



# **Fiscal Implications of the Health Access Project: A Hospital Perspective**

## ***Final Report***

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November 10, 2003

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Prepared for the Health Access Project of Salt Lake County

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The SPHERE Institute is a nonprofit policy firm established in 1996 under the laws of the State of California. In conjunction with its affiliated for profit firm, Acumen, LLC, it conducts public policy research evaluating health and social service programs supported by public and private funds. Projects have been undertaken on behalf of federal, state and county government agencies, as well for foundations and public policy organizations. Several of the staff at Acumen and SPHERE have associations with Stanford University and the National Bureau of Economic Research and have acquired much of their experience directing projects through these other research organizations.

Acumen and SPHERE have created, measured and presented outcomes revealing program effectiveness, including differential success across groups, localities and time. Because of our commitment to better public policy through information management in all aspects of program implementation, we have worked with private nonprofit agencies to develop resources to build their internal databases and self-evaluation capacity. We have accordingly created our own substantial capability to deliver databases to service providers permitting them to administer their operations and report outcomes to benefactors. To supplement internal sources, our team has created and utilized all forms of administrative and survey data to produce outcomes relevant for both service providers and funding organizations.

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	iii
1 BACKGROUND .....	1
2 OBJECTIVES OF THIS APPRAISAL .....	2
3 METHODS.....	3
3.1 HAP client selection .....	3
3.2 Services provided by HAP .....	3
3.3 Data sources.....	4
3.4 Data analyses .....	4
3.4.1 Descriptive analyses .....	4
3.4.2 Matched analyses of acute episodes .....	5
3.4.3 Fiscal implications.....	5
3.5 Role of the funding source.....	7
4 RESULTS .....	7
4.1 Analysis population and baseline characteristics .....	7
4.2 Trends in observed visits and charges in Years 1 and 2 (pre- and post-HAP intake, respectively) .....	9
4.3 Analyses of acute episodes .....	12
4.4 Fiscal implications .....	13
5 DISCUSSION.....	16
5.1 Summary .....	16
5.2 Review of prior evaluations .....	18
5.3 Implications .....	19
5.3.4 Reducing bias in non-randomized appraisals .....	19
5.3.5 Projecting fiscal impact.....	20
5.4 Concluding remarks .....	23
6 APPENDICES.....	24
7 SELECTED REFERENCES.....	30

### List of Tables

Table 1. Observed Cumulative Charges (Total and Compensated) Pre- and Post-HAP, by Referral Source .....	11
Table 2. Relative Year 2 Effects on Total and Compensated Charges, by Scenario .....	14
Table 3. Results of Scenario 1 .....	14
Table 4. Effect on Net Revenue of Different Periods to Impute Average Charges for Months 5 to 11 .....	15
Table 5. Results of Scenario 2 .....	15
Table 6. Results of Scenario 3 .....	16
Table 7. Sensitivity Analyses, Changing C/C Ratio from 40-60% .....	17

## List of Figures

Figure 1. Illustration of Observed Data With and Without HAP.....	6
Figure 2. Client Flow .....	8
Figure 3. Accrual Rate into HAP .....	8
Figure 4. Percent of Patients Followed since HAP Intake .....	9
Figure 5. Trends of Percent of Patients With ER Visits, by Referral Source and No. of Visits .....	9
Figure 6. Trends of Percent of Patients With Non-ER Visits, by Referral Source and No. of Visits .....	10
Figure 7. Trends of ER Charges, by Referral Source and Insurance.....	10
Figure 8. Trends of Non-ER Charges, by Referral Source and Insurance .....	11
Figure 9. Average of All Monthly Visits after Acute Episode, Pre and Post HAP.....	12
Figure 10. Average Monthly Charges after Acute Episode, Pre and Post HAP.....	13

## List of Appendices

Appendix 1. Local Partner Hospitals .....	24
Appendix 2. Summary of Data on Clients Referred from ER.....	26
Appendix 3. Summary of Data on Clients Referred from Non-ER Source.....	27
Appendix 4. Trends of Average Monthly ER Visits, by Referral Source.....	28
Appendix 5. Trends of Average Monthly Non-ER Visits, by Referral Source .....	28
Appendix 6. Average Monthly ER Visits after Acute Episode, Pre and Post HAP .....	29
Appendix 7. Average Monthly Non-ER Visits after Acute Episode, Pre and Post HAP .....	29

## **Executive summary**

### **Background**

The Health Access Project (HAP) of Salt Lake County is sponsored by a Community Access Program (CAP) grant administered by the Health Resources and Services Administration (HRSA) of the US Department of Health and Human Services<sup>1</sup> and the in-kind contributions of the project's hospital and volunteer physician partners. HAP's mission is to improve access and coordinate comprehensive health care for low-income, uninsured, and underinsured residents of Salt Lake County.

HAP case managers refer clients to volunteer physicians for specialty and primary care and to community clinics for primary care. Case managers also assist clients by providing interpreters for medical appointments and helping with the completion of applications required for assistance from other agencies or charity care from hospitals.

The prospects for ongoing federal funding of HAP are unlikely. Consequently, HAP decided to conduct an evaluation of its economic performance from the perspective of potential local hospital partners who may have a financial stake in HAP's ongoing operation.

### **Purpose**

To conduct an independent third-party appraisal of the early effects of HAP on the use and cost of hospital services (ER and non-ER) from the perspective of local partner hospitals.

### **Methods**

The study is a single-arm, longitudinal evaluation of clients enrolled in HAP between February 20, 2002 and December 31, 2002. Primary outcomes were assessed through March 31, 2003. Eligibility for HAP intake was based on being a resident of Salt Lake County, uninsured or underinsured, and having a household income not exceeding 150% of the federal poverty level. HAP case managers evaluated potential clients referred by hospitals, clinics, volunteer doctors, and other sources. Clients who appeared to meet HAP criteria were invited to participate in an intake appointment to determine the ir

eligibility— according to income and County residency— and to assess their initial medical referral needs. HAP collected and stored data on each client’s date of birth, gender, preferred language, date of enrollment and case closure, and site of referral (ER or non-ER). Six hospital partners provided HAP with data on ER and non-ER hospital utilization data from administrative databases.

Descriptive analyses of trends by quarter and by month were conducted for the period 1 year before and 1 year after HAP intake. Our primary analysis was to assess in a predefined subset of clients at risk of acute care the effect prior to and at HAP intake on the subsequent 4-month change in number of visits and charges.

There was no reference data for a situation without HAP. To estimate the fiscal impact of HAP, we therefore generated hypothetical 2-year scenarios of net revenue for a cohort of clients if HAP had not been implemented.

*Scenario 1.* Without HAP, total and compensated charges in year 2 were based on the percent change in charges observed in the analyses of acute episodes. To estimate the percent change, we used actual charges in the 0-4 months of an acute episode and set charges for each month from 5 to 11 equal to the average monthly charges in the 1-4 months after an acute episode.

*Scenario 2.* Without HAP, total charges and visits in year 2 would have been equal to those observed in year 1.

*Scenario 3.* Without HAP, total charges and visits in year 2 would have been equal to those observed with HAP in year 2. However, without HAP, total compensated charges would have been equal to those observed in year 1.

Sensitivity analyses were conducted on key assumptions.

## **Results**

Seven hundred forty-six persons were referred to HAP between February 20, 2002 and December 31, 2002. Four hundred eighty-eight were enrolled in HAP, 469 of who were

enrolled prior to December 31, 2002. Local hospital partners had data on 288 clients; this final subset comprised the analysis population.

The mean client age was 39 years. Forty-six percent of clients preferred to speak Spanish in the medical encounter and 45% preferred to speak English. Fifty-six percent of clients were referred from the ER.

Total visits and charges increased from the year prior to HAP, e.g., average annual total charges almost doubled from \$3,117 in the year prior to HAP intake to \$6,027 in the year after HAP intake. Based on analysis of acute episodes applied to simulation of charges without HAP, HAP was associated with 25% fewer total visits, 1% lower total charges, and 42% higher compensated charges. The discrepancy between changes in visits and charges is due primarily to a 49% increase post-HAP in the charges per compensated non-ER visit.

Applying these results to the three scenarios with a hypothetical cohort of 300 clients, net revenue to local hospital partners ranged from \$202,107 (Scenario 2) to \$638,649 (Scenario 3). For the primary analysis (Scenario 1), the net revenue was estimated to be \$317,988.

## **Conclusions**

In the acute episode analysis, we found that HAP was associated with fewer total visits and higher compensated charges, with relatively little change in total charges. The benefit to local hospital partners will depend on the fraction of compensated charges that can be recouped from third-party payers. Assuming payment in full for a hypothetical cohort of 300 clients, local hospital partners should realize a 2-year net revenue between \$202,000 to \$639,000.

## 1 Background

The Health Access Project (HAP) is sponsored by a Community Access Program (CAP) grant administered by the Health Resources and Services Administration (HRSA) of the US Department of Health and Human Services<sup>1</sup> and the in-kind contributions of the project's hospital and volunteer physician partners. HAP's primary mission is to improve access and coordinate comprehensive health care for low-income, uninsured, and underinsured residents of Salt Lake City. Since beginning enrollment in March 2002, HAP has:

- Established a volunteer network of more than 500 physicians.
- Obtained commitments from seven of the nine Salt Lake County hospitals, two private labs, and a variety of other ambulatory care centers and health services suppliers to provide charity care to HAP clients who are being treated by members of the HAP Volunteer Physician Network.
- Provided more than 1,000 clients with case management services consisting of:
  - finding 'medical homes' and specialty care
  - screening clients for Medicaid eligibility
  - providing bilingual services
- Conducted training on cultural competency for HAP staff and partner organizations.
- Developed a fully staffed center governed by an active Project Advisory Committee and the Salt Lake Valley Health Care Coverage Coalition Governance Committee.

Eligible clients include low-income, uninsured, and underinsured Salt Lake County residents who are ineligible for publicly funded health insurance or who are eligible but not currently enrolled. The program originally targeted residents who have been treated in an Emergency Room (ER) two or more times within a three-month period or have a condition that is likely to result in Emergency Room utilization if not treated. In practice, clients also came from other sources.

The prospects for ongoing federal sources of funding for HAP are unlikely. Consequently, HAP decided to conduct an evaluation of its economic performance from the perspective of potential local hospital partners who may have a financial stake in HAP's ongoing operation. The purpose of the project described herein was to conduct an independent, third-party appraisal of the early effects of HAP on the use and cost of medical services from the perspective of local hospitals.

## **2 Objectives of this appraisal**

The specific aims of this appraisal are to assess the impact of the HAP implementation on:

- Rates of ER and non-ER visits
- Total and compensated charges over time

At the outset of this appraisal, we hypothesized that the introduction of HAP would:

- Reduce the rate of ER use, as a consequence of clients having a regular source of outpatient care
- Result in no change or perhaps even an increase in the rate of non-ER service use because finding a stable medical home might lead to detection of a previously undiagnosed condition requiring inpatient management (e.g., symptomatic coronary artery disease)
- Increase the initial costs of medical services for managing the episodes of acute care resulting from clients being referred to HAP from the ER (e.g., hernia)
- Increase the number of clients enrolled in health insurance programs
- Reduce the number and costs of uncompensated ER and non-ER services

Because it is unrealistic to establish the permanent fiscal impact of HAP on hospitals in such a short time after its implementation, this study is intended to be an exploratory and descriptive appraisal. In addition to the main goals, we also hope to collaborate with hospitals and establish methods for future and ongoing process and outcome evaluation. We aim to base these processes on using available data as a vehicle to identify ways in

which the program could be modified to run more efficiently and thereby better serve clients, hospitals, and the community.

### **3 Methods**

The study is a single-arm, longitudinal evaluation of clients enrolled in HAP between February 20, 2002 and December 31, 2002. Primary outcomes were assessed through March 31, 2003.

#### **3.1 *HAP client selection***

Persons were considered for enrollment in HAP using several criteria:

- Residents of Salt Lake County
- Uninsured or underinsured
- Household income cannot exceed 150% of the Federal Poverty Level

HAP case managers evaluated potential clients referred by hospitals, clinics, volunteer doctors and other sources. Clients who appeared to meet HAP criteria were invited to participate in an intake appointment that determined their eligibility, based on income and County residency, as well as started the process of assessing the client's medical referral needs.

#### **3.2 *Services provided by HAP***

Case managers referred clients to physicians enrolled in a Volunteer Physician Network (VPN) for specialty care and primary care and to community clinics for primary care. If the physician determined that tests, procedures, or surgeries were needed, the case manager attempted to coordinate those services by working with the client, the doctor's office and the facility where the service was to be provided. Case managers also assisted the clients by arranging for interpreters for medical appointments and helping with the completion of applications required for assistance from other agencies or charity care from hospitals. Case management services were terminated when the client had completed their specialty care, had found primary care outside the VPN, or for issues of non-adherence, such as not keeping appointments or because HAP was not able to contact them after repeated efforts.

### **3.3**    *Data sources*

HAP collected and stored data on each patient's date of birth, gender, preferred language, date of enrollment and case closure, and site of referral (from ER or non-ER source).

HAP obtained hospital utilization data from the following partner hospital administrative databases:

- University Hospital
- LDS Hospital
- Cottonwood Hospital
- Alta View Hospital
- St. Marks Hospital
- Primary Children's Medical Center

A description of local partner hospitals can be found in **Appendix 1**. Data were collected from partner hospitals on date of visit, whether the visit was ER or non-ER, charges associated with visit, and source of payment (uninsured, Medicaid, Medicare, private, Private Care Network (PCN), or other). PCN is a section 1115 Medicaid waiver that provides primary care, basic dental, emergency room, and prescription coverage to working adults who meet income guidelines. Most hospitals accessed billing databases (e.g., entered from UB-92) to provide data, matching clients via names and birthdates. Data on actual costs would have been desirable; however, it was not feasible to obtain hospital proprietary information on costs, or cost-to-charge ratios (C/C) applied to charge data. We therefore applied published C/C ratios to the data on charges.

### **3.4**    *Data analyses*

#### **3.4.1**    *Descriptive analyses*

Descriptive analyses of trends by quarter and by month were conducted for the period 1 year before and 1 year after HAP intake. We numbered months from -12 to +11, with month 0 equal to the month of HAP intake. These analyses were stratified by whether the client was referred from an ER.

### 3.4.2 *Matched analyses of acute episodes*

Because analyses of trends in visits and charges may not control fully for confounding factors, we conducted a primary analysis matching acute episodes of care before and after HAP intake. We defined an “acute episode” for a period of analysis using two criteria:

- Monthly charges were above the 70th percentile of the distribution of positive monthly charges during the period of analysis, and
- Monthly charges in the previous month were below the 70th percentile of the distribution of positive monthly charges during the period of analysis.

We compared visits and charges for two samples:

- “Post-HAP” included all clients starting an acute episode in month of HAP intake (month 0)
- “Pre-HAP” included all clients starting an acute episode during months -12 to -5.

We then assessed the visits and charges in the 4 months after the acute episode of care. Unlike the descriptive trend analysis, with the acute-episode analysis, attrition is not an issue because all patients were observed for at least 4 months after an acute episode; left censoring also is not a problem because the analysis included only patients known to be in the system in the evaluation period.

### 3.4.3 *Fiscal implications*

We were able to observe directly what happened among clients with HAP (**Figure 1**). It was beyond the scope of the HAP’s budget—and of this project—to obtain information from a reference group similar in characteristics to the sample without access to HAP in year 2.<sup>†</sup>

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<sup>†</sup> For example, in a randomized control trial of HAP and not HAP, or a case-matched study comparing outcomes from hospitals in a county that had not implemented HAP, or in years 2 – 3 years prior to HAP intake (from 2001 to 2002).

**Figure 1. Illustration of observed data with and without HAP**

	Year 1*	Year 2
With HAP	Observed	Observed
Without HAP	Observed	Unobserved

\* Year 1 = months -12 to -1, Year 2 = months 0 to +11. HAP intake occurs in month 0.

In determining the effect of HAP, we assume similar visit and charges in year 1 prior to HAP intake. We observed visits and charges in year 2 with HAP; there were no observed data for year 2 in the absence of HAP. Thus, to estimate the fiscal impact of HAP, we were required to make assumptions about what would have happened to visits and charges in year 2 if HAP had not been implemented.

We assessed three scenarios for visits and charges over 2 years. In all scenarios, we assumed charges in year 1 were the same with and without HAP, but we considered variations in the charges occurring with and without HAP in year 2.

*Scenario 1* represents the basecase, assuming that without HAP, total and compensated charges in year 2 were based on the percent change in charges directly following an acute episode. To estimate the percent change, we used actual charges in the 0-4 months of an acute episode and set charges for each month from 5 to 11 equal to the average monthly charges in the 1-4 months after an acute episode. We conducted sensitivity analyses of different periods (from 0-4 months to only month 4) to impute average monthly charges in months 5 – 11. *Scenario 2* assumes that without HAP, the level of visits and charges in year 2 would have been identical to those observed in year 1. Therefore, charges across two years are equal to twice those observed in year 1. Effectively, the evaluation under this scenario assumes all increased charges and visits in year 2 are a consequence of HAP enrollment. *Scenario 3* assumes charges in year 2 without HAP would have been the same as those observed in year 2 with HAP, but uncompensated charges in year 2 would

have been the same as those observed in year 1. The evaluation under this scenario takes the opposite extreme from Scenario 2, assuming HAP had no impact on charges and visits over the second year. However, this scenario assumed that HAP may have been responsible for clients obtaining alternative sources of insurance and thereby increasing compensated charges.

For each scenario, revenue was estimated as compensated charges.<sup>‡</sup> Costs were estimated as total charges multiplied by a charge-to-cost ratio (C/C ratio). Because such information is proprietary, we applied a published C/C ratio of 50%<sup>2</sup> and conducted sensitivity analyses around this estimate in a range between 40-60%. We also computed the change from year 1 to year 2 in compensated charges and in the average of 2-year net revenue per client, equal to revenue minus costs. The average of 2-year net revenue per client also was estimated for a hypothetical cohort of 300 clients assumed to be similar in baseline demographics and health as those included in the dataset used for this appraisal.

### ***3.5 Role of the funding source***

This project was supported by funding from HAP through its CAP grant. The sponsors of the study collected data from partner hospitals and provided SPHERE with datasets upon which analyses were performed. HAP and the partner hospitals requested the opportunity to review the report in draft format, but SPHERE made final decisions on all aspects of the analyses and the report.

## **4 Results**

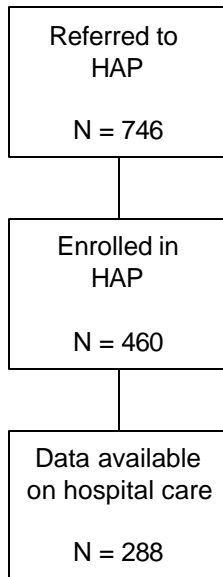
### ***4.1 Analysis population and baseline characteristics***

Seven hundred forty-six persons were referred to HAP between February 20, 2002 and December 31 2002. Four hundred eighty-eight were enrolled in HAP, 469 of whom were enrolled prior to December 31, 2002. Local hospital partners had data on 288 clients; this final subset comprised the analysis population (**Figure 2**).

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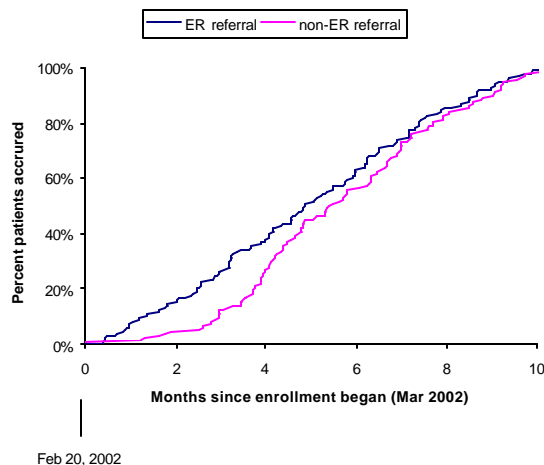
<sup>‡</sup> Actual revenue will depend on the ability of the hospital to recoup compensated charges.

**Figure 2. Client flow**

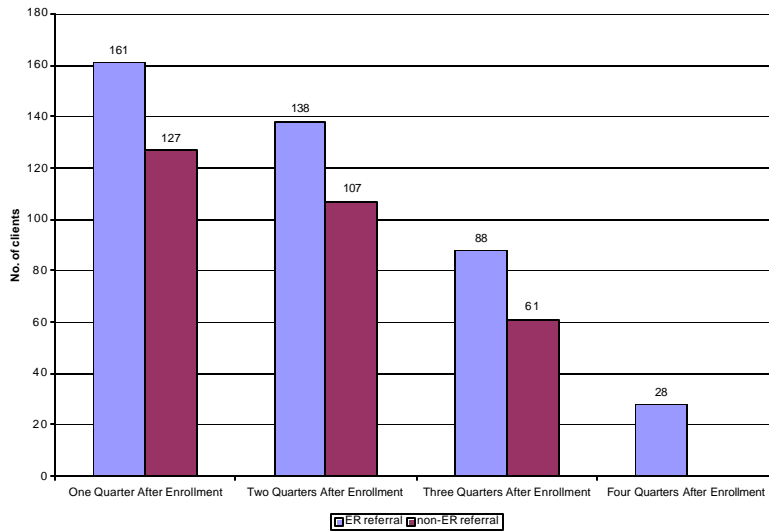


**Appendices 2 and 3** contain detailed summaries of findings by quarter and stratified by referral source (ER and non-ER). The mean client age was 39.3 years (SD 14.3, range 2 - 98) and 63% were women. Spanish or English was the preferred language for more than 90% of clients. Fifty-six percent of clients were referred from the ER. **Figure 3** shows the rate of accrual into HAP for these patients since February 20, 2002 and **Figure 4** shows the percent of patients available for observation post-HAP by quarter.

**Figure 3. Accrual rate into HAP**



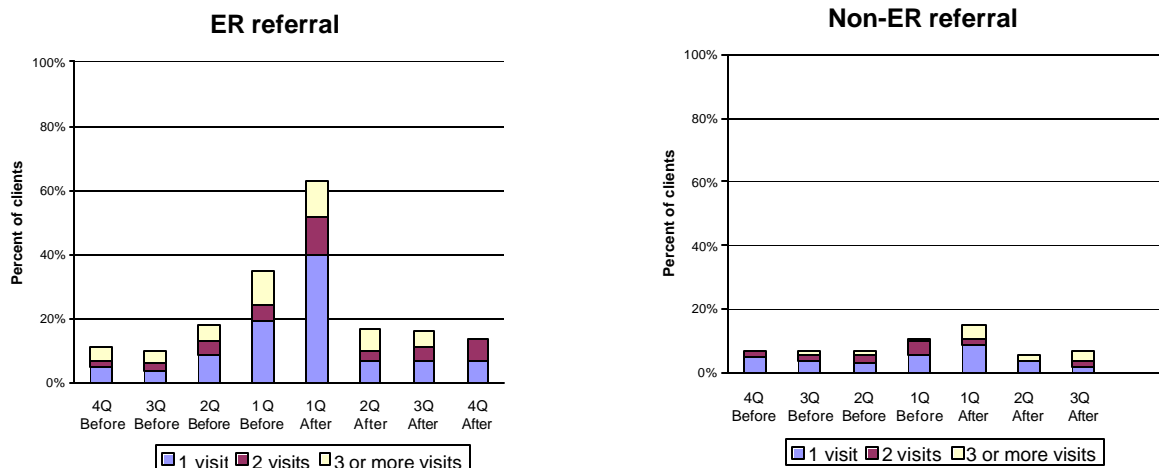
**Figure 4. Percent of patients followed since HAP intake**



**4.2 Trends in observed visits and charges in Years 1 and 2 (pre- and post-HAP intake, respectively)**

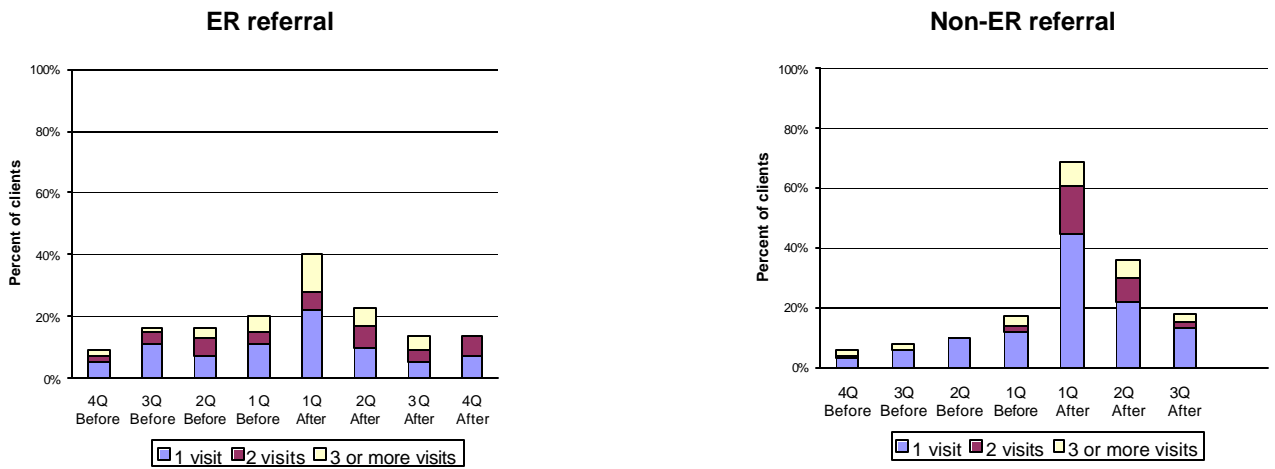
Among clients referred from the ER, the percent with ER visits increased for several quarters prior to HAP intake (**Figure 5**). In contrast, among clients referred from non-ER sources, fewer clients had ER visits and there was a much smaller increase in the percent with ER visits prior to HAP intake.

**Figure 5. Trends of percent of patients with ER visits, by referral source and no. of visits**



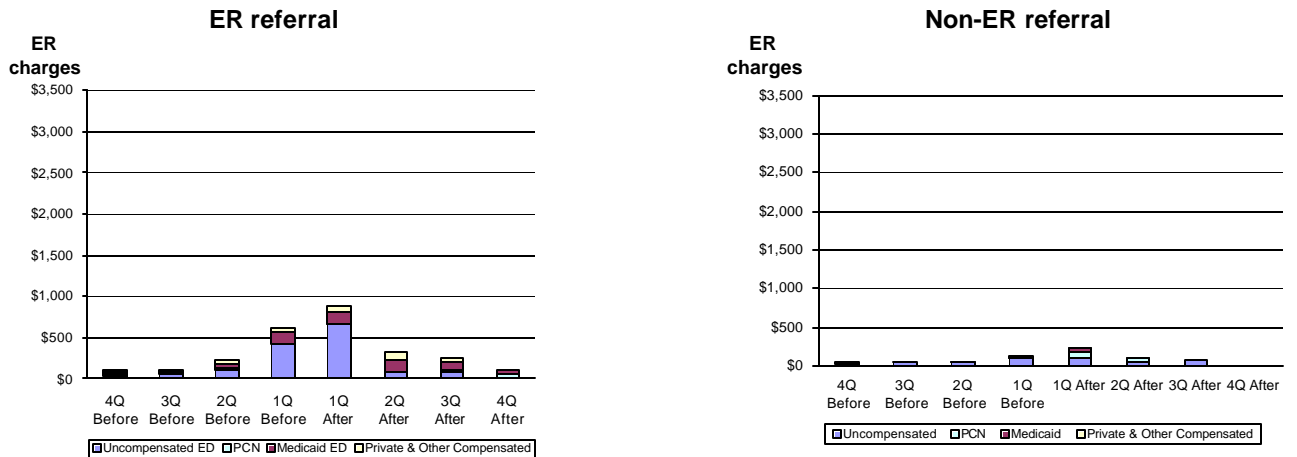
The percent of clients with non-ER visits was higher among clients referred from the ER than among clients referred from other sources. In contrast with ER visits, there was a relatively small increase in the percent of clients with non-ER visits prior to HAP (Figure 6). Among clients referred from non-ER sources, the percent with non-ER visits increased substantially after HAP intake.

**Figure 6. Trends of percent of patients with non-ER visits, by referral source and no. of visits**

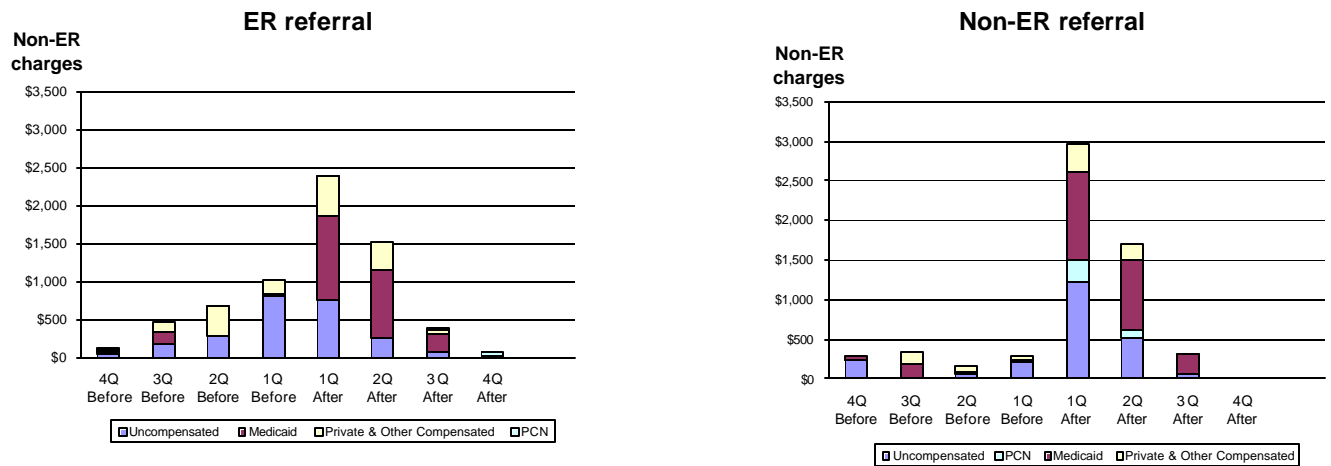


Similar patterns are found if trends are analyzed by month or by average visits per clients (see Appendices 4 and 5). The trends seen in ER and non-ER charges closely follow the patterns found with visits (Figures 7 and 8).

**Figure 7. Trends of ER charges, by referral source and insurance**



**Figure 8. Trends of non-ER charges, by referral source and insurance**



The fraction of all charges that was compensated in year 1 was 49% (51% for ER visits and 47% for non-ER visits). This fraction increased to 61% in year 2 (66% for ER visits and 54% for non-ER visits; **Table 1**).

**Table 1. Observed cumulative charges (total and compensated) pre- and post-HAP, by referral source**

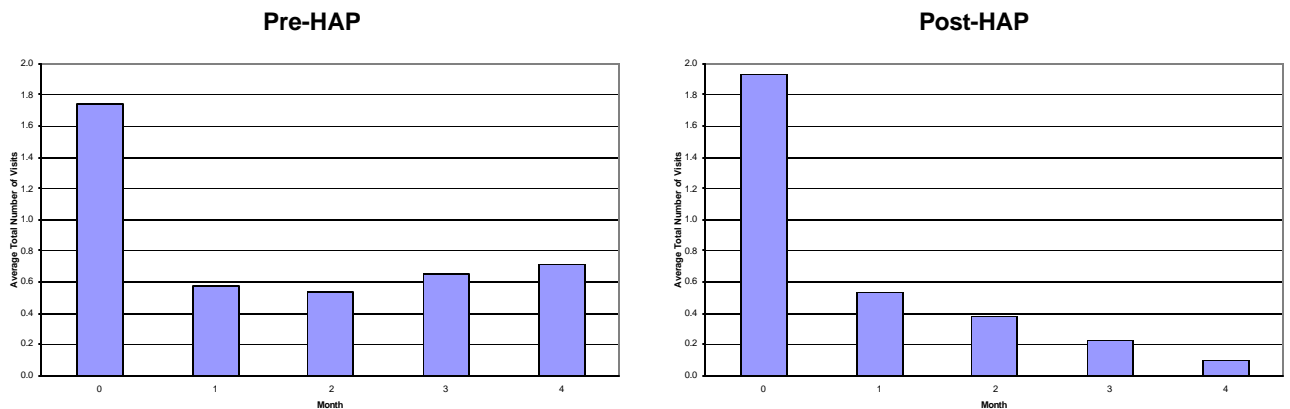
Referral Source	Pre-HAP	Post-HAP
<b>ER referral</b>		
Compensated	\$2,226	\$4,305
Total	\$4,402	\$6,515
% Compensated	51%	66%
<b>Non-ER referral</b>		
Compensated	\$706	\$2,898
Total	\$1,487	\$5,408
% Compensated	47%	54%
<b>All *</b>		
Compensated	\$1,556	\$3,685
Total	\$3,117	\$6,027
% Compensated	49%	61%

\* Weighted average (56% referred from ER)

### 4.3 Analyses of acute episodes

In the 4 months after an acute episode prior to HAP, there was relatively little change in the average number of visits per client (n=43 episodes). By contrast, after HAP intake (n=87 episodes), there was a steady decline in the average number of visits per client (**Figure 9**), suggesting that acute episodes were managed differently after HAP enrollment. For example, acute episodes occurring after HAP enrollment were treated more intensively during the first month compared to episodes occurring during the pre-enrollment period. Moreover, the number of visits per month following an acute episode occurring after HAP enrollment declined steadily over time, a pattern that was not observed for acute episodes occurring prior to HAP. In fact, there was a modest rise in the average number of visits from the third and fourth month following an acute episode during the pre-HAP period. This pattern suggests that patients experiencing an acute episode in the pre-enrollment period were more likely to have unresolved needs than patients with acute episodes occurring in the post-enrollment period. This pattern was seen for both ER and non-ER visits (See **Appendices 6 and 7**).

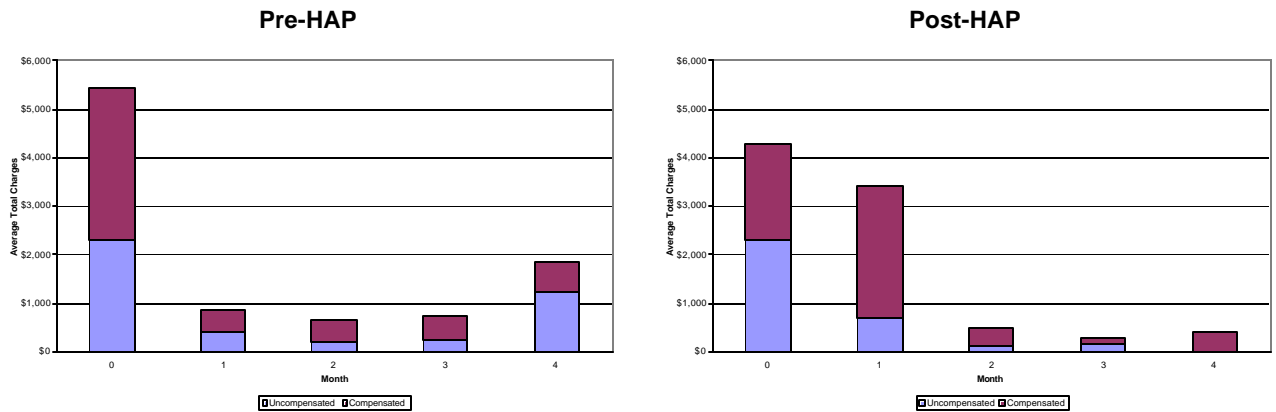
**Figure 9. Average of all monthly visits after acute episode, pre and post HAP**



After an acute episode in the pre-HAP periods, the average monthly charges dropped significantly from the month after the acute episode (**Figure 10**). The fraction of charges that were uncompensated remained relatively unchanged for the next several months following the episode. In the month immediately after an acute episode in the post-HAP period, there was a substantially higher level of charges compared with the same month

in the pre-HAP period, with a higher fraction of compensated charges. Then, there was a marked reduction in total charges accruing during the second, third, and fourth months following an episode. Despite lower number of visits in the post-HAP period, the charges per compensated non-ER visit were 49% higher than pre-HAP.

**Figure 10. Average monthly charges after acute episode, pre and post HAP**



Total charges were 1% higher post-HAP and compensated charges were 42% higher post-HAP. These analyses suggest that HAP reduced the total number of visits, increased the charge per visit, and increased the fraction of charges that was compensated.

The total charges before HAP intake equaled \$1,285,996. Charges associated with acute episodes before HAP intake equaled \$829,014; hence, the share of costs explained by acute episodes was 64%, indicating that the acute-episode analysis captured a large proportion of the fiscal impact of HAP.

#### 4.4 Fiscal implications

**Table 2** summarizes the projected relative year 2 effects of HAP on total and compensated charges for each scenario. Scenario 2 projects increases in both total and compensated charges, with a larger increase in compensated charges. Scenario 3 projects increases in only compensated charges.

**Table 2. Relative year 2 effects on total and compensated charges, by scenario**

Scenario	Total charges	Compensated charges
1	1%	42%
2	93%	137%
3	0%	137%

(HAP minus w/o HAP) ÷ (w/o HAP)

In Scenario 1, using results from analyses of acute episodes, without HAP resulted in projected negative net revenue over 2 years (-\$391 per client, -\$117,418 per cohort; **Table 3**). With HAP, costs increased slightly (by \$30) because of the 1% increase in year 2 total charges. Revenue increased by \$1,090 because of the 42% increase in year 2 compensated charges. Uncompensated charges over both years decreased by 12% with HAP. Consequently, net revenue with HAP over 2 years was positive (\$669 per client, \$200,571 per cohort). Comparison of HAP to without HAP resulted in a projected increase in average net revenue per client of \$1,060, or \$317,988 per cohort.

**Table 3. Results of Scenario 1**

Total *	With HAP	w/o HAP	Difference
Revenue	\$5,240	\$4,150	\$1,090
Costs	\$4,572	\$4,542	\$30
% Uncompensated charges	43%	54%	-12%
Net revenue ¶			
Per client	\$669	(\$391)	\$1,060
Per cohort ‡	\$200,571	(\$117,418)	\$317,988

\* 2-year period.

¶ Equal to revenue minus costs.

‡ Based on hypothetical cohort of 300 clients.

The following table shows the effect of changing the period by which we impute the average monthly charges in months 5-11. Month 0 is not included because the level of charges in this month was used as an entry criteria.

**Table 4. Effect on net revenue of different periods to impute average charges for months 5 to 11**

Months *	Percent change in year 2 charges		Net revenue per client ¶
	Total	Compensated	
1-4	1%	42%	\$1,060
2-4	0%	42%	\$1,090
3-4	-39%	-18%	\$1,118
4	-47%	-10%	\$2,263

\* Used to impute average charges for months 5-11. Total year 2 results based on months 0-11.

¶ Attributed to HAP

This table reveals the marked reductions in total and compensated charges at successively later months after HAP, with a greater absolute reduction in total charges than in compensated charges. This table suggests that if the patterns of care in months 5-11 are more closely matched with those found in months 3 and 4, then the basecase estimates of net revenue attributable to HAP in these analyses are conservative.

Scenario 2 also projects negative net revenue over 2 years of \$5 per client and \$1,536 per population (**Table 5**). These estimates are lower than shown in Scenario 1 because of the assumption that there would have been no increase in services without HAP among a population of patients largely enrolled from ER. The estimates with HAP are the same as in Scenario 1. Consequently, the comparison of HAP to the situation without HAP projects a 7% decrease in uncompensated charges and an average net revenue per client of \$674, or \$202,107 per cohort.

**Table 5. Results of Scenario 2**

Total *	With HAP	w/o HAP	Difference
Revenue	\$5,240	\$3,111	\$2,129
Costs	\$4,572	\$3,117	\$1,455
% Uncompensated charges	43%	50%	-7%
Net revenue ¶			
Per client	\$669	(\$5)	\$674
Per cohort ‡	\$200,571	(\$1,536)	\$202,107

\* 2-year period.

¶ Equal to revenue minus costs.

‡ Based on hypothetical cohort of 300 clients.

In Scenario 3, the costs without HAP are equal to those with HAP because this scenario assumes that these visits and charges would have occurred regardless of HAP (**Table 6**). Because Scenario 3 assumes that HAP increased the availability of insurance, the fraction of charges that are uncompensated declined from 66% to 43%. Thus, revenue is expected to increase by \$2,129. This results in a projected increase in average net revenue per client between HAP and without HAP of \$2,129, or \$638,649 per cohort.

**Table 6. Results of Scenario 3**

Total *	With HAP	w/o HAP	Difference
Revenue	\$5,240	\$3,111	\$2,129
Costs	\$4,572	\$4,572	\$0
% Uncompensated charges	43%	66%	-23%
Net revenue ¶			
Per client	\$669	(\$1,460)	\$2,129
Per cohort ‡	\$200,571	(\$438,078)	\$638,649

\* 2-year period.

¶ Equal to revenue minus costs.

‡ Based on hypothetical cohort of 300 clients.

Altering the C/C ratio between 40% and 60% impacts the projected net revenue occurring under the three potential scenarios (**Table 7**), with smallest net revenue occurring when the C/C is set equal to 60% for Scenario 2 and the largest net revenue arising from Scenario 3 regardless of C/C ratio. In scenario 3, varying the C/C ratio has no effect on the difference in cost because they are assumed to be identical regardless of HAP.

## 5 Discussion

### 5.1 Summary

In the quarters immediately prior to HAP intake, the percent of clients with ER visits increased, reaching a peak in the quarter after intake. We anticipated the gradual increase in ER visits prior to and peaking at HAP intake because ER referral was believed to be an indicator of acute illness and the event that triggered enrollment in HAP for most clients. In addition, we believed that the illness leading to the ER referral may have begun manifesting prior to HAP intake in some cases, suggesting that more than one visit to an ER may have occurred for some clients before being referred to and enrolled in HAP.

**Table 7. Sensitivity analyses, changing C/C ratio from 40-60%**

Charge-to-cost ratio / scenario	Average net revenue per client	Average difference between HAP and scenario in population net revenue *
40%		
HAP	\$1,583	--
Scenario No. 1	\$1,043	\$319,779
Scenario No. 2	\$618	\$289,416
Scenario No. 3	(\$546)	\$638,649
50%		
HAP	\$669	--
Scenario No. 1	\$1,031	\$317,988
Scenario No. 2	(\$5)	\$202,107
Scenario No. 3	(\$1,460)	\$638,649
60%		
HAP	(\$246)	--
Scenario No. 1	\$1,019	\$316,198
Scenario No. 2	(\$628)	\$114,799
Scenario No. 3	(\$2,375)	\$638,649

\* Hypothetical cohort of 300 clients.

In contrast to the pattern of observed ER visits, non-ER visits were relatively unchanged prior to HAP and increased predominantly in the quarter after HAP intake. The question arises whether this increase was a consequential effect of HAP? The analyses of acute episodes is the most direct evidence showing that the average monthly visits declined steadily for 4 months after HAP intake, compared with little change in visits in the months following an acute episode occurring in the pre-HAP period.

These findings suggest that the temporary increases in ER and non-ER visits after enrollment in HAP, as observed in the descriptive analyses of time trends, would have happened in the absence of HAP. This is not surprising because much of the population was indigent, uninsured, and referred from the ER, thereby having a relatively high likelihood of being acutely or chronically ill. Moreover, the acute-episode analyses provide evidence, albeit circumstantial, that HAP reduced the number of visits. Last, HAP appears to have resulted in 50% higher charges per visit and a 42% higher fraction of charges that was compensated. The fiscal analyses over 2-years suggest that HAP

resulted in a substantial gain in net revenue, equal to approximately \$320,000 for a hypothetical cohort of 300 clients.

## **5.2 *Review of prior evaluations***

Several evaluations have attempted to estimate the impact of improved case-management for indigent patients identified through emergency services. In most instances, they attempt to draw inferences from comparisons of data before and after implementation of the program, using the clients/patients as their own controls. The available reports also show differences in the objectives of the program, the criteria for selecting patients who may be enrolled in the program, how the programs were implemented, and in the outcomes of the evaluation. Below, we briefly summarize the findings of these evaluations.

Okin et al. collected data on 53 patients who used the ER five or more times in 12 months, and compared utilization, cost, and psychosocial variables 12 months before and after a case-management intervention.<sup>3</sup> They found substantial reductions in median ER visits and costs. The investigators fully acknowledged the limitation of the pre-post comparative methodology employed, where patients serve as their own controls. They indicated plans to undertake a randomized controlled trial of this intervention. In addition, it is notable that the population they recruited had substantially more visits per client than the rates for clients enrolled in HAP.

In March 1999, the Accessing Community Care through Eastside Social Services (ACCESS; Gainesville, Florida) program began providing primary care services to uninsured patients not eligible for state, federal, or local medical assistance.<sup>4</sup> Patients were eligible if they had one of five chronic conditions (hypertension, diabetes, asthma, congestive heart failure, and chronic obstructive pulmonary disease) and were not eligible for Medicaid or Medicare. Davidson et al. evaluated service use and costs in the year before and after enrollment of 91 patients, reporting a marked reduction in ER visits and mean ER charges, but no change in inpatient admissions.

The Buncombe County Medical Society Project Access (Asheville, North Carolina) sought to improve access to health care for uninsured county residents who are 200%

below FPL. The program is a coordinated system of physician volunteer services. During 1998, 4,094 patients received free care. They collected data on 1,668 participants enrolled in 1997, evaluating health care access, utilization, insurance status, ability to work, and health status using the 12-item MOS short-form (SF-12).<sup>5</sup> The available evaluation leaves unstated the period for the evaluation or analysis plan. They report that 23% of participants had obtained health insurance and 80% stated their health was either “much better” or “better” than when they enrolled in the program. Moreover, they find an 11% increase in the percent of patients employed for wages.. Details about the use of hospital services are not provided.

The Sedgwick County Project Access is a physician-driven program to connect low-income uninsured patients to specialty care and hospital services, with specific aims to encourage more appropriate use of primary care resources and reduce the use of local ERs. They conducted an evaluation of the program using the program’s database of patients’ demographic information, hospital administrative data, and physician office administrative data.<sup>6</sup> Comparison were made between 1 and 2 years (1999 and 2000) after program was initiated. The primary outcome was use of physician and hospital services. They provided services to 566 patients in year 1, which increased by 116 in year 2. This evaluation was not designed to compare changes before and after initiation of the program. In addition, the comprehensiveness of data collection is not addressed in the report. They report a decline in average charges per hospital admission and total hospital charges per patient from 1999 to 2000, but an increase in total admissions per patients.

### **5.3 Implications**

#### *5.3.4 Reducing bias in non-randomized appraisals*

As these various evaluations reveal, conclusions about the effects of a program on the improvement of access and coordination of comprehensive health care for low-income, uninsured, and underinsured residents are influenced by many factors. These include details about how clients are selected, what outcomes are measured, completeness of the data collection process, and whether the analyses are able to control for expected temporal changes in the use and costs of services. With respect to uncontrolled temporal changes, Kne et al. studied the pattern of ER use over 4 years in a cohort of 79 patients

who had at least 10 visits in the preceding year (from 8/90 to 7/91).<sup>7</sup> Unrelated to a specific intervention, patients identified as frequent users of ER services showed a marked reduction in services over time.

Our analyses differ from previous ones in several ways. Most importantly, we applied a conventional, but underutilized, method for inferring the effects of HAP from non-randomized data. Specifically, we matched on episodes of acute care before and after HAP intake and examined the changes in visits and charges associated with HAP. Such matching is important to help reduce sources of unobserved heterogeneity when comparing effects of programs. This methodology also avoids biases that may be introduced because of attrition after HAP (right-censoring) and uncertainties about whether clients were living in the county for the full year prior to HAP (left censoring).

Randomization is clearly an effective means for limiting the risk of unobserved heterogeneity. Although this is the most prevalent and credible methodology used to test drug safety and efficacy, randomized trials are applied to a much lesser degree in the evaluation of social programs. A trial was unrealistic for a timely and relevant evaluation of HAP. For example, although the findings of a trial as proposed by Okin et al. will contribute an important test of whether a case-management program can reduce ER visits and charges, it may be of limited usefulness to local partner hospitals or to HAP because of key differences in client eligibility and in the ways services are organized and provided.

Another design involves comparing the outcomes of HAP enrollees to those of a 'reference' group that has similar characteristics at the baseline as the intervention group but who are not enrolled in HAP, such as from a similar county in Utah or from the prior 2 years in SLC. This approach requires more comprehensive data collection beyond the scope of resources available to HAP at this time.

### *5.3.5 Projecting fiscal impact*

At such an early phase in any such program's existence, it would be unreasonable to expect that the program has reached steady-state; that is, its maximum capacity to achieve its goals. Consequently, most early evaluations are focused on a program's adherence to

desired processes, such as (1) responsiveness to stakeholder issues, (2) adherence to the principles and values of the program, (3) staff development, and (4) fiscal management. Based on information provided by program staff, HAP is on track to satisfy most, if not all, these objectives.

Typically, during subsequent years (e.g., years 2 -3) of an evaluation--once the program is at steady-state and when there has been sufficient follow-up of clients--the focus moves towards evaluation of outcomes. For example, a specific aim that HAP has identified is to assist clients who previously used the ER as their main source of health care to create an outpatient medical 'home' among the volunteer network of community physicians. Achieving this goal was expected to reduce the client population's mean rate of ER use. Because a potential risk of such a strategy is that there would be identification of other problems, we expected an increase in the use of non-ER services.<sup>§</sup> While the time trend analysis would seem to confirm our *a priori* hypotheses, the acute-episode analyses suggest that HAP reduced both ER and non-ER visits compared with what would have happened without HAP.

Interpretation of the fiscal impact of HAP depends on creating credible scenarios for what would have happened without HAP. Creating scenarios required addressing the following questions:

- Can we improve our comparisons by looking at certain DRGs?
- What C/C ratio should be used to estimate costs?
- Should charges associated with the PCN be included as compensated or uncompensated charges?
- What is the best imputation method to annualize the effects seen in the 5 months of the acute-episode analysis, or should we assume the effects last for only the months of the analyses?
- How do we construct appropriate lower and upper bounds of HAP effects?

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<sup>§</sup> From Project Analysis Plan (1/24/03).

## Health Access Project Fiscal Implications

- Should the size of the hypothetical cohort be approximate to that in the study or should it be based on the total number of clients that have been enrolled in HAP?
- How should we assess actual revenue in the absence of data on hospitals' ability to recoup charges?

In general, when conducting such analyses, it is important to be transparent in all the key assumptions and when judgments arise--and they necessarily will--to bias the analyses against conclusions that may be favorable to the funding source. It is also important to test the implications of deviations from these assumptions. Assumptions that unambiguously were biased against interests of the funding source were: (1) including the PCN as an uncompensated charge, (2) setting the size of the hypothetical cohort approximately equal to the size of the study population, (3) imputing monthly charges for months 5-11 from estimates of all months after an acute episode, e.g., average of months 1-4 instead of months 3-4.

The impact of doubling the size of the cohort on net revenue can be estimated by simply doubling the estimates provided in the tables, but the reliability of this estimate depends on the extent to which the next 300 HAP clients have characteristics similar to those of the study cohort that would predict an equivalently effect. Consequently, firm conclusions cannot be drawn without analysis of the other HAP clients who are not included in the available data.

The implications of recouping a fraction less than 100% of compensated charges can be readily estimated from the data we have provided. Similarly, hospitals can use the sensitivity analyses to understand the impact of their own C/C ratio on fiscal projections.

We chose to annualize the effects of HAP because of the promise of the persistent beneficial effect on reducing visits found with HAP after an acute episode. If we had restricted the fiscal analysis to a time horizon of just 5 months post-HAP, the net revenue gains would have declined by approximately 40%. Longer follow-up than could be reasonably assessed at this early stage of the program is needed to determine how durable the effect of HAP is on visits and charges.

We realize that Scenarios 2 and 3 are unlikely, and they are intended to provide extreme boundary conditions. They also illustrate how varying assumptions on total and compensated charges affects net revenue. In the acute-episode analyses, we did not present estimates of sampling variability, e.g., 95% confidence intervals, because they could give the reader a false impression of precision when factors other than sampling variability are likely to have greater influence on the estimates.

#### **5.4 *Concluding remarks***

The dilemma of limited access to and appropriate use of health care by indigent, underinsured US residents is well documented in the literature. What is less certain is how to solve this problem. In the late 1990s, community-based case management programs that help identify residents who might benefit from services through an established network of coordinated care became an important innovation. Evaluations of these programs have been limited in scope and in the methodologies for limiting biases, making it difficult to draw reasonable inferences about such programs' value and costs. This lack of evidence may partially explain the difficulty of sustaining federal funding for case management programs, particularly at a time with rising deficits and attention focused on other areas.

Matching by acute episode before and after HAP intake, we found HAP was associated with 25% fewer total visits and 42% higher compensated charges, with slight change in total charges. The benefit to local hospital partners will depend on the fraction of compensated charges that can be recouped from third-party payers. Assuming payment in full for a hypothetical cohort of 300 clients, local hospital partners are projected to realize a 2-year net revenue between \$202,000 to \$639,000.

## 6 Appendices

### Appendix 1. Local partner hospitals

#### Intermountain Health Care Hospitals (IHC)

IHC LDS Hospital † ¶  
8<sup>th</sup> Avenue & C Street  
Salt Lake City, Utah 84143  
[www.ihc.com/ldsh](http://www.ihc.com/ldsh)  
Licensed beds 520

IHC Cottonwood Hospital † ¶  
5770 South 300 East  
Murray, Utah 84107  
[www.ihc.com/cottonwood](http://www.ihc.com/cottonwood)  
Licensed beds 227

IHC Alta View Hospital † ¶  
9660 South 1300 East  
Sandy, Utah 84094  
[www.ihc.com/altaview](http://www.ihc.com/altaview)  
Licensed beds 70

IHC Primary Children's Medical Center †  
100 North Medical Drive  
Salt Lake City, Utah 84113  
[www.ihc.com/primary](http://www.ihc.com/primary)  
Licensed beds 232

#### University Hospital † ¶

50 North Medical Drive  
Salt Lake City, Utah 84132  
[www.med.utah.edu](http://www.med.utah.edu)  
Licensed beds 425

#### St. Marks Hospital †

1200 East 3900 South  
Salt Lake City, Utah 84124  
[www.stmarkshospital.com](http://www.stmarkshospital.com)  
Licensed beds 299

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† Contributed data to this evaluation

¶ Referral source of clients in evaluation

## Health Access Project Fiscal Implications

### IASIS Hospitals

Salt Lake Regional Medical Center  
1050 E South Temple  
Salt Lake City, Utah 84102  
[www.saltlakeregional.com](http://www.saltlakeregional.com)  
Licensed beds 200

Pioneer Valley Hospital <sup>¶</sup>  
3460 S Pioneer Parkway  
West Valley City, Utah 84120  
[www.pioneervalleyhospital.com](http://www.pioneervalleyhospital.com)  
Licensed beds 139

Jordan Valley Hospital  
3580 West 9000 South  
West Jordan, Utah 84088  
[www.jordanvalleyhospital.com](http://www.jordanvalleyhospital.com)  
Licensed beds 50

**Appendix 2. Summary of data on clients referred from ER**

Variable	Quarter since HAP Intake							
	4 Quarters Before	3 Quarters Before	2 Quarters Before	1 Quarter Before	1 Quarter After	2 Quarters After	3 Quarters After	4 Quarters After
Sex †								
Female					59%	58%	58%	50%
Male					41%	42%	42%	50%
Preferred Language †								
English					46%	49%	52%	57%
Spanish					48%	45%	39%	32%
Other					6%	7%	9%	11%
Insurance Source of Visits								
Not insured	60%	44%	69%	82%	84%	67%	40%	50%
Medicaid	17%	31%	14%	23%	20%	33%	45%	67%
Medicare	0%	0%	0%	0%	0%	0%	0%	17%
Private	30%	36%	33%	14%	10%	20%	20%	0%
Other	0%	0%	0%	0%	2%	0%	0%	0%
PCN	7%	0%	2%	1%	2%	7%	10%	17%
ER Visits								
% with at least one ER Visit	11%	10%	18%	35%	63%	17%	16%	14%
% with more than one ER visit	6%	6%	9%	16%	23%	10%	9%	7%
% with more than two ER Visits	4%	4%	5%	11%	11%	7%	5%	0%
Non-ER Visits								
% with at least one ER visit	9%	16%	16%	20%	40%	23%	14%	14%
% with more than one ER visit	4%	5%	9%	9%	18%	13%	9%	7%
% with more than two ER Visits	2%	1%	3%	5%	12%	6%	5%	0%
Average ER Charges by Source								
Uncompensated Care	\$47	\$54	\$117	\$417	\$672	\$90	\$79	\$0
Medicaid Compensated Care	\$5	\$23	\$46	\$148	\$141	\$148	\$89	\$38
Medicare Compensated Care	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$19
Private Compensated Care	\$23	\$30	\$57	\$61	\$80	\$97	\$50	\$0
Other Compensated Care	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
PCN (Un)compensated Care	\$23	\$0	\$20	0	\$3	\$0	\$31	\$72
Average Non-ER Charges by Source								
Uncompensated Care	\$52	\$178	\$282	\$810	\$762	\$262	\$87	\$14
Medicaid Compensated Care	\$23	\$63	\$250	\$788	\$1,263	\$1,313	\$122	\$31
Medicare Compensated Care	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Private Compensated Care	\$13	\$121	\$387	\$188	\$498	\$357	\$39	\$0
Other Compensated Care	\$0	\$0	\$0	\$0	\$20	\$0	\$0	\$0
PCN (Un)compensated Care	\$0	\$0	\$171	\$5	\$1	\$133	\$4	\$0
Total ER Charges, mean	\$99	\$108	\$239	\$626	\$895	\$334	\$250	\$128
Total Non-ER Charges, mean	\$89	\$362	\$1,090	\$1,790	\$2,544	\$2,065	\$251	\$45
Number of cases †					161	153	100	53
No. of cases with visits	30	36	42	73	128	50	27	10

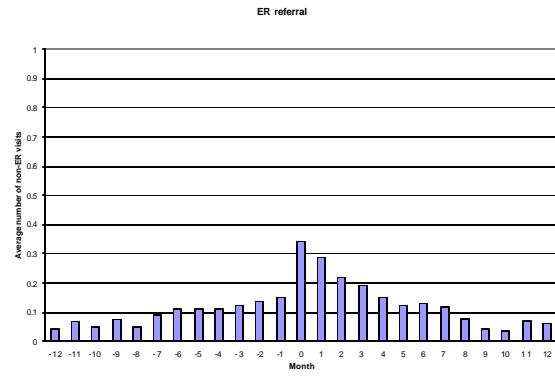
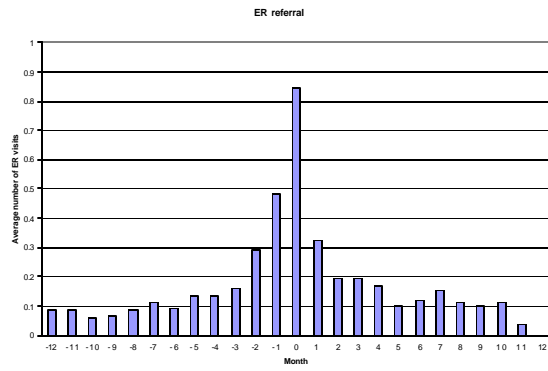
† The actual no. of clients and these characteristics in quarters before HAP intake are not observed.

**Appendix 3. Summary of data on clients referred from non-ER source**

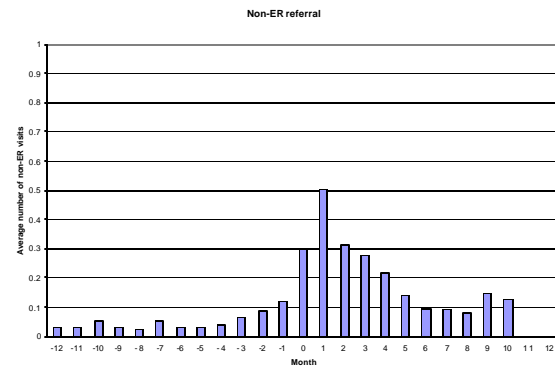
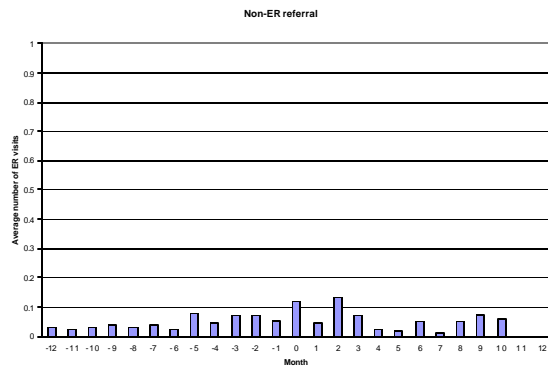
Variable	Quarter since HAP Intake							
	4 Quarters Before	3 Quarters Before	2 Quarters Before	1 Quarter Before	1 Quarter After	2 Quarters After	3 Quarters After	4 Quarters After
Sex †								
Female					69%	71%	67%	0%
Male					31%	29%	33%	100%
Preferred Language †								
English					46%	43%	52%	100%
Spanish					46%	49%	43%	0%
Other					8%	9%	5%	0%
Insurance Source of Visits								
Not insured	56%	56%	50%	75%	74%	56%	75%	67%
Medicaid	6%	17%	6%	14%	14%	26%	17%	33%
Medicare	0%	0%	0%	0%	0%	0%	0%	0%
Private	38%	28%	39%	14%	9%	12%	17%	33%
Other	6%	6%	0%	0%	10%	9%	0%	0%
PCN	6%	6%	17%	11%	9%	5%	0%	0%
ER Visits								
% with at least one ER Visit	7%	7%	7%	11%	15%	6%	7%	40%
% with more than one ER visit	2%	3%	4%	5%	6%	2%	5%	20%
% with more than two ER Visits	0%	1%	1%	1%	4%	2%	3%	20%
Non-ER Visits								
% with at least one non-ER visit	6%	8%	10%	17%	69%	36%	18%	20%
% with more than one non-ER visit	3%	2%	0%	5%	24%	14%	5%	0%
% with more than two non-ER visits	2%	2%	0%	3%	8%	6%	3%	0%
Average ER Charges by Source								
Uncompensated Care	\$35	\$42	\$42	\$100	\$114	\$63	\$74	\$198
Medicaid Compensated Care	\$0	\$0	\$3	\$15	\$57	\$0	\$0	\$643
Medicare Compensated Care	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Private Compensated Care	\$28	\$16	\$10	\$4	\$15	\$9	\$12	\$140
Other Compensated Care	\$2	\$0	\$0	\$0	\$2	\$0	\$0	\$0
PCN (Un)compensated Care	\$0	\$0	\$0	\$0	\$57	\$30	\$0	\$0
Average Non-ER Charges by Source								
Uncompensated Care	\$249	\$17	\$74	\$212	\$1,225	\$513	\$75	\$55
Medicaid Compensated Care	\$37	\$172	\$0	\$24	\$1,111	\$895	\$230	\$0
Medicare Compensated Care	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Private Compensated Care	\$113	\$44	\$92	\$51	\$232	\$124	\$2	\$0
Other Compensated Care	\$0	\$95	\$0	\$0	\$126	\$83	\$0	\$0
PCN (Un)compensated Care	\$1	\$1	\$5	\$3	\$266	\$93	\$0	\$0
Total ER Charges, mean	\$65	\$58	\$55	\$119	\$245	\$102	\$87	\$981
Total Non-ER Charges, mean	\$400	\$329	\$171	\$291	\$2,961	\$1,708	\$307	\$55
Number of cases †					127	107	61	5
No. of cases with visits	16	18	18	28	94	47	16	8

† The actual no. of clients and these characteristics in quarters before HAP intake are not observed.

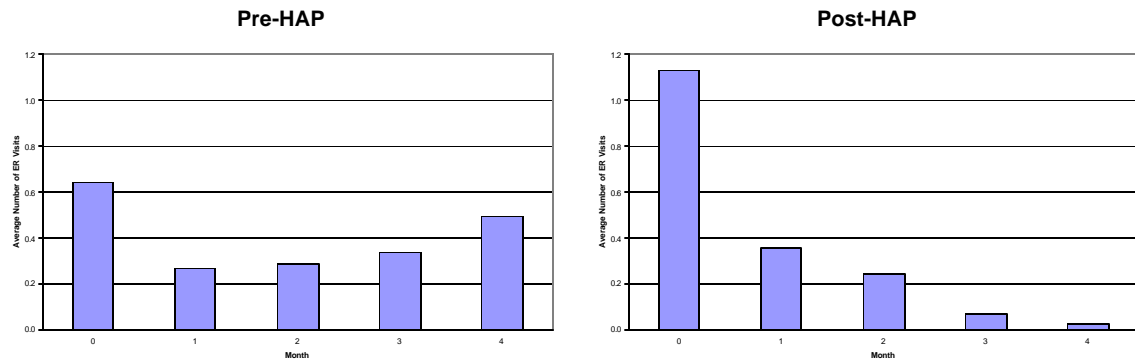
**Appendix 4. Trends of average monthly ER visits, by referral source**



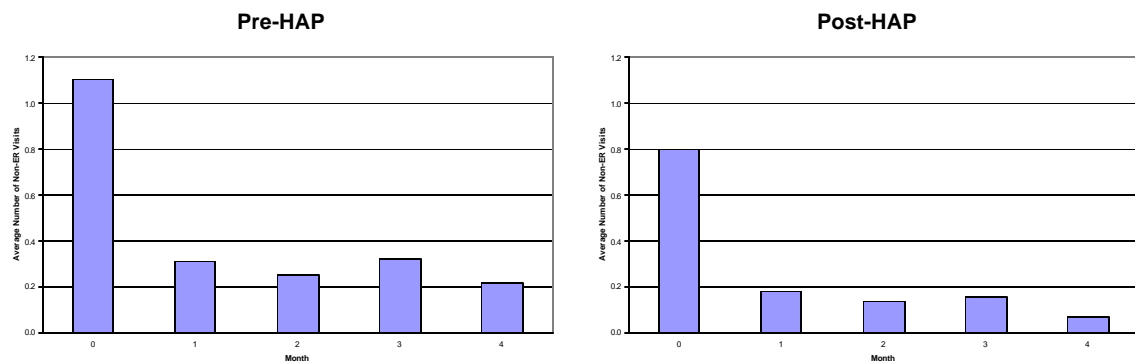
**Appendix 5. Trends of average monthly non-ER visits, by referral source**



**Appendix 6. Average monthly ER visits after acute episode, pre and post HAP**



**Appendix 7. Average monthly non-ER visits after acute episode, pre and post HAP**



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