02. \$ 5,000 - 9,999	\$ 417 - 833
03. \$10,000 - 14,999	\$ 834 - 1,249
04. \$15,000 - 19,999	\$1,250 - 1,666
05. \$20,000 - 24,999	\$1,667 - 2,082
06. \$25,000 - 29,999	\$2,083 - 2,499
07. \$30,000 - 34,999	\$2,500 - 2,916
08. \$35,000 - 39,999	\$2,917 - 3,332
09. \$40,000 - 44,999	\$3,333 - 3,749
10. \$45,000 - 49,999	\$3,750 - 4,166
11. \$50,000 - 59,999	\$4,167 - 4,999
12. \$60,000 - 69,999	\$5,000 - 5,833

- |                       |                 |
|-----------------------|-----------------|
| 13. \$70,000 - 79,999 | \$5,834 - 6,666 |
| 14. \$80,000 - 99,999 | \$6,667 - 8,333 |
| 15. \$100,000 or more | \$8,334 or more |

- 97. REFUSED
- 98. DK
- 99. NA

NOTE: INCOME SOURCES TO BE INCLUDED:

- |                        |                |                              |
|------------------------|----------------|------------------------------|
| 1. Wages & salaries    | 4. Social Sec. | 7. Unemployment compensation |
| 2. Interest on savings | 5. Pensions    | 8. Alimony                   |
| 3. Dividends           | 6. Welfare     | 9. Child support             |

Q45. RECORD RESPONDENT’S GENDER:

- 1. MALE
- 2. FEMALE

Q46. “Are you the legal guardian of (CHILD’S NAME)?”

- 1. YES (CONTINUE)
- 2. NO (SKIP TO Q48)

Q47. “As part of the School Based Health Center Evaluation Project, we would like to ask (CHILD’S NAME) a much shorter list of questions than we just asked you. The questions would ask (CHILD’S NAME) about how healthy he/she feels and about how he/she feel about his/her school. These questions will take about 5 minutes and a representative from Children’s Hospital would ask the questions of (CHILD’S NAME) while he/she is at school.”

“The answers to these questions will be held in confidence and will not be shared with the school. (CHILD’S NAME) will receive a small gift for answering these questions. The survey is voluntary. No action will be taken against your child or yourself if you do not agree to have (CHILD’S NAME) answer the questions.”

“Can we have permission to ask (CHILD’S NAME) these questions?”

- 1. YES, I GIVE PERMISSION FOR MY CHILD TO TAKE PART IN THE SURVEY
- 2. NO, I DO NOT GIVE PERMISSION FOR MY CHILD TO TAKE PART IN THE SURVEY

**SKIP TO Q49**

Q48. “As part of the School-Based Health Center Evaluation Project, we would like to ask (CHILD’S NAME) a much shorter list of questions than we just asked you. These questions will take about 5 minutes and a representative from Children’s Hospital would ask the questions of (CHILD’S NAME) while he/she is at school. To do this we need to obtain permission from (CHILD’S NAME)’s legal guardian. Would you please give to me the name, address and telephone number of (CHILD’S NAME)’s legal guardian.

NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

\_\_\_\_\_

PHONE: \_\_\_\_\_

Q49. “Finally, let me verify the correct spelling of your name and address.”

VERIFY RESPONDENTS NAME ADDRESS AND PHONE NUMBER AND RECORD BELOW.

NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

\_\_\_\_\_

PHONE: \_\_\_\_\_

“That's all the questions I have -- you've been very helpful. Thank you for your cooperation. Goodbye.”

## INTERVIEWER SUPPLEMENT

Q50. RECORD THE STUDENT ID NUMBER FROM THE LABEL

--	--	--	--	--	--	--	--	--	--

Q51. RECORD YOUR INTERVIEWER NUMBER

--	--

Q52. RECORD DATE INTERVIEW COMPLETED (E.G. 01-24)

		-		
--	--	---	--	--

Q53. RECORD FINAL STATUS CODE

0. COMPLETION FROM RAW #
1. COMPLETION FROM APPOINTMENT
2. COMPLETION FROM REFUSAL
3. COMPLETION FROM PARTIAL (REGULAR OR REFUSAL)
4. FINAL PARTIAL

NOTE: BE SURE TO RECORD "FINAL CALL STATUS" ON CALL RECORD

**Appendix B. SBHC Coordinator's Survey Questionnaire**

**Resource Use Questionnaire for SBHC Evaluation Project**

Date: \_\_\_\_\_

Your SBHC (circle one): \_\_\_\_\_

Your Name \_\_\_\_\_

Your Office Phone#: \_\_\_\_\_

Your Office Fax#: \_\_\_\_\_

Your email address: \_\_\_\_\_

**1. Personnel Resource**

**Which of the following health care providers were involved in your school's on-site SBHC?**

	9/2000-7/2001		9/2001-7/2002		9/2002-7/2003	
	Yes/No/ Off-site	Hours per week	Yes/No/ Off-site	Hours per week	Yes/No/ Off-site	Hours per week
Physician						
Nurse Practitioner						
Registered Nurse						
Social Worker						
Mental health consultant						
Other (please specify)						



**2. Equipment and Service Items**

**Please list the type and cost of any/all equipment acquired for use in your SBHC.**

	9/2000-7/2001		9/2001-7/2002		9/2002-7/2003	
	Yes/No	Cost\$	Yes/No	Cost\$	Yes/No	Cost\$
Computer (+monitor)						
Software?						
Welligent						
Examination bed						
Blood pressure meter						
Weight/height scale						
Other (please specify)						

**3. Facility and Utility**

**Describe the nature and size of the school facility space made available for use by the SBHC. (If you don't have this information, please provide a school contact person with phone# \_\_\_\_\_ . Thank you!)**

	9/2000-7/2001		9/2001-7/2002		9/2002-7/2003	
	Units	Cost\$	Units	Cost\$	Units	Cost\$
Square feet for SBHC						
Heat & Cool (gas & power)						
Water						
Stationary & supplies						
Other (please specify)						

**4. Other Sources of Funding to Support SBHC Program**

**Were any other sources of funding used to support the SBHC program aside from the startup funds provided by the Health Foundation of Greater Cincinnati?**

Other Source	9/2000-7/2001		9/2001-7/2002		9/2002-7/2003	
	Units	Cost\$	Units	Cost\$	Units	Cost\$
please specify						

**5. Did the presence of an SBHC help your school to accomplish other valued projects?**

Source	9/2000-7/2001		9/2001-7/2002		9/2002-7/2003	
	Grant/ contract	Amount\$	Grant/ contract	Amount\$	Grant/ contract	Amount\$
Children Hospital Medical Center						
please specify						

**6. Do you have any comments and suggestions regarding the “Value” of SBHC?**

## Appendix C. Brand Names and Generic Names of Medications for Asthma Treatment

Brand-Name Drugs	Generic-Name Drugs
A Cream	Hydrocortisone
A-Hydrocort	Hydrocortisone Sod Succinate
Aarane	Cromolyn Sodium
Accolate	Zafirlukast
Accurbron	Theophylline Anhydrous
Acticort	Hydrocortisone
Aerobid	Flunisolide
Aerobid-M	Flunisolide/Menthol
Aerolate	Theophylline Anhydrous
Aerolate 111	Theophylline Anhydrous
Aerolate Jr	Theophylline Anhydrous
Aerolate Sr	Theophylline Anhydrous
Aerolone	Isoproterenol Hcl
Aerolone Compound	Isoproterenol
Aeroseb-Hc	Hydrocortisone
Aeroseb-Hc	Hydrocortisone Acetate
Airet	Albuterol
Ak-Cort	Hydrocortisone
Ak-Pred	Prednisolone Sodium Phosphate
Ak-Tate	Prednisolone Acetate
Ala-Cort	Hydrocortisone
Ala-Scalp Hp	Hydrocortisone
Albacort	Hydrocortisone
Albuterol	
Albuterol	Albuterol
Albuterol	Albuterol Sulfate
Albuterol Sulfate	
Albuterol Sulfate	Albuterol
Albuterol Sulfate	Albuterol Sulfate
Allercort	Hydrocortisone
Allersone	Hydrocortisone
Alocril	Nedocromil Sodium
Aloe Cort	Hydrocortisone/Aloe Vera
Alphaderm	Hydrocortisone
Alphaderm	Hydrocortisone Acetate/Urea
Alphaderm	Hydrocortisone/Urea
Alphaderm	Hydrocortisone/Urea (Top)
Alupent	Metaproterenol Sulfate
Aminophylline	Theophylline Anhydrous
Anti-Itch Scalp Relief	Hydrocortisone
Anu-Med Hc	Hydrocortisone Acetate
Anucort-Hc	Hydrocortisone Acetate
Anudil Hc	Hydrocortisone Acetate
Anumed	Hydrocortisone Acetate
Anumed-Hc	Hydrocortisone Acetate
Anuprep Hc	Hydrocortisone Acetate

Anuprep-Hc	Hydrocortisone Acetate
Anurx Hc	Hydrocortisone Acetate
Anusert Hc-1	Hydrocortisone Acetate
Anusol Hc	Hydrocortisone
Anusol Hc	Hydrocortisone Acetate
Anusol Hc-1	Hydrocortisone Acetate
Anusol-Hc	Hydrocortisone
Anusol-Hc	Hydrocortisone Acetate
Anuzone-Hc	Hydrocortisone Acetate
Apro Cort	Hydrocortisone
Aquanil Hc	Hydrocortisone
Aquaphyllin	Theophylline Anhydrous
Arm-A-Med (Isoetharine Hcl)	Isoetharine Hcl
Arm-A-Med (Isoproterenol Hcl)	Isoproterenol Hcl
Arm-A-Med (Metaproterenol)	Metaproterenol Sulfate
Articulose-50	Prednisolone Acetate
Asmalix	Theophylline Anhydrous
Ataraxoid	Prednisolone/Hydroxyzine
Atrovent	Ipratropium Bromide
Atrovent Nasal Spray	Ipratropium Bromide
Azmacort	Triamcinolone Acetonide
Beclovent	Beclomethasone Dipropionate
Beconase	Beclomethasone Dipropionate
Beconase Aq	Beclomethasone Dipropionate
Beta Cort	Hydrocortisone
Beta Hc	Hydrocortisone
Beta-2	Isoetharine Hydrochloride
Bio-Organidin	Theophylline/Iod Glycerol
Bio-Phylline	Theophylline/Iod Glycerol
Biosone	Hydrocortisone Acetate
Bisorine	Isoetharine Hydrochloride
Brethaire	Terbutaline Sulfate
Brethine	Terbutaline Sulfate
Brethine Gy-Pak	Terbutaline Sulfate
Bricanyl	Terbutaline Sulfate
Bricanyl 1ml In 2ml	Terbutaline Sulfate
Bronchobid Duracap	Theophylline/Ephedrine
Bronkodyl	Theophylline Anhydrous
Bronkodyl-Sr	Theophylline Anhydrous
Bronkometer	Isoetharine Mesylate
Bronkometer Refill	Isoetharine Mesylate
Bronkometer W/Nebulizer	Isoetharine Mesylate
Bronkometer-2 Tpr W/Actuator	Isoetharine Mesylate
Bronkosol	Isoetharine Hcl
Bronkosol	Isoetharine Hydrochloride
Budesonide	Budesonide
Caladryl Hydrocortisone	Hydrocortisone Acetate
Caldecort	Hydrocortisone
Caldecort	Hydrocortisone Acetate
Caldecort Light	Hydrocortisone Acetate/Alo Ver

Caldecort Light	Hydrocortisone Acetate/Aloe
Carmol Hc	Hydrocortisone Acetate/Urea
Carmol-Hc	Hydrocortisone Acetate/Urea
Cenalone	Prednisolone Sodium Phosphate
Cenalone La	Prednisolone/Prednisolone
Cetacort	Hydrocortisone
Childrens Nasalcrom	Cromolyn Sodium
Clearaid	Hydrocortisone
Clearaid	Hydrocortisone Acetate
Clocort	Hydrocortisone
Colocort	Hydrocortisone
Comb-Pred	Prednisolone/Prednisolone
Combivent	Albuterol Sulfate/Ipratropium
Complex A	Hydrocortisone
Constant-T	Theophylline Anhydrous
Cort	Hydrocortisone
Cort-A	Hydrocortisone Acetate
Cort-Dome	Hydrocortisone
Cort-Dome	Hydrocortisone Acetate
Corta-Plex Hc	Hydrocortisone Acetate
Cortaid	Hydrocortisone
Cortaid	Hydrocortisone Acetate
Cortaid W/Aloe	Hydrocortisone Acetate/Alo Ver
Cortaid W/Aloe	Hydrocortisone Acetate/Aloe
Cortalone	Prednisolone
Cortane	Hydrocortisone
Cortef	Hydrocortisone
Cortef	Hydrocortisone Cypionate
Cortef Acetate	Hydrocortisone Acetate
Cortef Feminine Itch	Hydrocortisone Acetate
Cortef Rectal Itch	Hydrocortisone Acetate
Cortenema	Hydrocortisone
Corticaine	Hydrocortisone Acetate
Corticreme	Hydrocortisone Acetate
Cortifair	Hydrocortisone
Cortifoam	Hydrocortisone Acetate
Cortinal	Hydrocortisone
Cortisol(Hydrocortisone)	Hydrocortisone
Cortisone Acetate	Hydrocortisone Acetate
Cortizone-10	Hydrocortisone
Cortizone-10 Anal Itch Relief	Hydrocortisone
Cortizone-10 Scalp Itch Relief	Hydrocortisone
Cortolone	Prednisolone/Prednisolone
Cortone-10	Hydrocortisone
Cortoxide	Hydrocortisone
Cortril	Hydrocortisone
Cotacort	Hydrocortisone
Cotolone	Prednisolone Acetate
Cpc-Pred-Cort-50	Prednisolone Acetate
Cremesone	Hydrocortisone

Crolom	Cromolyn Sodium
Cromolyn Sodium	Cromolyn Sodium
Cutivate	Fluticasone Propionate
Cutivate Cream	Fluticasone Propionate
Cutivate Oint	Fluticasone Propionate
D.R. Hydrocort	Hydrocortisone
Deca-P	Prednisolone Acetate
Declofen S.R.	Theophylline Anhydrous
Delacort	Hydrocortisone
Delta-Cortef	Prednisolone
Deltasone	Prednisone
Depapred Ip	Prednisolone/Prednisolone
Depo-Pred	Prednisolone Sodium Phosphate
Dermacort	Hydrocortisone
Dermasone	Hydrocortisone
Dermicort	Hydrocortisone
Dermol Hc	Hydrocortisone
Dermolate Anal-Itch	Hydrocortisone
Dermolate Anti-Itch	Hydrocortisone
Dermolate Scalp-Itch	Hydrocortisone
Dermtex Hc	Hydrocortisone/Aloe Vera
Dey-Dose (Isoetharine Hcl)	Isoetharine Hydrochloride
Dey-Dose (Isoproterenol)	Isoproterenol Hcl
Dey-Dose (Metaproterenol)	Metaproterenol Sulfate
Dey-Lute (Isoetharine Hcl)	Isoetharine Hcl
Dey-Lute (Isoetharine Hcl)	Isoetharine Hydrochloride
Dibucort	Hydrocortisone/Dibucaine
Diurette	Theophylline/Mersalyl
Dofscort	Hydrocortisone
Dr. Smith's Anti-Itch	Hydrocortisone
Duapred	Prednisolone/Prednisolone
Duo-Medihaler	Isoproterenol/Phenylephrine
Duo-Pred	Prednisolone/Prednisolone
Duo-Pred R.S.	Prednisolone/Prednisolone
Duohaler Refill W/Mouthpiece	Isoproterenol/Phenylephrine
Duohaler W/Mouthpiece & Case	Isoproterenol/Phenylephrine
Duoneb	Albuterol Sulfate/Ipratropium
Duralone	Prednisolone/Prednisolone
Duraphyl	Theophylline Anhydrous
Earsol-Hc	Hydrocortisone
Econopred Droptainer	Prednisolone Acetate
Econopred Ophthalmic	Prednisolone Acetate
Econopred Plus	Prednisolone Acetate
Econopred Plus Droptainer	Prednisolone Acetate
Ed-Pred 25	Prednisolone Acetate
Ed-Pred 50	Prednisolone Acetate
Ed-Pred Sp	Prednisolone Sod Phosphate
Eldecort	Hydrocortisone
Elixicon	Theophylline Anhydrous
Elixophyllin	Theophylline

Elixophyllin	Theophylline Anhydrous
Elixophyllin Ki	Theophylline/Potassium Iodide
Elixophyllin Sr	Theophylline Anhydrous
Elixophyllin-Ki	Theophylline/Potassium Iodide
Enzone	Hydrocortisone
Epicort	Hydrocortisone
Episone	Hydrocortisone
Ersalyn	Theophylline/Mersalyl
Ethi-Pred	Prednisolone/Cme-Cell/Polysorb
Ethi-Pred-Sp	Prednisolone Sodium Phosphate
Fercort	Hydrocortisone
Fercort	Hydrocortisone Acetate
Fernisolone-P	Prednisolone
Fernisone	Prednisolone Acetate
Fernisone	Prednisone
First-Hydrocortisone	Hydrocortisone
Fleet Theophylline	Theophylline
Flonase	Fluticasone Propionate
Flonase Aq	Fluticasone Propionate
Flovent	Fluticasone Propionate
Flovent Rotadisk	Fluticasone Propionate
Flunisolide	Flunisolide
Foillecort Hydrocortisone	Hydrocortisone
Foradil	Formoterol Fumarate
Foyuretic	Theophylline/Mersalyl
Gastrocrom	Cromolyn Sodium
Genasone	Hydrocortisone Acetate
Genasone W/Aloe	Hydrocortisone Acetate/Alo V
Gly-Cort	Hydrocortisone
Gmd Lotion	Hydrocortisone
H2-Cort	Hydrocortisone
H2-Cort	Hydrocortisone Acetate
Hc-Jel	Hydrocortisone
Hemorrhoid	Hydrocortisone/Bismuth Subgal
Hemorrhoidal	Hydrocortisone/Bis Sg(Ptv)
Hemorrhoidal	Hydrocortisone/Bismuth Subgal
Hemorrhoidal Hc	Hydrocortisone Acetate
Hemorrhoidal Rectal	Hydrocortisone/Bismuth Subgal
Hemorrhoidal Suppos W/Hc	Hydrocortisone/Bismuth Subgal
Hemorrhoidal W/Hydrocortisone	Hydrocortisone Acetate
Hemorrhoidal-Hc	Hydrocortisone Acetate
Hemorrhoidal-Hc	Hydrocortisone/Bis Sg(Ptv)
Hemorrhoidal-Hc	Hydrocortisone/Bismuth Subgal
Hemorrhoidal Hc	Hydrocortisone Acetate
Hemorrhoidal-Hc	Hydrocortisone Acetate
Hemril	Hydrocortisone Acetate
Hemril-Hc	Hydrocortisone Acetate
Hemusol-Hc	Hydrocortisone/Bismuth Subgal
Hi-Cor	Hydrocortisone
Hi-Cor 1.0	Hydrocortisone

Hi-Cor-1.0	Hydrocortisone
Hi-Cor-2.5	Hydrocortisone
Hill Cortac 0.50	Hydrocortisone/Zinc Oxide/Sulf
Hycort	Hydrocortisone
Hydeltra-T.B.A.	Prednisolone Tebutate
Hydeltrasol	Prednisolone Sod Phosphate
Hydeltrasol	Prednisolone Sodium Phosphate
Hydro Lotion	Hydrocortisone
Hydro-Tex	Hydrocortisone
Hydro-Tex 0.5pc	Hydrocortisone
Hydroco	Hydrocortisone Acetate
Hydrocort	Hydrocortisone
Hydrocort Opth	Hydrocortisone Acetate
Hydrocortex	Hydrocortisone
Hydrocortisol	Hydrocortisone
Hydrocortisone	
Hydrocortisone	Hydrocortisone
Hydrocortisone	Hydrocortisone Acetate
Hydrocortisone	Hydrocortisone Valerate
Hydrocortisone 1%	Hydrocortisone
Hydrocortisone 1pc	Hydrocortisone
Hydrocortisone Ace	
Hydrocortisone Ace Cream	
Hydrocortisone Ace Inj	
Hydrocortisone Acetate	Hydrocortisone
Hydrocortisone Acetate	Hydrocortisone Acetate
Hydrocortisone Acetate Bio-F	Hydrocortisone Acetate
Hydrocortisone Acetate W/Aloe	Hydrocortisone Acetate/Alo Ver
Hydrocortisone Acetate W/Aloe	Hydrocortisone Acetate/Aloe
Hydrocortisone Acetate W/Urea	Hydrocortisone Acetate/Urea
Hydrocortisone Butyrate	Hydrocortisone Butyrate
Hydrocortisone Clear	Hydrocortisone
Hydrocortisone Cream	
Hydrocortisone Crm	
Hydrocortisone In Absorbase	Hydrocortisone/Mo/Petrolatum
Hydrocortisone Lotion	
Hydrocortisone Micronized	Hydrocortisone
Hydrocortisone Oint	
Hydrocortisone Sod Phosphate	Hydrocortisone Sod Phosphate
Hydrocortisone Sod Succ Inj	
Hydrocortisone Sod Succinate	Hydrocortisone Sod Succinate
Hydrocortisone Sodium Succ	Hydrocortisone Sod Succinate
Hydrocortisone U.S.P.	Hydrocortisone
Hydrocortisone Valerate	Hydrocortisone Valerate
Hydrocortisone W-Iod	
Hydrocortisone W/Aloe	Hydrocortisone Acetate/Alo V
Hydrocortisone W/Aloe	Hydrocortisone Acetate/Alo Ver
Hydrocortisone W/Aloe	Hydrocortisone Acetate/Aloe
Hydrocortisone W/Aloe	Hydrocortisone/Aloe Vera
Hydrocortisone W/Iod	



Hydrocortisone W/Neo	Neomycin Sulfate/Hc
Hydrocortisone W/Neomycin	Neomycin Sulfate/Hc Acetate
Hydrocortisone W/Neomycin	Dibucaine/Hydrocortisone
Hydrocortisone-Dibucaine	Hydrocortisone Acetate/Alo V
Hydrocortisone/Aloe	Hydrocortisone Acetate
Hydrocortisoneacetate	Hydrocortisone
Hydrocortone	Hydrocortisone Acetate
Hydrocortone	Hydrocortisone Acetate
Hydrocortone Acetate	Hydrocortisone Sod Phosphate
Hydrocortone Phosphate	Hydrocortisone
Hydromar	Theophylline/Ephed/Hydroxyz
Hydrophed	Hydrocortisone
Hydrososone	Hydrocortisone
Hytone	Hydrocortisone
Hytone Lotion	Prednisolone Sodium Phosphate
I-Pred	Prednisolone Acetate
I-Prednicet	Prednisolone Acetate
I-Prednicet Ophthalmic	Prednisolone Sod Phosphate
Inflamase Forte	Prednisolone Sodium Phosphate
Inflamase Forte	Prednisolone Sod Phosphate
Inflamase Mild	Prednisolone Sodium Phosphate
Inflamase Mild	Hydrocortisone
Instacort	Hydrocortisone
Instacort Scalp	Hydrocortisone
Instacort-10	Cromolyn Sodium
Intal	Inhaler
Intal Spinhaler	Theophylline/Iod Glycerol
Iod Glycerol W/Theophylline	Theophylline/Iod Glycerol
Iophen	Theophylline/Iod Glycerol
Iophylline	Theophylline/Potassium Iodide
Iophylline	Isoproterenol Hcl
Iprenol	Isoproterenol Hcl
Iso Meters	Isoetharine Hcl
Isoetharine Hcl	Isoetharine Hydrochloride
Isoetharine Hcl	Isoetharine Hcl
Isoetharine Hcl Dispos-A-Med	Isoetharine Hydrochloride
Isoetharine Hcl Dispos-A-Med	Isoetharine Mesylate
Isoetharine Mesylate	
Isoetharine Soln	
Isolone Forte	Prednisolone Sod Phosphate
Isolone Forte Ophth	Prednisolone Sodium Phosphate
Isophed	Isoproterenol/Ephed/Phenobarb
Isoproterenol	Isoproterenol Hcl
Isoproterenol Abboject	Isoproterenol Hcl
Isoproterenol Dispos-A-Med	Isoproterenol Hcl
Isoproterenol Hcl	Isoproterenol Hcl
Isoproterenol Hcl Injection	Isoproterenol Hcl
Isoproterenol Hcl Select-A-Jet	Isoproterenol Hcl
Isoproterenol Mist	
Isoproterenol Sulfate	Isoproterenol Sulfate

Isoproterenol Universal Add	Isoproterenol Hcl
Isuprel	Isoproterenol Hcl
Isuprel Compound	Theop/Isoproterenol/Epd/Ki/Pb
Isuprel Glosset	Isoproterenol Hcl
Isuprel Injectable	Isoproterenol Hcl
Isuprel Mistometer	Isoproterenol Hcl
Ivocort	Hydrocortisone
Ivocort-Dp	Hydrocortisone
Key-Pred	Prednisolone Acetate
Key-Pred 100	Prednisolone Acetate
Key-Pred 25	Prednisolone Acetate
Key-Pred Sp	Prednisolone Sodium Phosphate
Kort	Hydrocortisone
Labid	Theophylline
Labid	Theophylline Anhydrous
Labid 250	Theophylline Anhydrous
Lacticare-Hc	Hydrocortisone
Lanophyllin	Theophylline Anhydrous
Lemoderm	Hydrocortisone
Lexocort	Hydrocortisone
Lexocort Forte	Hydrocortisone
Lifocort-100	Hydrocortisone Sod Succinate
Liquid Pred	Prednisone
Liquophylline	Theophylline Anhydrous
Lisacort	Prednisone
Lite Pred Ophthalmic	Prednisolone Sodium Phosphate
Lixolin	Theophylline Anhydrous
Locoid	Hydrocortisone Butyrate
Locoid Cream	Hydrocortisone Butyrate
Locoid Oint	Hydrocortisone Butyrate
Lodrane-130	Theophylline Anhydrous
Lodrane-260	Theophylline Anhydrous
Marax	Theophylline/Ephed/Hydroxyz
Marax Df	Theophylline/Ephed/Hydroxyz
Maxair	Pirbuterol Acetate
Maxair Autohaler	Pirbuterol Acetate
Medacort-25	Prednisolone Acetate
Medacort-50	Prednisolone Acetate
Medacort-S	Prednisolone Sodium Phosphate
Medicort 100	Prednisolone Acetate
Medicort 50	Prednisolone Acetate
Medigel H+	Hydrocortisone
Medihaler Ergotamine	Ergotamine Tartrate
Medihaler-Epi	Epinephrine Bitartrate
Medihaler-Iso	Isoproterenol Sulfate
Medipads H+	Hydrocortisone
Mercutheolin	Theophylline/Mersalyl
Merphlex	Theophylline/Mersalyl
Merphylinne	Theophylline/Mersalyl
Merphylline	Theophylline/Mersalyl

Mersalo	Theophylline/Mersalyl
Mersalyl-Theophylline	Theophylline/Mersalyl
Mertheo	Theophylline/Mersalyl
Metalone Tba	Prednisolone Tebutate
Metaprel	Metaproterenol Sulfate
Metaprel Asthma Mist	Metaproterenol Sulfate
Metaproterenol	
Metaproterenol	Metaproterenol Sulfate
Metaproterenol Inh 2.5ml Amp	
Metaproterenol Inh Soln	
Metaproterenol Inh Soln	Metaproterenol Sulfate
Metaproterenol Sulfate	
Metaproterenol Sulfate	Metaproterenol Sulfate
Metaproterenol Syrup	
Metaproternol	Metaproterenol Sulfate
Meti-Derm	Prednisolone
Meticortelone Acetate	Prednisolone Acetate
Meticorten	Prednisone
Metreton	Prednisolone Sodium Phosphate
Milone 50 Imia	Prednisolone Acetate
Milone R/A	Prednisolone Sodium Phosphate
My-Cort	Hydrocortisone
Myodine T	Theophylline/Iod Glycerol
Nasalcrom	Cromolyn Sodium
Nasalcrom A	Chlor-Mal/Cromolyn Sodium
Nasalcrom Ca	P-Ephed Hcl/Apap/Cromolyn
Nasalide	Flunisolide
Nasarel	Flunisolide
Niscort	Prednisolone Acetate
Nogenic Hc Cream	Hydrocortisone
Nor-Pred S	Prednisolone Sodium Phosphate
Nor-Pred Tba	Prednisolone Tebutate
Norisodrine Aerohalor	Isoproterenol Sulfate
Norisodrine Aerotrol	Isoproterenol Hcl
Norisodrine W/Calcium Iodide	Isoproterenol/Calcium Iodide
Norophylline	Theophylline Anhydrous
Nupercainal Hc	Hydrocortisone
Nutracort	Hydrocortisone
Opticrom	Cromolyn Sodium
Or-Cort	Prednisolone Acetate
Or-Pred	Prednisolone/Prednisolone
Orabase Hca	Hydrocortisone Acetate
Orapred	Prednisolone Sod Phosphate
Orasone 1	Prednisone
Orasone 10	Prednisone
Orasone 20	Prednisone
Orasone 5	Prednisone
Orasone 50	Prednisone
Pan-Sone	Prednisone
Panasol	Prednisone

Panasol-S	Prednisone
Pandel	Hydrocortisone Buteprate
Panhydrosone	Hydrocortisone
Panisolone	Prednisolone
Pc-Hc	Hydrocortisone
Pediapred	Prednisolone Sod Phosphate
Pediapred	Prednisolone Sodium Phosphate
Penecort	Hydrocortisone
Pharmacort	Hydrocortisone
Phosalone	Prednisolone/Prednisolone
Physpan	Theophylline
Physpan	Theophylline Anhydrous
Pramosone	Hydrocortisone
Pred Forte	Prednisolone Acetate
Pred Mild	Prednisolone Acetate
Pred-50	Prednisolone Acetate
Pred-Air-A Ophthalmic	Prednisolone Acetate
Pred-Ap	Prednisolone Sodium Phosphate
Pred-Forte Ophthalmic	Prednisolone Acetate
Pred-Mild Ophthalmic	Prednisolone Acetate
Predacort	Prednisolone/Prednisolone
Predair	Prednisolone Acetate
Predair	Prednisolone Sodium Phosphate
Predair Forte	Prednisolone Acetate
Predair Forte	Prednisolone Sodium Phosphate
Predair Ophth	Prednisolone Sodium Phosphate
Predair-A	Prednisolone Acetate
Predair-A	Prednisolone Sodium Phosphate
Predair-A Ophthalmic	Prednisolone Acetate
Predair-A Suspension Ophth	Prednisolone Acetate
Predair-A-Susp	Prednisolone Acetate
Predaject-50	Prednisolone Acetate
Predalone 50	Prednisolone Acetate
Predalone Rp	Prednisolone/Prednisolone
Predalone Tba	Prednisolone Tebutate
Predcor-25	Prednisolone Acetate
Predcor-50	Prednisolone Acetate
Predcor-Tba	Prednisolone Tebutate
Predicort-50	Prednisolone Acetate
Predicort-Rp	Prednisolone Sod Phosphate
Predinsone	Prednisone
Predisol 50	Prednisolone Acetate
Predisol T.B.A.	Prednisolone Tebutate
Predisol-100	Prednisolone Acetate
Prednicen-M	Prednisone
Prednicin-M	Prednisone
Prednisol	Prednisolone Sodium Phosphate
Prednisol Qs	Prednisolone/Prednisolone
Prednisoline	Prednisolone
Prednisolone	

Prednisolone  
 Prednisolone  
 Prednisolone  
 Prednisolone (Orange)  
 Prednisolone Ac-Sod Phosphate  
 Prednisolone Ac/Sod Phosp  
 Prednisolone Acetate  
 Prednisolone Acetate  
 Prednisolone Acetate  
 Prednisolone Acetate Bio-Pred  
 Prednisolone Acetate Inj  
 Prednisolone Acetate Opth  
 Prednisolone Acetate Opth Susp  
 Prednisolone Acetate Susp  
 Prednisolone Anhydrous  
 Prednisolone Orange  
 Prednisolone Sod Ph/Prednis Ac  
 Prednisolone Sod Phos Opth  
 Prednisolone Sod Phos Opth Sol  
 Prednisolone Sod. Phosphate  
 Prednisolone Sodium Phos  
 Prednisolone Sodium Phosphate  
 Prednisolone Sodium Phosphate  
 Prednisolone Sodium Succinate  
 Prednisolone Sulfacet Opth Sus  
 Prednisolone T.B.A.  
 Prednisolone Tba  
 Prednisolone Tebutate  
 Prednisolone Terbuate  
 Prednisolone U.S.P.  
 Prednisolone W/Prednisolone  
 Prednisolone W/Sulfacetamide  
 Prednisolone W/Sulfaetamide  
 Prednisone  
 Prednisone  
 Prednisone  
 Prednisone Intensol  
 Prednisone Oral Soln  
 Prednisone U.S.P.  
 Prednisone-5  
 Predoxine-5  
 Prelone  
 Prelone Syrup  
 Preparation H  
 Prepcort Hydrocortisone  
 Prexix 50  
 Pri-Cortin 25  
 Pri-Cortin 50  
 Primatene  
 Primatene M

Prednisolone  
 Prednisolone Acetate  
 Prednisolone Sodium Phosphate  
 Prednisolone  
 Prednisolone/Prednisolone  
 Prednisolone/Prednisolone  
  
 Prednisolone  
 Prednisolone Acetate  
 Prednisolone Acetate  
  
 Prednisolone Acetate  
  
 Prednisolone Acetate  
 Prednisolone  
 Prednisolone  
 Prednisolone/Prednisolone  
 Prednisolone Sodium Phosphate  
  
 Prednisolone Sodium Phosphate  
 Prednisolone Sodium Phosphate  
 Prednisolone Sod Phosphate  
 Prednisolone Sodium Phosphate  
 Prednisolone Sodium Succinate  
  
 Prednisolone Tebutate  
 Prednisolone Tebutate  
 Prednisolone Tebutate  
 Prednisolone Tebutate  
 Prednisolone  
 Prednisolone/Prednisolone  
 Sulfacetamide/Prednisolone  
 Sulfacetamide/Prednisolone  
  
 Prednisolone  
 Prednisone  
 Prednisone  
  
 Prednisone  
 Prednisone  
 Prednisolone  
 Prednisolone  
 Prednisolone  
 Hydrocortisone  
 Hydrocortisone  
 Prednisolone Acetate  
 Prednisolone Acetate  
 Prednisolone Acetate  
 Theophylline/Ephedrine Hcl  
 Theophylline/Ephedrine/Pyril

Pro-Cort	Hydrocortisone
Pro-Cort M	Hydrocortisone/Emollient
Procort	Hydrocortisone
Procto-Hc	Hydrocortisone
Procto-Kit	Hydrocortisone
Procto-Pak	Hydrocortisone
Proctocort	Hydrocortisone
Proctocort	Hydrocortisone Acetate
Proctocream-Hc	Hydrocortisone
Proctosol Hc	Hydrocortisone
Proctosol-Hc	Hydrocortisone
Proctosol-Hc	Hydrocortisone Acetate
Proctozone-Hc	Hydrocortisone
Pronax	Prednisone
Proventil	Albuterol
Proventil	Albuterol Sulfate
Proventil Hfa	Albuterol Sulfate
Proventil Repetab	Albuterol Sulfate
Psp Iv	Prednisolone Sodium Phosphate
Pulmicort	Budesonide
Q-U-Cort	Hydrocortisone
Quibron Bidcaps	Theophylline Anhydrous
Quibron-T	Theophylline Anhydrous
Quibron-T/Sr	Theophylline Anhydrous
Quibron-T/Sr Dividose	Theophylline Anhydrous
Qvar	Beclomethasone Dipropionate
Racet Se 0.5pc	Hydrocortisone
Racet Se 1pc	Hydrocortisone
Recort	Hydrocortisone
Recort Plus	Hydrocortisone
Rectasol-Hc	Hydrocortisone Acetate
Rederm	Hydrocortisone
Respbid	Theophylline Anhydrous
Respirol	Albuterol
Rhinocort	Budesonide
Rhinocort Aqua	Budesonide
Rhulicort	Hydrocortisone
Rhulicort	Hydrocortisone Acetate
Rhulicort Pre-Packed Display	Hydrocortisone Acetate
Ridisone	Hydrocortisone
Ru-A-Dron	Prednisolone Sod Phosphate
Ru-Cort 100	Prednisolone Acetate
Ru-Cort 50	Prednisolone Acetate
Russ-Cort 50	Prednisolone Acetate
Russ-Cort 80/20	Prednisolone/Prednisolone
Russ-Cort Tba	Prednisolone Tebutate
S-T Cort	Hydrocortisone
Sarnol-Hc	Hydrocortisone
Savacort-100	Prednisolone Acetate
Savacort-50	Prednisolone Acetate

Sb Hydrocortisone	Hydrocortisone
Scalp	Hydrocortisone
Scalp Cort	Hydrocortisone
Scalp-Aid	Hydrocortisone
Scalp-Cort	Hydrocortisone
Serevent	Salmeterol Xinafoate
Serevent Diskus	Salmeterol Xinafoate
Shocort Ss	Hydrocortisone Sod Succinate
Sholone	Prednisolone Acetate
Singulair	Montelukast Sodium
Sk-Prednisone	Prednisone
Slo-Bid	Theophylline Anhydrous
Slo-Bid 100	Theophylline Anhydrous
Slo-Bid 100 Gyrocaps	Theophylline Anhydrous
Slo-Bid 125	Theophylline Anhydrous
Slo-Bid 125 Gyrocaps	Theophylline Anhydrous
Slo-Bid 200	Theophylline Anhydrous
Slo-Bid 200 Gyrocaps	Theophylline Anhydrous
Slo-Bid 300	Theophylline Anhydrous
Slo-Bid 300 Gyrocaps	Theophylline Anhydrous
Slo-Bid 50	Theophylline Anhydrous
Slo-Bid 50 Gyrocaps	Theophylline Anhydrous
Slo-Bid 75	Theophylline Anhydrous
Slo-Bid 75 Gyrocaps	Theophylline Anhydrous
Slo-Phyllin	Theophylline Anhydrous
Slo-Phyllin 125 Gyrocaps	Theophylline Anhydrous
Slo-Phyllin 250 Gyrocaps	Theophylline Anhydrous
Slo-Phyllin 60 Gyrocaps	Theophylline Anhydrous
Slo-Phyllin 80	Theophylline Anhydrous
Slo-Phyllin Gyrocaps	Theophylline Anhydrous
Sodasone	Prednisolone Sodium Phosphate
Solar Cort	Hydrocortisone
Solio-Sone R.P.	Prednisolone/Prednisolone
Solprex	Prednisolone Sodium Phosphate
Solu-Cortef	Hydrocortisone Sod Succinate
Solu-Cortef W/Diluent	Hydrocortisone Sod Succinate
Solu-Phyllin	Theophylline Anhydrous
Solu-Predalone	Prednisolone Sodium Phosphate
Solujet	Prednisolone/Prednisolone
Solupred	Prednisolone Sodium Phosphate
Somophyllin-Crt	Theophylline Anhydrous
Somophyllin-T	Theophylline Anhydrous
Spectro-Pred	Prednisolone Sodium Phosphate
Spectro-Tate	Prednisolone Acetate
Sterane	Prednisolone
Sterapred	Prednisone
Sterapred Ds	Prednisone
Sterapred Ds Unipak	Prednisone
Sterapred Unipak	Prednisone
Sustaire	Theophylline Anhydrous

Synacort	Hydrocortisone
Synophylate	Theophylline Sod Gly
Synpred Tba	Prednisolone Tebutate
T-Phyl	Theophylline Anhydrous
Tba-Pred	Prednisolone Tebutate
Tedral-25	Theophylline/Ephed/Butabarb
Tega Cort	Hydrocortisone
Tega-Cort	Hydrocortisone
Tega-Cort-Forte	Hydrocortisone
Terbutaline Sulfate	Terbutaline Sulfate
Texacort	Hydrocortisone
Texacort Scalp	Hydrocortisone
Theo	Theophylline Anhydrous
Theo Liquid	Theophylline Anhydrous
Theo-24	Theophylline Anhydrous
Theo-24 Cr	Theophylline Anhydrous
Theo-250	Theophylline Anhydrous
Theo-Dilate	Theophylline Anhydrous
Theo-Dur	Theophylline Anhydrous
Theo-Dur Sprinkle	Theophylline Anhydrous
Theo-Liquid	Theophylline Anhydrous
Theo-Lix	Theophylline Anhydrous
Theo-Organidin	Theophylline/Iod Glycerol
Theo-Oridol	Theophylline/Iod Glycerol
Theo-R-Gen	Theophylline/Iod Glycerol
Theo-Sav	Theophylline Anhydrous
Theo-Syl-R	Theophylline/Mersalyl
Theobid	Theophylline Anhydrous
Theobid Duracap	Theophylline Anhydrous
Theobid Jr	Theophylline Anhydrous
Theobid Jr Duracap	Theophylline Anhydrous
Theobron Sr	Theophylline Anhydrous
Theochron	Theophylline Anhydrous
Theoclear L.A.-65	Theophylline Anhydrous
Theoclear La-130 Cenules	Theophylline Anhydrous
Theoclear La-260 Cenules	Theophylline Anhydrous
Theoclear-100	Theophylline
Theoclear-200	Theophylline
Theoclear-80	Theophylline Anhydrous
Theocot	Theophylline Anhydrous
Theofed	Theophylline/Ephed/Phenobarb
Theokin	Theophylline/Potassium Iodide
Theolair	Theophylline
Theolair	Theophylline Anhydrous
Theolair Crc Strip	Theophylline
Theolair-Sr	Theophylline Anhydrous
Theolixir	Theophylline Anhydrous
Theomar	Theophylline Anhydrous
Theomer	Theophylline/Mersalyl
Theon	Theophylline Anhydrous



Theophyl	Theophylline Anhydrous
Theophyl-225	Theophylline Anhydrous
Theophyl-Sr	Theophylline Anhydrous
Theophylline	
Theophylline	Theophylline Anhydrous
Theophylline 200mg In D5w	Theophylline/Dextrose 5%-Water
Theophylline 400mg In D5w	Theophylline/Dextrose 5%-Water
Theophylline 800mg In D5w	Theophylline/Dextrose 5%-Water
Theophylline And D5w	Theophylline/Dextrose 5%-Water
Theophylline Anhydrous	Theophylline Anhydrous
Theophylline Anhydrous Cap	Theophylline Anhydrous
Theophylline Compound	Theophyll/Ephedrine/Phenobarb
Theophylline Elixir	
Theophylline In 5% Dextrose	Theophylline/Dextrose 5%-Water
Theophylline In 5pc Dextrose	Theophylline/Dextrose 5%-Water
Theophylline In D5w	Theophylline/Dextrose 5%-Water
Theophylline Iodinat	
Theophylline Ki	Theophylline/Potassium Iodide
Theophylline Sr	
Theophylline Sr	Theophylline Anhydrous
Theophylline Tr	
Theophylline W/Dextrose 5%	Theophylline/Dextrose 5%-Water
Theophylline W/Dextrose-Water	Theophylline/Dextrose 5%-Water
Theophylline W/Guaifenesin	Guaifenesin/Theophylline
Theophylline W/Guaifenesin	Guaifenesin/Theophylline
Theophylline/Ephedrine/Pb	Theophyll/Ephed Hcl/Phenobarb
Theophylline/Ephedrine/Pb	Theophyll/Ephedrine/Phenobarb
Theophylline/Guaifenesin	Guaifenesin/Theophylline
Theophylline/Guaifen	
Theophylline/Potassium Iodide	Theophylline/Potassium Iodide
Theophyllineanhydrous	Theophylline Anhydrous
Theorex	Theophylline Anhydrous
Theosol-80	Theophylline Anhydrous
Theospan	Theophylline Anhydrous
Theospan-Sr	Theophylline Anhydrous
Theostat	Theophylline Anhydrous
Theostat 80	Theophylline Anhydrous
Theovent Long Acting	Theophylline Anhydrous
Theox	Theophylline Anhydrous
Tilade	Nedocromil Sodium
Tornalate	Bitolterol Mesylate
Tri Cin	Hydrocortisone
Truxophyllin	Theophylline Anhydrous
U-Cort	Hydrocortisone Acetate/Urea
Uad Pred	Prednisolone Acetate
Uad Pred Tba	Prednisolone Tebutate
Ulacort	Prednisolone
Ulacort	Prednisolone Acetate
Ulcort	Hydrocortisone
Ultra Pred Ophthalmic	Prednisolone Acetate

Uni-Cort W/Aloe	Hydrocortisone Acetate/Aloe
Uni-Dur	Theophylline Anhydrous
Uniphyl	Theophylline Anhydrous
Urea Hc	Hydrocortisone Acetate/Urea
Vancenase	Beclomethasone Dipropionate
Vancenase Aq	Beclomethasone Dipropionate
Vanceril	Beclomethasone Dipropionate
Vanceril Double Strength	Beclomethasone Dipropionate
Vanoxide-Hc	Hydrocortisone/Benz Per
Vapo-Iso	Isoproterenol Hcl
Ventolin	Albuterol
Ventolin	Albuterol Sulfate
Ventolin Kit	Albuterol Sulfate
Ventolin Rotacaps	
Ventolin Rotacaps	Albuterol Sulfate
Ventolin Syrup	Albuterol Sulfate
Volmax	Albuterol Sulfate
Westcort	Hydrocortisone Valerate
Westcort Cream	Hydrocortisone Valerate
Westcort Oint	Hydrocortisone Valerate
Xopenex	Levalbuterol Hcl
Yeast-X	Hydrocortisone
Zyflo	Zileuton

## Appendix D. International Classification of Diseases (ICD9) Codes for Mental Illnesses

ICD9_Code	Disease_Description
290	Senile/Presenile Psychos*
290.0	Senile Dementia Uncomp
290.1	Presenile Dementia*
290.10	Presenile Dementia
290.11	Presenile Delirium
290.12	Presenile Delusion
290.13	Presenile Depression
290.2	Senile Delusion/Depress*
290.20	Senile Delusion
290.21	Senile Depressive
290.3	Senile Delirium
290.4	Arteriosclerot Dementia*
290.40	Arterioscler Dement Nos
290.41	Arterioscler Delirium
290.42	Arterioscler Delusion
290.43	Arterioscler Depressive
290.8	Senile Psychosis Nec
290.9	Senile Psychot Cond Nos
291	Alcoholic Psychoses*
291.0	Delirium Tremens
291.1	Alcohol Amnestic Synd
291.2	Alcoholic Dementia Nec
291.3	Alcohol Hallucinosi
291.4	Pathologic Alcohol Intox
291.5	Alcoholic Jealousy
291.8	Alcoholic Psychosis Nec*
291.81	Alcohol Withdrawal
291.89	Alcoholic Psychosis Nec
291.9	Alcoholic Psychosis Nos
292	Drug Psychoses*
292.0	Drug Withdrawal Syndrome
292.1	Drug Paranoid/Hallucinos*
292.11	Drug Paranoid State
292.12	Drug Hallucinosi
292.2	Pathologic Drug Intox
292.8	Other Drug Mental Dis*
292.81	Drug-Induced Delirium
292.82	Drug-Induced Dementia
292.83	Drug Amnestic Syndrome

ICD9_Code	Disease_Description
292.84	Drug Depressive Syndrome
292.89	Drug Mental Disorder Nec
292.9	Drug Mental Disorder Nos
293	Transient Org Mental Dis*
293.0	Acute Delirium
293.1	Subacute Delirium
293.8	Oth Transient Org Mental*
293.81	Organic Delusional Synd
293.82	Organic Hallucinosi Syn
293.83	Organic Affective Synd
293.84	Organic Anxiety Syndrome
293.89	Transient Org Mental Nec
293.9	Transient Org Mental Nos
294	Other Organic Psych Cond*
294.0	Amnesic Syndrome
294.1	Dementia In Oth Diseases*
294.10	Dementia W/O Behav Dist
294.11	Dementia W Behavior Dist
294.8	Organic Brain Synd Nec
294.9	Organic Brain Synd Nos
295	Schizophrenic Disorders*
295.0	Simple Schizophrenia*
295.00	Simpl Schizophren-Unspec
295.01	Simpl Schizophren-Subchr
295.02	Simple Schizophren-Chr
295.03	Simp Schiz-Subchr/Exacer
295.04	Simpl Schizo-Chr/Exacerb
295.05	Simpl Schizophren-Remiss
295.1	Hebephrenia*
295.10	Hebephrenia-Unspec
295.11	Hebephrenia-Subchronic
295.12	Hebephrenia-Chronic
295.13	Hebephren-Subchr/Exacerb
295.14	Hebephrenia-Chr/Exacerb
295.15	Hebephrenia-Remission
295.2	Catatonic Schizophrenia*
295.20	Catatonian-Unspec
295.21	Catatonian-Subchronic
295.22	Catatonian-Chronic
295.23	Catatonian-Subchr/Exacerb
295.24	Catatonian-Chr/Exacerb
295.25	Catatonian-Remission
295.3	Paranoid Schizophrenia*

ICD9_Code	Disease_Description
295.30	Paranoid Schizo-Unspec
295.31	Paranoid Schizo-Subchr
295.32	Paranoid Schizo-Chronic
295.33	Paran Schizo-Subchr/Exac
295.34	Paran Schizo-Chr/Exacerb
295.35	Paranoid Schizo-Remiss
295.4	Ac Schizophrenic Episode*
295.40	Ac Schizophrenia-Unspec
295.41	Ac Schizophrenia-Subchr
295.42	Ac Schizophrenia-Chr
295.43	Ac Schizo-Subchr/Exacerb
295.44	Ac Schizophr-Chr/Exacerb
295.45	Ac Schizophrenia-Remiss
295.5	Latent Schizophrenia*
295.50	Latent Schizophren-Unsp
295.51	Lat Schizophren-Subchr
295.52	Latent Schizophren-Chr
295.53	Lat Schizo-Subchr/Exacer
295.54	Latent Schizo-Chr/Exacer
295.55	Lat Schizophren-Remiss
295.6	Residual Schizophrenia*
295.60	Resid Schizophren-Unsp
295.61	Resid Schizophren-Subchr
295.62	Residual Schizophren-Chr
295.63	Resid Schizo-Subchr/Exac
295.64	Resid Schizo-Chr/Exacerb
295.65	Resid Schizophren-Remiss
295.7	Schizoaffective Type*
295.70	Schizoaffective-Unspec
295.71	Schizoaffective-Subchr
295.72	Schizoaffective-Chronic
295.73	Schizoaff-Subchr/Exacer
295.74	Schizoaffect-Chr/Exacer
295.75	Schizoaffective-Remiss
295.8	Schizophrenia Nec*
295.80	Schizophrenia Nec-Unspec
295.81	Schizophrenia Nec-Subchr
295.82	Schizophrenia Nec-Chr
295.83	Schizo Nec-Subchr/Exacer
295.84	Schizo Nec-Chr/Exacerb
295.85	Schizophrenia Nec-Remiss
295.9	Schizophrenia Nos*
295.90	Schizophrenia Nos-Unspec

ICD9_Code	Disease_Description
295.91	Schizophrenia Nos-Subchr
295.92	Schizophrenia Nos-Chr
295.93	Schizo Nos-Subchr/Exacer
295.94	Schizo Nos-Chr/Exacerb
295.95	Schizophrenia Nos-Remiss
296	Affective Psychoses*
296.0	Manic Dis, Singl Episode*
296.00	Manic Disorder-Unspec
296.01	Manic Disorder-Mild
296.02	Manic Disorder-Mod
296.03	Manic Disorder-Severe
296.04	Manic Dis-Severe W Psych
296.05	Manic Dis-Partial Remiss
296.06	Manic Dis-Full Remission
296.1	Manic, Recurrent Episode*
296.10	Recur Manic Dis-Unspec
296.11	Recur Manic Dis-Mild
296.12	Recur Manic Dis-Mod
296.13	Recur Manic Dis-Severe
296.14	Recur Manic-Sev W Psycho
296.15	Recur Manic-Part Remiss
296.16	Recur Manic-Full Remiss
296.2	Depr Psych, Singl Episod*
296.20	Depress Psychosis-Unspec
296.21	Depress Psychosis-Mild
296.22	Depressive Psychosis-Mod
296.23	Depress Psychosis-Severe
296.24	Depr Psychos-Sev W Psych
296.25	Depr Psychos-Part Remiss
296.26	Depr Psychos-Full Remiss
296.3	Depr Psych, Recur Episod*
296.30	Recurr Depr Psychos-Unsp
296.31	Recurr Depr Psychos-Mild
296.32	Recurr Depr Psychos-Mod
296.33	Recur Depr Psych-Severe
296.34	Rec Depr Psych-Psychotic
296.35	Recur Depr Psyc-Part Rem
296.36	Recur Depr Psyc-Full Rem
296.4	Bipolar Affective, Manic*
296.40	Bipol Aff, Manic-Unspec
296.41	Bipolar Aff, Manic-Mild
296.42	Bipolar Affec, Manic-Mod
296.43	Bipol Aff, Manic-Severe

ICD9_Code	Disease_Description
296.44	Bipol Manic-Sev W Psych
296.45	Bipol Aff Manic-Part Rem
296.46	Bipol Aff Manic-Full Rem
296.5	Bipolar Affect, Depress*
296.50	Bipolar Aff, Depr-Unspec
296.51	Bipolar Affec, Depr-Mild
296.52	Bipolar Affec, Depr-Mod
296.53	Bipol Aff, Depr-Severe
296.54	Bipol Depr-Sev W Psych
296.55	Bipol Aff Depr-Part Rem
296.56	Bipol Aff Depr-Full Rem
296.6	Bipolar Affective, Mixed*
296.60	Bipol Aff, Mixed-Unspec
296.61	Bipolar Aff, Mixed-Mild
296.62	Bipolar Affec, Mixed-Mod
296.63	Bipol Aff, Mixed-Severe
296.64	Bipol Mixed-Sev W Psych
296.65	Bipol Aff, Mix-Part Rem
296.66	Bipol Aff, Mix-Full Rem
296.7	Bipolar Affective Nos
296.8	Manic-Depressive Nec/Nos*
296.80	Manic-Depressive Nos
296.81	Atypical Manic Disorder
296.82	Atypical Depressive Dis
296.89	Manic-Depressive Nec
296.9	Affect Psychoses Nec/Nos*
296.90	Affective Psychosis Nos
296.99	Affective Psychoses Nec
297	Paranoid States*
297.0	Paranoid State, Simple
297.1	Paranoia
297.2	Paraphrenia
297.3	Shared Paranoid Disorder
297.8	Paranoid States Nec
297.9	Paranoid State Nos
298	Oth Nonorganic Psychoses*
298.0	React Depress Psychosis
298.1	Excitativ Type Psychosis
298.2	Reactive Confusion
298.3	Acute Paranoid Reaction
298.4	Psychogen Paranoid Psych
298.8	React Psychosis Nec/Nos
298.9	Psychosis Nos

ICD9_Code	Disease_Description
299	Psychoses Of Childhood*
299.0	Infantile Autism*
299.00	Infantile Autism-Active
299.01	Infantile Autism-Resid
299.1	Disintegrative Psychosis*
299.10	Disintegr Psych-Active
299.11	Disintegr Psych-Residual
299.8	Early Chld Psychoses Nec*
299.80	Child Psychos Nec-Active
299.81	Child Psychos Nec-Resid
299.9	Early Chld Psychosis Nos*
299.90	Child Psychos Nos-Active
299.91	Child Psychos Nos-Resid
300	Neurotic Disorders*
300.0	Anxiety States*
300.00	Anxiety State Nos
300.01	Panic Disorder
300.02	Generalized Anxiety Dis
300.09	Anxiety State Nec
300.1	Hysteria*
300.10	Hysteria Nos
300.11	Conversion Disorder
300.12	Psychogenic Amnesia
300.13	Psychogenic Fugue
300.14	Multiple Personality
300.15	Dissociative React Nos
300.16	Factitious Ill W Symptom
300.19	Factitious Ill Nec/Nos
300.2	Phobic Disorders*
300.20	Phobia Nos
300.21	Agoraphobia With Panic
300.22	Agoraphobia W/O Panic
300.23	Social Phobia
300.29	Isolated Phobias Nec
300.3	Obsessive-Compulsive Dis
300.4	Neurotic Depression
300.5	Neurasthenia
300.6	Depersonalization Synd
300.7	Hypochondriasis
300.8	Neurotic Disorders Nec*
300.81	Somatization Disorder
300.82	Undiff Somatoform Disrdr
300.89	Neurotic Disorders Nec



ICD9_Code	Disease_Description
300.9	Neurotic Disorder Nos
301	Personality Disorders*
301.0	Paranoid Personality
301.1	Affective Personality*
301.10	Affectiv Personality Nos
301.11	Chronic Hypomanic Person
301.12	Chr Depressive Person
301.13	Cyclothymic Disorder
301.2	Schizoid Personality*
301.20	Schizoid Personality Nos
301.21	Introverted Personality
301.22	Schizotypal Personality
301.3	Explosive Personality
301.4	Compulsive Personality
301.5	Histrionic Personality*
301.50	Histrionic Person Nos
301.51	Chr Factitious Illness
301.59	Histrionic Person Nec
301.6	Dependent Personality
301.7	Antisocial Personality
301.8	Other Personality Dis*
301.81	Narcissistic Personality
301.82	Avoidant Personality
301.83	Borderline Personality
301.84	Passive-Aggressiv Person
301.89	Personality Disorder Nec
301.9	Personality Disorder Nos
302	Sexual Disorders*
302.0	Ego-Dystonic Homosexlty
302.1	Zoophilia
302.2	Pedophilia
302.3	Transvestism
302.4	Exhibitionism
302.5	Trans-Sexualism*
302.50	Trans-Sexualism Nos
302.51	Trans-Sexualism, Asexual
302.52	Trans-Sexual, Homosexual
302.53	Trans-Sex, Heterosexual
302.6	Psychosex Identity Dis
302.7	Psychosexual Dysfunction*
302.70	Psychosexual Dysfunc Nos
302.71	Inhibited Sexual Desire
302.72	Inhibited Sex Excitement

ICD9_Code	Disease_Description
302.73	Inhibited Female Orgasm
302.74	Inhibited Male Orgasm
302.75	Premature Ejaculation
302.76	Functional Dyspareunia
302.79	Psychosexual Dysfunc Nec
302.8	Psychosexual Dis Nec*
302.81	Fetishism
302.82	Voyeurism
302.83	Sexual Masochism
302.84	Sexual Sadism
302.85	Gend Iden Dis,Adol/Adult
302.89	Psychosexual Dis Nec
302.9	Psychosexual Dis Nos
303	Alcohol Dependence Syndr*
303.0	Ac Alcohol Intoxication*
303.00	Ac Alcohol Intox-Unspec
303.01	Ac Alcohol Intox-Contin
303.02	Ac Alcohol Intox-Episod
303.03	Ac Alcohol Intox-Remiss
303.9	Alcohol Depend Nec/Nos*
303.90	Alcoh Dep Nec/Nos-Unspec
303.91	Alcoh Dep Nec/Nos-Contin
303.92	Alcoh Dep Nec/Nos-Episod
303.93	Alcoh Dep Nec/Nos-Remiss
304	Drug Dependence*
304.0	Opioid Type Dependence*
304.00	Opioid Dependence-Unspec
304.01	Opioid Dependence-Contin
304.02	Opioid Dependence-Episod
304.03	Opioid Dependence-Remiss
304.1	Barbiturate Dependence*
304.10	Barbiturat Depend-Unspec
304.11	Barbiturat Depend-Contin
304.12	Barbiturat Depend-Episod
304.13	Barbiturat Depend-Remiss
304.2	Cocaine Dependence*
304.20	Cocaine Depend-Unspec
304.21	Cocaine Depend-Contin
304.22	Cocaine Depend-Episodic
304.23	Cocaine Depend-Remiss
304.3	Cannabis Dependence*
304.30	Cannabis Depend-Unspec
304.31	Cannabis Depend-Contin

ICD9_Code	Disease_Description
304.32	Cannabis Depend-Episodic
304.33	Cannabis Depend-Remiss
304.4	Amphetamine Dependence*
304.40	Amphetamin Depend-Unspec
304.41	Amphetamin Depend-Contin
304.42	Amphetamin Depend-Episod
304.43	Amphetamin Depend-Remiss
304.5	Hallucinogen Dependence*
304.50	Hallucinogen Dep-Unspec
304.51	Hallucinogen Dep-Contin
304.52	Hallucinogen Dep-Episod
304.53	Hallucinogen Dep-Remiss
304.6	Drug Dependence Nec*
304.60	Drug Depend Nec-Unspec
304.61	Drug Depend Nec-Contin
304.62	Drug Depend Nec-Episodic
304.63	Drug Depend Nec-In Rem
304.7	Opioid/Other Drug Depend*
304.70	Opioid/Other Dep-Unspec
304.71	Opioid/Other Dep-Contin
304.72	Opioid/Other Dep-Episod
304.73	Opioid/Other Dep-Remiss
304.8	Comb Drug Dependence Nec*
304.80	Comb Drug Dep Nec-Unspec
304.81	Comb Drug Dep Nec-Contin
304.82	Comb Drug Dep Nec-Episod
304.83	Comb Drug Dep Nec-Remiss
304.9	Drug Dependence Nos*
304.90	Drug Depend Nos-Unspec
304.91	Drug Depend Nos-Contin
304.92	Drug Depend Nos-Episodic
304.93	Drug Depend Nos-Remiss
305	Nondependent Drug Abuse*
305.0	Alcohol Abuse*
305.00	Alcohol Abuse-Unspec
305.01	Alcohol Abuse-Continuous
305.02	Alcohol Abuse-Episodic
305.03	Alcohol Abuse-In Remiss
305.1	Tobacco Use Disorder
305.2	Cannabis Abuse*
305.20	Cannabis Abuse-Unspec
305.21	Cannabis Abuse-Contin
305.22	Cannabis Abuse-Episodic

ICD9_Code	Disease_Description
305.23	Cannabis Abuse-In Remiss
305.3	Hallucinogen Abuse*
305.30	Hallucinog Abuse-Unspec
305.31	Hallucinog Abuse-Contin
305.32	Hallucinog Abuse-Episod
305.33	Hallucinog Abuse-Remiss
305.4	Barbiturate Abuse*
305.40	Barbiturate Abuse-Unspec
305.41	Barbiturate Abuse-Contin
305.42	Barbiturate Abuse-Episod
305.43	Barbiturate Abuse-Remiss
305.5	Opioid Abuse*
305.50	Opioid Abuse-Unspec
305.51	Opioid Abuse-Continuous
305.52	Opioid Abuse-Episodic
305.53	Opioid Abuse-In Remiss
305.6	Cocaine Abuse*
305.60	Cocaine Abuse-Unspec
305.61	Cocaine Abuse-Continuous
305.62	Cocaine Abuse-Episodic
305.63	Cocaine Abuse-In Remiss
305.7	Amphetamine Abuse*
305.70	Amphetamine Abuse-Unspec
305.71	Amphetamine Abuse-Contin
305.72	Amphetamine Abuse-Episod
305.73	Amphetamine Abuse-Remiss
305.8	Antidepressant Abuse*
305.80	Antidepress Abuse-Unspec
305.81	Antidepress Abuse-Contin
305.82	Antidepress Abuse-Episod
305.83	Antidepress Abuse-Remiss
305.9	Drug Abuse Nec/Nos*
305.90	Drug Abuse Nec-Unspec
305.91	Drug Abuse Nec-Contin
305.92	Drug Abuse Nec-Episodic
305.93	Drug Abuse Nec-In Remiss
306	Psychophysiologic Dis*
306.0	Psychogen Musculskel Dis
306.1	Psychogenic Respir Dis
306.2	Psychogen Cardiovasc Dis
306.3	Psychogenic Skin Disease
306.4	Psychogenic Gi Disease
306.5	Psychogenic Gu Disease*

ICD9_Code	Disease_Description
306.50	Psychogenic Gu Dis Nos
306.51	Psychogenic Vaginismus
306.52	Psychogenic Dysmenorrhea
306.53	Psychogenic Dysuria
306.59	Psychogenic Gu Dis Nec
306.6	Psychogen Endocrine Dis
306.7	Psychogenic Sensory Dis
306.8	Psychogenic Disorder Nec
306.9	Psychogenic Disorder Nos
307	Special Symptom Nec*
307.0	Stammering & Stuttering
307.1	Anorexia Nervosa
307.2	Tics*
307.20	Tic Disorder Nos
307.21	Transient Tic, Childhood
307.22	Chronic Motor Tic Dis
307.23	Gilles Tourette Disorder
307.3	Stereotyped Movements
307.4	Nonorganic Sleep Disord*
307.40	Nonorganic Sleep Dis Nos
307.41	Transient Insomnia
307.42	Persistent Insomnia
307.43	Transient Hypersomnia
307.44	Persistent Hypersomnia
307.45	Disrupt Sleep-Wake Cycle
307.46	Somnambulism/Nght Terror
307.47	Sleep Stage Dysfunc Nec
307.48	Repetit Sleep Intrusion
307.49	Nonorganic Sleep Dis Nec
307.5	Eating Disorders Nec/Nos*
307.50	Eating Disorder Nos
307.51	Bulimia
307.52	Pica
307.53	Psychogenic Rumination
307.54	Psychogenic Vomiting
307.59	Eating Disorder Nec
307.6	Enuresis
307.7	Encopresis
307.8	Psychalgia*
307.80	Psychogenic Pain Nos
307.81	Tension Headache
307.89	Psychogenic Pain Nec
307.9	Special Symptom Nec/Nos

ICD9_Code	Disease_Description
308	Acute Reaction To Stress*
308.0	Stress React, Emotional
308.1	Stress Reaction, Fugue
308.2	Stress React, Psychomot
308.3	Acute Stress React Nec
308.4	Stress React, Mixed Dis
308.9	Acute Stress React Nos
309	Adjustment Reaction*
309.0	Brief Depressive React
309.1	Prolong Depressive React
309.2	Adjust React/Oth Emotion*
309.21	Separation Anxiety
309.22	Emancipation Disorder
309.23	Academic/Work Inhibition
309.24	Adj React-Anxious Mood
309.28	Adj React-Mixed Emotion
309.29	Adj React-Emotion Nec
309.3	Adjust React-Conduct Dis
309.4	Adj React-Emotion/Conduc
309.8	Other Adjust Reaction*
309.81	Prolong Posttraum Stress
309.82	Adjust React-Phys Sympt
309.83	Adjust React-Withdrawal
309.89	Adjustment Reaction Nec
309.9	Adjustment Reaction Nos
310	Nonpsychotic Brain Synd*
310.0	Frontal Lobe Syndrome
310.1	Organic Personality Synd
310.2	Postconcussion Syndrome
310.8	Nonpsychot Brain Syn Nec
310.9	Nonpsychot Brain Syn Nos
311	Depressive Disorder Nec
312	Conduct Disturbance Nec*
312.0	Unsocialized Aggression*
312.00	Unsocial Aggress-Unspec
312.01	Unsocial Aggression-Mild
312.02	Unsocial Aggression-Mod
312.03	Unsocial Aggress-Severe
312.1	Unsocializ, Unaggressive*
312.10	Unsocial Unaggress-Unsp
312.11	Unsocial Unaggress-Mild
312.12	Unsocial Unaggress-Mod
312.13	Unsocial Unaggr-Severe

ICD9_Code	Disease_Description
312.2	Socialized Conduct Dis*
312.20	Social Conduct Dis-Unsp
312.21	Social Conduct Dis-Mild
312.22	Social Conduct Dis-Mod
312.23	Social Conduct Dis-Sev
312.3	Impulse Control Dis Nec*
312.30	Impulse Control Dis Nos
312.31	Pathological Gambling
312.32	Kleptomania
312.33	Pyromania
312.34	Intermitt Explosive Dis
312.35	Isolated Explosive Dis
312.39	Impulse Control Dis Nec
312.4	Mix Dis Conduct/Emotion
312.8	Other Conduct Disturb*
312.81	Cndct Dsrdr Chldhd Onst
312.82	Cndct Dsrdr Adlscnt Onst
312.89	Other Conduct Disorder
312.9	Conduct Disturbance Nos
313	Emotional Dis Child/Adol*
313.0	Overanxious Disorder
313.1	Misery & Unhappiness Dis
313.2	Sensitivity & Withdrawal*
313.21	Shyness Disorder-Child
313.22	Introverted Dis-Child
313.23	Elective Mutism
313.3	Relationship Problems
313.8	Oth Emotional Dis Child*
313.81	Oppositional Disorder
313.82	Identity Disorder
313.83	Academic Underachievement
313.89	Emotional Dis Child Nec
313.9	Emotional Dis Child Nos
314	Hyperkinetic Syndrome*
314.0	Attention Deficit Dis*
314.00	Attn Defic Nonhyperact
314.01	Attn Deficit W Hyperact
314.1	Hyperkinet W Devel Delay
314.2	Hyperkinetic Conduct Dis
314.8	Other Hyperkinetic Synd
314.9	Hyperkinetic Synd Nos
315	Specific Develop Delays*
315.0	Specific Reading Dis*

<b>ICD9_Code</b>	<b>Disease_Description</b>
315.00	Reading Disorder Nos
315.01	Alexia
315.02	Developmental Dyslexia
315.09	Reading Disorder Nec
315.1	Arithmetical Disorder
315.2	Oth Learning Difficulty
315.3	Speech/Language Disorder*
315.31	Development Language Dis
315.32	Receptive Language Disrd
315.39	Speech/Language Dis Nec
315.4	Coordination Disorder
315.5	Mixed Development Dis
315.8	Development Delays Nec
315.9	Development Delay Nos
316	Psychic Factor W Oth Dis



## Appendix E. Brand Names and Generic Names of Medications for Mental Health Therapy

Brand-Name Drugs	Generic-Name Drugs
A-Poxide	Chlordiazepoxide Hcl
Acabamate	Meproamate
Acetazolamide	Acetazolamide
Adapin	Doxepin Hydrochloride
Adderall (Ages 4-18 Only)	Amphet Asp/Amphet/D-Amphet
Adderall Xr (Ages 4-18 Only)	Amphet Asp/Amphet/D-Amphet
Adlerika Laxative	Magnesium Sulfate
Ak-Zol	Acetazolamide
Allertoc	Pyrilamine Maleate
Alprazolam	Alprazolam
Alprazolam Intensol	Alprazolam
Ambien	Zolpidem Tartrate
Amitid	Amitriptyline Hcl
Amitril	Amitriptyline Hcl
Amitriptyline Hcl	Amitriptyline Hcl
Amitriptyline W/Perphenazine	Amitriptyline Hcl/Perphenazine
Amitriptyline W/Perphenazine	Amitriptyline Hcl/Perphenazine
Amitriptyline/Chlordiazepoxide	Amitriptyline/Cl-Diazepoxide
Amobarbital Sodium	Amobarbital Sodium
Amoxapine	Amoxapine
Amphetamine Salt Combo Age4-18	Amphet Asp/Amphet/D-Amphet
Amytal	Amobarbital
Amytal Sodium	Amobarbital Sodium
Amytal Sodium Pulvules	Amobarbital Sodium
Anaclasine	Magnesium Sulfate/Rhubarb/Tta
Anafranil	Clomipramine Hcl
Anafranil	Clomipramine Hydrochloride
Aquachloral	Chloral Hydrate
Aricept	Donepezil Hcl
Artane	Trihexyphenidyl Hcl
Artane Sequel	Trihexyphenidyl Hcl
Artane Sequeles	Trihexyphenidyl Hcl
Asendin	Amoxapine
Ativan	Lorazepam
Ativan 1ml/2ml Tubex	Lorazepam
Atretol	Carbamazepine
Aventyl Hcl	Nortriptyline Hcl
Aventyl Hcl	Nortriptyline Hydrochloride
Azene	Clorazepate Monopotassium
B.B.S.	Butabarbital Sodium
Barbased	Butabarbital Sodium
Barbita	Phenobarbital
Bendectin	Doxylamine/Pyridoxine
Benzotropine Mesylate	Benzotropine Mesylate
Benzotropine Mesylates	Benzotropine Mesylate
Bupropion Hcl	Bupropion Hcl

Busodium  
Buspar  
Buspar  
Buspirone Hcl  
Buta-Kay  
Butabarbital Sodium  
Butalan  
Butalix  
Butatran  
Buticaps  
Butisol  
Butisol Sodium  
Calmium  
Carbamazepine  
Carbatrol  
Carbrital Half-Str Kapseal  
Carbrital Kapseal  
Cdp  
Ceberclon  
Celexa  
Celontin  
Cerebyx  
Chlor Pox 10  
Chlor Pox 25  
Chlor Pox 5  
Chloral Hydrate  
Chloral-Methylol  
Chloramead  
Chlordiazepoxide Hcl  
Chlorpromazine Hcl  
Cibalith-S  
Clomipramine Hcl  
Clomipramine Hcl  
Clonazepam  
Clorazepate Dipotassium  
Clorazine  
Clozapine  
Clozaril  
Clozaril (Bmn Only)  
Cogentin  
Cognex  
Cohidrate  
Colspan  
Comazol  
Compa-Z  
Compazine  
Compazine  
Compazine Spansule  
Compro  
Concerta (Age 6 & Older Only)  
Coprobate  
Cotropine

Butabarbital Sodium  
Buspirone Hcl  
Buspirone Hydrochloride  
Buspirone Hcl  
Butabarbital Sodium  
Butabarbital Sodium  
Butabarbital Sodium  
Butabarbital Sodium  
Butabarbital Sodium  
Butabarbital Sodium  
Butabarbital Sodium  
Butabarbital Sodium  
Chlordiazepoxide Hcl  
Carbamazepine  
Carbamazepine  
Pentobarbital Sodium/Carbromal  
Pentobarbital Sodium/Carbromal  
Chlordiazepoxide Hcl  
Clonazepam  
Citalopram Hydrobromide  
Methsuximide  
Fosphenytoin Sodium  
Chlordiazepoxide Hcl  
Chlordiazepoxide Hcl  
Chlordiazepoxide Hcl  
Chloral Hydrate  
Chloral Hydrate/Me-Salicylate  
Chlorpromazine Hcl  
Chlordiazepoxide Hcl  
Chlorpromazine Hcl  
Lithium Citrate  
Clomipramine Hcl  
Clomipramine Hydrochloride  
Clonazepam  
Clorazepate Dipotassium  
Chlorpromazine Hcl  
Clozapine  
Clozapine  
Clozapine  
Benztropine Mesylate  
Tacrine Hcl  
Chloral Hydrate  
Chlordiazepoxide Hcl  
Prochlorperazine Maleate  
Prochlorperazine Edisylate  
Prochlorperazine Edisylate  
Prochlorperazine Maleate  
Prochlorperazine Maleate  
Prochlorperazine Maleate  
Methylphenidate Hcl  
Meprobamate  
Benztropine Mesylate

Cyclert	Pemoline
Cylert	Pemoline
Cylert Chewable	Pemoline
D-Tran	Chlordiazepoxide Hcl
D-Val	Diazepam
Dalicote	Pyrilamine Maleate/Hexachlor
Dalmane	Flurazepam Hcl
Dalmane	Flurazepam Hydrochloride
Dalpro	Valproic Acid
Daxolin	Loxapine Succinate
Decapryn	Doxylamine Succinate
Deconil	Imipramine Hydrochloride
Depa-Syrup	Valproate Sodium
Depacon	Valproate Sodium
Depakene	Valproic Acid
Depakene (Bmn Only)	Valproate Sodium
Depakene (Bmn Only)	Valproic Acid
Depakote	Divalproex Sodium
Depakote Er	Divalproex Sodium
Depakote Sprinkle	Divalproex Sodium
Deproic	Valproic Acid
Desipramine Hcl	Desipramine Hcl
Desipramine Hcl	Desipramine Hydrochloride
Desyrel	Trazodone Hcl
Desyrel	Trazodone Hydrochloride
Di-Phen	Phenytoin Sodium
Di-Tran	Diazepam
Diamox	Acetazolamide
Diamox	Acetazolamide Sodium
Diamox Sequels	Acetazolamide
Diastat Twin-Pak	Diazepam
Diazepam	Diazepam
Dilantin	Phenytoin
Dilantin	Phenytoin Sodium
Dilantin	Phenytoin Sodium Extended
Dilantin Kapseal	Phenytoin Sodium Extended
Dilantin Steri-Dose	Phenytoin Sodium
Dilantin W/Pb	Phenytoin Sodium/Phenobarbital
Dilantin W/Pb Kapseal	Phenytoin Sodium/Phenobarbital
Dilantin-125	Phenytoin
Dilantin-30	Phenytoin
Dilantin-30 Pediatric	Phenytoin
Diphen	Phenytoin Sodium
Diphenlhydantoin Sodium	Phenytoin Sodium
Diphentin	Phenytoin Sodium
Diphentoin	Phenytoin Sodium
Diphentoin	Phenytoin Sodium Extended
Diphenylan Sodium	Phenytoin Sodium
Diphenylhydantoin Sodium	Phenytoin Sodium
Ditan	Phenytoin Sodium
Divalproex Sodium	Divalproex Sodium
Dizac	Diazepam/Soybean Oil

Doral  
Dormalin  
Dormarex  
Dormutol  
Doxepin Hcl  
Doxepin Hcl  
Doxine  
Doxylamine  
Doxylamine Plus  
Doxylamine Succinate  
Doxylamine W/B6  
Doxysom  
E-Vill 10  
E-Vill 100  
E-Vill 25  
E-Vill 50  
E-Vill 75  
Effexor  
Effexor Xr  
Elavil  
Emitrip  
Endep  
Enovil  
Epitol  
Epsal  
Epsom Salt  
Epsom Salt  
Epsom Salts  
Equanil  
Eskabarb Spansule  
Eskalith  
Eskalith Cr  
Estazolam  
Ethchlorvynol  
Ethosuximide  
Etnofril  
Etrafon 2-10  
Etrafon 2-25  
Etrafon A 4-10  
Etrafon Forte 4-25  
Exelon  
Felbatol  
Felsules  
Fluoxetine  
Fluoxetine Hcl  
Fluoxetine Hcl Tab  
Fluphenazine Decanoate  
Fluphenazine Deconoate  
Fluphenazine Hcl  
Fluphenazine Hcl  
Flurazepam  
Flurazepam Hcl  
Appendix E for SBHC Cost Study Report

Quazepam  
Quazepam  
Pyrilamine Maleate  
Pyrilamine Maleate  
Doxepin Hcl  
Doxepin Hydrochloride  
Doxylamine/Pyridoxine  
Doxylamine Succinate  
Doxylamine/Pyridoxine  
Doxylamine Succinate  
Doxylamine/Pyridoxine  
Doxylamine Succinate  
Amitriptyline Hcl  
Amitriptyline Hcl  
Amitriptyline Hcl  
Amitriptyline Hcl  
Amitriptyline Hcl  
Amitriptyline Hcl  
Venlafaxine Hcl  
Venlafaxine Hcl  
Amitriptyline Hcl  
Amitriptyline Hcl  
Amitriptyline Hcl  
Amitriptyline Hcl  
Carbamazepine  
Magnesium Sulfate  
Magnesium Sulf (Lax)  
Magnesium Sulfate  
Magnesium Sulfate  
Meprobamate  
Phenobarbital  
Lithium Carbonate  
Lithium Carbonate  
Estazolam  
Ethchlorvynol  
Ethosuximide  
Imipramine Hydrochloride  
Amitriptyline Hcl/Perphenazine  
Amitriptyline Hcl/Perphenazine  
Amitriptyline Hcl/Perphenazine  
Amitriptyline Hcl/Perphenazine  
Rivastigmine Tartrate  
Felbamate  
Chloral Hydrate  
Fluoxetine Hcl  
Fluoxetine Hcl  
Fluoxetine Hcl  
Fluphenazine Decanoate  
Fluphenazine Decanoate  
Fluphenazine Hcl  
Fluphenazine Hydrochloride  
Flurazepam Hydrochloride  
Flurazepam Hcl

Flurazepam Hcl  
Fluvoxamine Maleate  
Foypromazine  
Gabapentin  
Gabitril  
Gen-Xene  
Geodon  
H-Tran  
Halcion  
Haldol  
Haldol  
Haldol Decanoate 100  
Haldol Decanoate 50  
Haldol Deconate 100  
Haloperidol  
Haloperidol  
Haloperidol Decanoate  
Haloperidol Lactate  
Halperon  
Icn-Azepox  
Imavate  
Imipramine Hcl  
Imipramine Hcl  
J-Tran  
Janimine  
Kenazine  
Kenrax  
Kenvil  
Klonopin  
Klorazine  
Labetalol Hcl  
Lamictal  
Lamictal Chewable  
Lanabarb No.1  
Lanabarb No.2  
Largon  
Largon  
Libaca  
Libritabs  
Librium  
Limbitrol  
Limbitrol  
Limbitrol Ds  
Limbitrol Ds  
Lipoxide  
Lithane  
Lithium Carbonate  
Lithium Citrate  
Lithobid  
Lithonate  
Lithonate-S  
Lithotabs

Flurazepam Hydrochloride  
Fluvoxamine Maleate  
Chlorpromazine Hcl  
Gabapentin  
Tiagabine Hcl  
Clorazepate Dipotassium  
Ziprasidone Hcl  
Chlordiazepoxide Hcl  
Triazolam  
Haloperidol  
Haloperidol Lactate  
Haloperidol Decanoate  
Haloperidol Decanoate  
Haloperidol Decanoate  
Haloperidol  
Haloperidol Lactate  
Haloperidol Decanoate  
Haloperidol Lactate  
Haloperidol  
Chlordiazepoxide Hcl  
Imipramine Hydrochloride  
Imipramine Hcl  
Imipramine Hydrochloride  
Chlordiazepoxide Hcl  
Imipramine Hydrochloride  
Chlorpromazine Hcl  
Chlordiazepoxide Hcl  
Amitriptyline Hcl  
Clonazepam  
Chlorpromazine Hcl  
Carbamazepine  
Lamotrigine  
Lamotrigine  
Amobarbital/Secobarbital  
Amobarbital/Secobarbital  
Propiomazine Hcl  
Propiomazine Hydrochloride  
Chlordiazepoxide Hcl  
Chlordiazepoxide  
Chlordiazepoxide Hcl  
Amitrip Hcl/Chlordiazepoxide  
Amitriptyline/Cl-Diazepoxide  
Amitrip Hcl/Chlordiazepoxide  
Amitriptyline/Cl-Diazepoxide  
Chlordiazepoxide Hcl  
Lithium Carbonate  
Lithium Carbonate  
Lithium Citrate  
Lithium Carbonate  
Lithium Carbonate  
Lithium Citrate  
Lithium Carbonate



Moban  
Murcil  
Myperidol  
Myproic Acid  
Mysoline  
Mysoline (Bmn Only)  
Nap-Kaps  
Navane  
Navane  
Navane  
Navane Inj  
Nembutal  
Nembutal Sodium  
Neo Cold  
Neuramate  
Neurate-400  
Neurontin  
Neuroval  
Nisaval  
Nite Time Sleep Aid  
Nitetime Sleep-Aid  
Noctec  
Norfranil  
Norpramin  
Norpramin  
Nortriptyline Hcl  
Nortriptyline Hcl  
Nortriptyline Hcl  
Orap  
Ormazine  
Pamelor  
Pamelor  
Paradione  
Paral  
Paraldehyde  
Pax 400  
Paxil  
Paxipam  
Pazine  
Peganone  
Pemadd  
Pemoline  
Pentobarbital Sodium  
Per-Trip  
Permitil  
Permitil  
Permitil Chronotab  
Pertofrane  
Phelantin Kapseal  
Phenobarbital  
Phenobarbital Sodium  
Phentoin  
Appendix E for SBHC Cost Study Report

Molindone Hydrochloride  
Chlordiazepoxide Hcl  
Haloperidol Lactate  
Valproate Sodium  
Primidone  
Primidone  
Pyrilamine Maleate  
Thiothixene  
Thiothixene Hcl  
Thiothixene Hydrochloride  
Thiothixene Hcl  
Pentobarbital  
Pentobarbital Sodium  
Pyrilamine Maleate/Vit C  
Meprobamate  
Meprobamate  
Gabapentin  
Phenobarbital  
Pyrilamine Maleate  
Doxylamine Succinate  
Doxylamine Succinate  
Chloral Hydrate  
Imipramine Hydrochloride  
Desipramine Hcl  
Desipramine Hydrochloride  
Nortriptyline Hcl  
Nortriptyline Hydrochloride  
Nortriptyline Hydrochloride  
Pimozide  
Chlorpromazine Hcl  
Nortriptyline Hcl  
Nortriptyline Hydrochloride  
Paramethadione  
Paraldehyde  
Paraldehyde  
Meprobamate  
Paroxetine Hcl  
Halazepam  
Prochlorperazine Edisylate  
Ethotoin  
Pemoline  
Pemoline  
Pentobarbital Sodium  
Amitriptyline Hcl/Perphenazine  
Fluphenazine Hcl  
Fluphenazine Hydrochloride  
Fluphenazine Hydrochloride  
Desipramine Hydrochloride  
Phenytoin/Methamphet/Phenobarb  
Phenobarbital  
Phenobarbital Sodium  
Phenytoin Sodium

Phentoin Sodium  
Phenurone  
Phenyltoin Sodium  
Phenytext  
Phenytext Extended  
Phenytoin  
Phenytoin  
Phenytoin Prompt  
Phenytoin Prompt Sodium  
Phenytoin Sodium  
Phenytoin Sodium  
Phenytoin Sodium Extended Rel  
Phenytoin Sodium Extended Rel  
Phenytoin Sodium Injection  
Phenytoin Sodium Prompt  
Phenytoin Sodium Prompt  
Phenytoin Sodium, Extended  
Phenytoin Sodium, Extended  
Placidyl  
Poxi  
Primidone  
Primidone Veterinary  
Probate  
Prochlorperazine  
Prochlorperazine Edisylate  
Prochlorperazine Maleate  
Prolixin  
Prolixin  
Prolixin Decanoate  
Prolixin Decanoate Unimatic  
Prolixin Enanthate  
Prolixin Enanthate Unimatic  
Prosom  
Protriptyline Hcl  
Prozac  
Prozac  
Prozac Weekly  
Prudoxin  
Pyrilamine Maleate  
Q-Bam 400  
Q-Pam  
Q.E.L  
Quiess  
Quietabs  
Re-Live  
Remeron  
Reminyl  
Reminyl  
Restoril  
Risperdal  
Ritalin  
Appendix E for SBHC Cost Study Report

Phenytoin Sodium  
Phenacemide  
Phenytoin Sodium  
Phenytoin Sodium Extended  
Phenytoin Sodium Extended  
Phenytoin  
Phenytoin Sodium  
Phenytoin Sodium  
Phenytoin Sodium  
Phenytoin Sodium  
Phenytoin Sodium Extended  
Phenytoin Sodium Extended  
Phenytoin Sodium Extended Rel  
Phenytoin Sodium  
Phenytoin Sodium  
Phenytoin Sodium Prompt  
Phenytoin Sodium Extended  
Phenytoin Sodium Extended  
Ethchlorvynol  
Chlordiazepoxide Hcl  
Primidone  
Primidone  
Meprobamate  
Prochlorperazine Maleate  
Prochlorperazine Edisylate  
Prochlorperazine Maleate  
Fluphenazine Hcl  
Fluphenazine Hydrochloride  
Fluphenazine Decanoate  
Fluphenazine Decanoate  
Fluphenazine Enanthate  
Fluphenazine Enanthate  
Estazolam  
Protriptyline Hydrochloride  
Fluoxetine Hcl  
Fluoxetine Hydrochloride  
Fluoxetine Hcl  
Doxepin Hcl  
Pyrilamine Maleate  
Meprobamate  
Diazepam  
Amitriptyline Hcl  
Phenobarbital/Allobarbital  
Pyrilamine Maleate  
Amitriptyline Hcl  
Mirtazapine  
Galantamine  
Galantamine Hcl  
Galantamine Hydrobromide  
Temazepam  
Risperidone  
Methylphenidate Hcl



Ritalin (Age 5 And Older)  
Ritalin-Sr (Age 5 And Older)  
Ro-Azepam  
Ro-Poxide  
Sarafem  
Sb Sleep-Aid  
Secobarbital Sodium  
Seconal  
Seconal Sodium  
Seconal Sodium Pulvule  
Sedabamate  
Sedadrops  
Sereen  
Serentil  
Serentil (1x20)  
Seroquel  
Serzone  
Sinequan  
Sinequan  
Sinequan Oral  
Sk-Amitriptyline  
Sk-Bamate  
Sk-Chloral Hydrate  
Sk-Lygen  
Sk-Phenobarbital  
Sk-Pramine  
Sk-Thioridazine Hcl  
Sleep Aid  
Sleep Easy  
Sleep Tablet  
Sleep Tablet  
Sleepwell  
Sleepwell 2-Nite  
Solfoton  
Somni Caps  
Somnised  
Somnote  
Sonata  
Spantran  
Spaz-10  
Spaz-5  
Stabanil  
Stelaprin  
Stelazine  
Stelazine Conc  
Sterasoline  
Steratane  
Storzolamide  
Surmontil  
Tegretol  
Tegretol (Bmn Only)  
Tegretol Susp

Methylphenidate Hcl  
Methylphenidate Hcl  
Diazepam  
Chlordiazepoxide Hcl  
Fluoxetine Hcl  
Doxylamine Succinate  
Secobarbital Sodium  
Secobarbital  
Secobarbital Sodium  
Secobarbital Sodium  
Meproamate  
Phenobarbital  
Chlordiazepoxide Hcl  
Mesoridazine Besylate  
Mesoridazine Besylate  
Quetiapine Fumarate  
Nefazodone Hcl  
Doxepin Hcl  
Doxepin Hydrochloride  
Doxepin Hcl  
Amitriptyline Hcl  
Meproamate  
Chloral Hydrate  
Chlordiazepoxide Hcl  
Phenobarbital  
Imipramine Hydrochloride  
Thioridazine Hydrochloride  
Doxylamine Succinate  
Doxylamine Succinate  
Doxylamine Succinate  
Pyrilamine Maleate  
Pyrilamine Maleate  
Doxylamine Succinate  
Phenobarbital  
Pyrilamine Maleate  
Doxylamine Succinate  
Chloral Hydrate  
Zaleplon  
Meproamate  
Chlordiazepoxide Hcl  
Chlordiazepoxide Hcl  
Amitriptyline Hcl  
Trifluoperazine Hcl  
Trifluoperazine Hcl  
Trifluoperazine Hcl  
Primidone  
Trihexyphenidyl Hcl  
Acetazolamide  
Trimipramine Maleate  
Carbamazepine  
Carbamazepine  
Carbamazepine

Tegretol Xr	Carbamazepine
Temazepam	Temazepam
Thioridazine Hcl	Thioridazine Hcl
Thioridazine Hcl	Thioridazine Hydrochloride
Thiothixene	Thiothixene
Thiothixene	Thiothixene Hydrochloride
Thiothixene Hcl	Thiothixene Hcl
Thiothixene Hcl	Thiothixene Hydrochloride
Thiothixene Hcl Intensol	Thiothixene Hydrochloride
Thoradol	Chlorpromazine Hcl
Thoramed	Chlorpromazine Hcl
Thorarex	Chlorpromazine Hcl
Thorazine	Chlorpromazine Hcl
Thorazine Spansule	Chlorpromazine Hcl
Thorazine Supp	Chlorpromazine Hcl
Thp	Trihexyphenidyl Hcl
Tofranil	Imipramine Hcl
Tofranil	Imipramine Hydrochloride
Tofranil-Pm	Imipramine Pamoate
Topamax	Topiramate
Trancopal	Chlormezanone
Trancopal Caplet	Chlormezanone
Tranmep	Meprobamate
Tranquil	Pyrilamine Maleate
Tranquilate	Pyrilamine Maleate
Tranxene	Clorazepate Dipotassium
Tranxene Sd	Clorazepate Dipotassium
Tranxene T-Tab	Clorazepate Dipotassium
Trazadone Hcl	Trazodone Hydrochloride
Trazodone Hcl	Trazodone Hcl
Trazodone Hcl	Trazodone Hydrochloride
Tremin	Trihexyphenidyl Hcl
Trialodine	Trazodone Hydrochloride
Triavil 10-2	Amitriptyline Hcl/Perphenazine
Triavil 2-10	Amitriptyline Hcl/Perphenazine
Triavil 2-25	Amitriptyline Hcl/Perphenazine
Triavil 25-2	Amitriptyline Hcl/Perphenazine
Triavil 25-4	Amitriptyline Hcl/Perphenazine
Triavil 4-10	Amitriptyline Hcl/Perphenazine
Triavil 4-25	Amitriptyline Hcl/Perphenazine
Triavil 4-50	Amitriptyline Hcl/Perphenazine
Triazolam	Triazolam
Tribamate	Trihexyphenidyl Hcl/Meprobam
Tridione	Trimethadione
Trifluoperazine Hcl	Trifluoperazine Hcl
Trihexane	Trihexyphenidyl Hcl
Trihexiphenidyl Hcl	Trihexyphenidyl Hcl
Trihexy	Trihexyphenidyl Hcl
Trihexy-2	Trihexyphenidyl Hcl
Trihexy-5	Trihexyphenidyl Hcl
Trihexyphenidyl Hcl	Trihexyphenidyl Hcl
Trileptal	Oxcarbazepine

Trimipramine Maleate  
Tuinal  
Tuinal  
Tuinal Pulvule  
Unisom  
Unisom Sleep Aid  
Valium  
Valproic Acid  
Valproic Acid  
Valrelease  
Valusom  
Vanatrip  
Vanspar  
Vasominic  
Versed  
Vesprin  
Vitamin B-12  
Vivactil  
Vivactil  
Wellbutrin  
Wellbutrin  
Wellbutrin Sr  
X-O'spaz  
Xanax  
Zarontin  
Zetran  
Zoloft  
Zoloft  
Zonalon  
Zyban  
Zyprexa  
Zyprexa Zydis

Trimipramine Maleate  
Amobarbital Sodium/Secobarb Na  
Amobarbital/Secobarbital  
Amobarbital/Secobarbital  
Doxylamine Succinate  
Doxylamine Succinate  
Diazepam  
Valproate Sodium  
Valproic Acid  
Diazepam  
Doxylamine Succinate  
Amitriptyline Hcl  
Buspirone Hcl  
Pyrilamine Maleate/Phenir  
Midazolam Hcl  
Triflupromazine Hcl  
Thiothixene  
Protriptyline Hcl  
Protriptyline Hydrochloride  
Bupropion Hcl  
Bupropion Hydrochloride  
Bupropion Hcl  
Diazepam  
Alprazolam  
Ethosuximide  
Diazepam  
Sertraline Hcl  
Sertraline Hydrochloride  
Doxepin Hcl  
Bupropion Hcl  
Olanzapine  
Olanzapine