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**Primary Care of Patients
with Hypertension By
Community Health
Centers**

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***Jill Eden
Daniel O'Connor
Barbara Lepidus Carlson
Jerrilynn Regan***

Submitted to:

Health Resources and Services Administration
Bureau of Primary Health Care
4350 East-West Highway
Bethesda, MD 208 14

Submitted by:

Mathematica Policy Research, Inc.
600 Maryland Avenue, S.W.
Washington, DC 20024-25 12
(202) 484-9220

Project Officer: Jerrilynn Regan

Project Director: Jill Eden

PRIMARY CARE OF PATIENTS WITH HYPERTENSION BY COMMUNITY HEALTH CENTERS

Community health centers (CHCs) are private, not-for-profit or publicly supported organizations that provide primary health care in medically-underserved areas throughout the U.S. and its territories. These health centers play an integral role in the nation's safety net for people who lack health insurance or face other barriers to health care. As such, they receive substantial federal support through grant funds and the Medicaid and Medicare programs.

Until recently, comprehensive and nationally representative data on people who regularly use CHCs have not been available. In late 1994, the Bureau of Primary Health Care funded an in-person survey of CHC users modeled on the National Health Interview Survey (NHIS). The survey found that CHC users are disproportionately at risk for hypertension, and consequently, at serious risk for coronary heart disease, stroke, and premature death (Eden et al. 1997).

Ensuring optimal prevention, detection, and treatment of hypertension are thus a crucial priority for CHCs. This goal is underscored by the well-established efficacy of standard anti-hypertensive drug therapy and non-pharmacologic interventions (National Heart, Lung, and Blood Institute 1997). Not only does proper treatment lead to reduced blood pressure levels, but risk of dying has also been proven to drop with early detection and treatment of high blood pressure (USPSTF 1996). There is also growing evidence that changes in diet and exercise can, with minimal risk and little cost, improve patient outcomes and diminish need for prescription drugs (Whelton et al 1998; National Heart, Lung, and Blood Institute 1997).

Recommendations for optimal prevention, detection, and ongoing clinical management of hypertension in the primary care setting have been issued by many organizations (see, for example, the National Heart, Lung, and Blood Institute, 1997; the U.S. Preventive Services Task Force, 1996;

and Healthy People 2000, 1996). Although recommendations vary somewhat in perspective and details, the overall message is consistent:

- Blood pressure should be checked at every medical encounter and the results must always be communicated to the patient;
- Blood cholesterol level should also be monitored regularly and the results communicated to the patient;
- Patient compliance with pharmacologic and non-pharmacologic treatment must be improved;
- Patients should be routinely and repeatedly advised on how to: (1) modify one's diet (reduce saturated fat, cholesterol, and sodium intake; maintain adequate dietary calcium, potassium, and magnesium; and lose weight if overweight); (2) stop smoking; (3) limit alcohol intake; and (4) increase aerobic physical activity to 30 to 45 minutes most days.

The purpose of this paper is twofold: (1) to compare the prevalence of hypertension among adult CHC users with other low-income, vulnerable U.S. adults who may similarly face barriers to health care and (2) to assess whether CHC care of hypertensive patients meets nationally accepted standards. Using data from the CHC User Survey and the NHIS, we analyze rates of hypertension among subgroups of the low-income, adult population and the effects of regular use of CHCs on the quality of hypertension-related services they receive. Our quality measures are drawn from the federal government's Healthy People (HP) 2000 objectives for lifestyle modification and basic clinical steps for improving hypertension detection and control (see Figure 1).

FIGURE 1

HEALTHY PEOPLE 2000 OBJECTIVES RELATED TO
THE EARLY DETECTION, TREATMENT, AND CONTROL OF HYPERTENSION

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- Increase to at least 90 percent the proportion of people with high blood pressure who are taking action to help control their blood pressure, including:
 1. Taking medication
 2. Dieting to lose weight, cutting down on salt
 3. Exercising
 - Increase to at least 50 percent the proportion of people with high blood pressure whose blood pressure is under control
 - Increase to at least 75 percent the proportion of primary care providers who routinely:
 1. Advise cessation and provide assistance and follow-up for all of their tobacco-using patients.
 2. Screen for alcohol and other drug use problems and provide counseling and referral as needed.
 3. Provide nutrition assessment and counseling and/or referral to qualified nutritionists or dietitians.
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SOURCE: Healthy People 2000: National Health Promotion and Disease Prevention Objectives (U.S. Dept. of Health and Human Services, 1991)

METHODS

Source of Data

Data for these analyses came from two population-based surveys: the 1994 NHIS and the 1995 CHC User Survey. The 1994 NHIS sample includes 116,179 individuals in 45,705 households. NHIS has been a principal source of information on the health, health care utilization, and health care access of U.S. residents for decades. In 1994, a special supplement designed to capture data on national progress toward the Year 2000 objectives was included for one sampled adult per family in half the NHIS households. Part D of the supplement, “Heart Disease and Stroke,” includes a series of 10 questions about blood pressure and treatment for hypertension.

The CHC User Survey sample includes 1,932 users of a nationally representative sample of 48 CHCs. Sampling for the survey was conducted in two main stages. First, a stratified sample of 48 CHCs was selected from the 501 CHCs (in the contiguous 48 states) that received Section 330 funding from the Bureau of Primary Health Care and provided primary care services in 1994. Second, CHC users from the 48-center sample were chosen. To be eligible for the user sample, a person must have made at least one medical visit to a selected center during 1994. Migrant farm workers and the homeless-two important target populations for some CHCs-were excluded.

The CHC User Survey instrument was specifically designed to enable direct comparisons with the 1994 National Health Interview Survey and incorporated questions from the core NHIS survey as well as the Year 2000 Part D questions on hypertension. Data collection for the survey was conducted by Mathematica Policy Research, Inc., Princeton, NJ. The survey was administered, in 1995, using computer-assisted personal interviews at the CHC, at some other location that was convenient for the respondent, or over the telephone if no personal interview could be arranged.

Interviews were conducted in the respondent's preferred language; 81 percent in English. 14 percent Spanish (Mexican). 2 percent Spanish (other), 2 percent Chinese. and 1 percent other.¹

Variables Used in the Analysis

The analysis used identically worded questions (with identically worded response categories²) from both surveys. Two aspects of hypertension care were analyzed: advice on changes on lifestyles and clinical interventions. For some topics, such as dietary advice and prescriptions. CHC users were also asked if the service was received at the CHC. Whether the respondent received appropriate lifestyle advice was determined using three survey questions: *(1) Has a doctor or other health professional ever advised going on a diet or changing eating habits to help lower blood pressure? (2) Are you now following a doctor's or other health professional's advice to go on a diet or change eating habits to lower bloodpressure? (3) During your last routine checkup³ by a medical doctor or health professional (at the CHC for CHC users), were you asked about: Amount of physical activity or exercise? Smoking or use of other forms of tobacco? How much and how often drink alcohol? Whether use marijuana, cocaine, or other drugs? Diet and eating habits?*

Clinical interventions were assessed using the following survey questions: *(1) Was any medication ever prescribed by a doctor to help lower high bloodpressure? (2) Are you now taking medication to help lower high bloodpressure? (3) About how long has it been since you had your bloodpressure checked by a doctor or other health professional? (4) At that time, did the doctor*

¹Includes all other languages and interviews conducted with the aid of an interpreter (i.e., respondent's relative or CHC staff).

² There is one exception. There are two CHC User Survey response categories (i.e., yes and no) for the question, "Are you now taking this medication?" NHIS includes a third alternative response, "sometimes;" these responses were coded as "no" in our analysis.

³Refers to checkups occurring within the past year.

or health professional say your blood pressure was high, low, or normal? (5) Is your high blood pressure under control? (6) At your last routine checkup by a medical doctor or health professional. was your: Bloodpressure checked? Cholesterol level checked?

Study Sample Population

The study population was a pooled sample of 1,175 adult CHC users and 19,738 adult NHIS respondents. Of these, 393 CHC users and 4,852 NHIS respondents had “ever been told” by a doctor or other health professional that they had hypertension (including borderline cases). The pooled sample was further limited to those with family incomes less than 300 percent of the federal poverty level (FPL) and at least one contact with a “medical doctor or assistant” in the past 12 months. CHC users were also restricted to those who reported that their usual source of care was a CHC. Given these restrictions on the study population, we ultimately excluded 2,720 adults with hypertension; 129 from the CHC User Survey and 2,591 from NHIS. Thus, the final pooled study sample of adults with hypertension included 264 regular CHC users and 2,261 NHIS respondents.

Statistical Analysis

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We used SUDAAN, a specialized software package that adjusts for the complex sample designs of the CHC User Survey and NHIS. Prevalence estimates are weighted to reflect national population totals and are presented in the form of simple bivariate comparisons between CHC users and U.S. residents (as represented by NHIS). Other analyses use logistic regression to control for potentially confounding variables such as age (18- to 39-years, 40- to 59-years, 60 or older), sex, family income (less than 100 percent FPL, 100-199 percent FPL, or 200-299 percent FPL), health insurance status (no coverage, Medicaid only, or other coverage), race/ethnicity (non-Hispanic white, non-Hispanic African-American, and Hispanic), health status (fair/poor or good/excellent), disability status (with

or without a major limitation in activity), education (less than high school or more), and whether overweight (body mass index equal to or greater than 27.8 for men, 27.3 for women).’ Unless otherwise noted, differences are significant at $p < 0.01$ (in a one-tailed t-test).

RESULTS

Prevalence of Hypertension

The burden of hypertension is disproportionately high among adult CHC users regardless of age, gender, race/ethnicity, health insurance status, poverty, education, and body weight. Overall, 36 percent of adult CHC users report that they have been told by a doctor or other health professional that they have hypertension, compared with 27 percent of other low-income U.S. adults (see Table 1).

Prevalence by Demographic Characteristics The higher rate of hypertension among CHC patients is particularly striking among certain subgroups. For example, fully half of middle-aged CHC users between 40- and 59-years-old are hypertensive; 16 percentage points more than their peers in the general population. And, while it is well-established that rates of hypertension among African-Americans are the highest in the nation, African-Americans who use CHCs have even higher rates; 48 percent of African-American CHC users have hypertension compared with 35 percent of other low-income, adult African-Americans.

⁴ Body mass indices were calculated using respondents’ reports of height and weight. The federal guidelines defining “overweight” were revised in 1998. Overweight is now viewed as BMI equal to or greater than 25 (men and women).

TABLE 1
PREVALENCE OF HYPERTENSION
REGULAR CHC USERS AND LOW-INCOME U.S. POPULATION

Respondent	Characteristic	CHC Users. % (95 % CI) n=745	Low-Income U.S. Population. % (95 %CI) n=7,730
All	Adults**	35.8 (31.3-40.3)	27.3 (26.2-28.4)
Sex			
	Female**	36.1 (31.1-41.1)	27.2 (25.8-28.6)
	Male*	35.1 (28.7-41.6)	27.5 (25.6-29.4)
Age			
	18-39**	15.2 (12.0-18.3)	10.3 (9.3-11.4)
	40-59**	50.0 (41.8-58.2)	33.8 (31.2-36.4)
	60+**	65.2 (54.8-75.5)	50.8 (48.2-53.4)
Education			
	Less than high school education	37.7 (31.0-44.5)	39.8 (37.6-42.1)
	High school or more**	34.1 (28.6-39.6)	22.6 (21.2-24.0)
Race/Ethnic@			
	African-American**	48.2 (40.7-55.7)	35.1 (31.7-38.6)
	Hispanic	19.7 (12.8-26.6)	22.8 (20.0-25.6)
	White**	37.2 (30.4-44.1)	27.3 (25.8-28.8)
Health Insurance			
	Uninsured**	27.7 (20.7-34.8)	17.3 (14.7-19.9)
	Medicaid Only	29.6 (20.6-38.6)	26.7 (22.4-31.1)
	Other Coverage**	45.2 (39.8-50.6)	29.7 (28.3-31.1)
Poverty Status			
	< 100% FPL*	37.0 (30.7-43.4)	29.7 (27.3-32.2)
	100-199% FPL	33.4 (26.7-40.1)	30.0 (28.1-31.9)
	200-299% FPL**	37.9 (28.6-47.1)	23.6 (21.8-25.4)
Health Status			
	Fair/poor	54.7 (46.5-62.9)	50.3 (47.7-53.0)
	Excellent/good*	26.2 (21.9-30.5)	21.5 (20.3-22.7)
Disability Status			
	Has major limitation	54.6 (45.5-63.7)	46.8 (44.1-49.5)
	Does not have major limitation**	29.5 (24.8-34.1)	22.9 (21.7-24.1)
Overweight			
	Yes*	46.0 (40.7-51.4)	40.2 (38.2-42.2)
	No*	26.9 (22.3-31.6)	20.8 (19.4-22.1)

SOURCE: **Mathematica** Policy Research analysis of data from the 1995 CHC User Survey and the 1994 National Health Interview Survey

NOTE: The study population includes anyone 18 or older, with family income less than 300 percent of the federal poverty level, and who had at least one health encounter in the previous 12 months.

*p<.05 (t-test for difference between CHC users and other low-income adults in the U.S. population)

**p<.01 (t-test for difference between CHC users and other low-income adults in the U.S. population)

Hypertension is also more widespread among not only *uninsured* CHC users compared with other uninsured adults (28 percent vs. 17 percent) but also CHC users *with* health insurance coverage⁵ compared with other insured adults (45 percent vs. 30 percent). Finally, there is a disproportionate burden of hypertension among CHC users with family incomes between 200 and 300 percent of poverty compared with other adults in the same income category; 38 percent and 24 percent, respectively.

Overweight. Earlier analyses have shown that CHC users are more likely than others to be overweight (Eden et al. 1997). Here we also find that overweight CHC users are disproportionately hypertensive; 46 percent say they have high blood pressure compared with 40 percent of their peers in the general population ($p < .05$).

Do CHCs follow *Healthy People 2000* objectives for improving hypertension control?

Neither CHC users, nor other low-income adults, met the HP 2000 goal that 90 percent of hypertensive people should be taking action to control their blood pressure. However, hypertensive CHC users differed greatly from other hypertensive, low-income adults with respect to several indicators of appropriate hypertension management (see Table 2). CHC hypertensive adults were not only more likely to be advised to change eating habits to lower blood pressure (78 percent vs. 61 percent) but they were also more likely than other hypertensive adults to report *following* a doctor's dietary advice (64 percent vs. 46 percent). CHC users who indicated that the advice they received was from a CHC provider, in particular, were even more likely to report following the advice (see Table 3).

⁵ Other than Medicaid only.

TABLE 2
HEALTHY PEOPLE 2000 HYPERTENSION GOALS
COMPARISON OF HYPERTENSIVE ADULT CHC USERS AND LOW-INCOME U.S. RESIDENTS
(In percent)

Healthy People 2000 Goal	Related Survey Question (CHC User Survey and NHIS)	CHC Study Population n=264	U.S. Study Population n=2,261
<i>Increase to 90% the proportion of hypertensive people taking action to control their blood pressure, including:</i>			
'faking' medication	Was any medication ever prescribed by a doctor to help lower high blood pressure?*	84.7 (79.8 • 89.6)	78.1 (76.0 • 80.1)
	Are you now taking medication to help lower high blood pressure?	65.4 (59.3 • 71.6)	64.3 (61.5 • 66.9)
Dieting to lose weight, cutting down on salt	I has a doctor or other health professional ever advised to go on a diet or change eating habits to help lower blood pressure?*	78.0 (71.8 • 84.2)	61.1 (58.5 • 63.8)
	Are you now following this advice'?**	63.6 (57.1 • 70.1)	45.6 (42.7 • 48.4)
Exercising	At last routine check-up were you asked about amount of physical activity or exercise?*	62.5 (52.3 • 72.7)	46.6 (43.3 • 49.9)
<i>Increase to 50% the proportion of hypertensive people whose blood pressure is under control</i>	<i>[Do you now have high blood pressure?]</i> If so, is this condition under control?	90.5 (86.1 • 94.9)	89.9 (87.3 • 92.6)
<i>Increase to 75% the proportion of primary care providers who routinely:</i>	<i>At last routine check-up by a medical doctor or health professional, were you asked about:</i>		
Advise cessation & provide help for tobacco-using patients	Smoking or use of other forms of tobacco?*	63.6 (53.4 • 73.7)	44.5 (41.5 • 47.5)
Screen for alcohol/drug use & provide counseling/referral as needed	How much and how often drink alcohol?*	57.1 (46.1 • 68.1)	36.6 (33.3 • 39.9)
	Whether use marijuana, cocaine, or other drugs'?**	39.6 (29.4 • 49.8)	20.7 (18.0 • 23.2)
Provide nutrition assessment, counseling, or referral	Diet & eating habits'?*	67.6 (56.9 • 78.4)	50.4 (47.0 • 53.9)

SOURCE: Mathematica Policy Research analysis of data from the 1995 CHC User Survey and the 1994 National Health Interview Survey

Note: Both study populations only include survey respondents who had "ever been told" by a doctor or other health professional that they had hypertension; age 18 or older; with family incomes less than 300 % FPL; and had at least one health encounter in the past 12 months.

*CHC response significantly different from U.S. population. $p < .05$ (one-tailed t-test).

**CHC response significantly different from U.S. population. $p < .01$ (one-tailed t-test).

TABLE 3

PATIENT COMPLIANCE WITH CHC-INITIATED DIETARY ADVICE AND
PRESCRIPTIONS FOR HYPERTENSION CONTROL

Patient Compliance Indicator	CHC Study Population %, 95% CI	CHC High-Risk Subgroup” %, 95% CI	CHC Racial or Ethnic Minority ^b %, 95%CI
Received dietary advice from a CHC provider	n=198	n=153	n=119
Ever followed CHC advice to diet or change eating habits to lower blood pressure	88.7 (83.8-93.7)	88.0 (82.7-93.3)	89.1 (83.8-94.4)
Now following CHC advice	75.4 (69.4-81.3)	75.7 (68.9-82.5)	78.8 (71.4-86.2)
Received prescription for antihypertensive medication from a CHC provider	n=200	n=146	n=117
Now taking medication to lower blood pressure	79.8 (72.2-87.3)	81.7 (73.5-89.9)	83.1 (74.3-92.0)
Satisfied with how these medications were explained at the CHC	95.8 (93.2-98.5)	96.1 (93.1-99.2)	97.0 (94.1-99.9)
Satisfied with how my questions about these medications were answered at the CHC	99.5 (98.5- 100.5)	99.3 (97.9- 100.7)	99.1 (97.4-1 00.9)

SOURCE: Mathematica Policy Research Analysis of data from the 1995 CHC User Survey.

“The high-risk subgroup includes anyone in the sample population who was African-American, Hispanic, uninsured, or enrolled in Medicaid (with no other source of coverage).

^bThe racial or ethnic minority subgroup includes only African-American and Hispanic members of the sample population.

HP 2000 also sets a goal that 75 percent of primary care providers should routinely advise and facilitate patients' efforts to change behaviors that can affect risk of hypertension and other serious illness.⁶ Compared with others, CHC users more frequently recalled that, *at their last routine checkup*, a medical doctor or other health professional asked about: their physical activity and exercise (63 percent vs. 47 percent), smoking or use of other forms of tobacco (64 percent vs. 45 percent), how much and how often they drank alcohol (57 percent vs. 37 percent), use of marijuana, cocaine, or other drugs (40 percent vs. 21 percent), and diet and eating habits (68 percent vs. 50 percent).

In contrast, however, the analysis also shows that CHC users were *not* more likely than others to be taking anti-hypertensive medications (65 percent vs. 64 percent) even though they were more likely to be prescribed drugs (85 percent vs. 79 percent, $p<.05$). However, almost 80 percent of CHC users who were prescribed anti-hypertensive medication, *by a CHC provider*, reported they were *now* taking medication to lower blood pressure (see Table 3). In addition, more than 95 percent of CHC users, who were prescribed anti-hypertensive medication by a CHC provider, said they were satisfied with how their medications were explained.

Finally, both CHC users and the comparison group far exceed-at least according to self report-the HP 2000 standard that at least 50 percent of hypertensive persons have their condition "under control" (91 percent vs. 90 percent).

Multivariate Analysis

Because the differences in the preceding table could be due to the effects of other factors, we also conducted multivariate analyses controlling for the following: age, sex, family income,

⁶ Although this recommendation is relevant to hypertension, it concerns all interactions between primary care providers and patients regardless of diagnosis.

education level, health insurance status, race/ethnicity, health status, disability status, and whether overweight. This analysis was conducted for the study sample population overall and for two subgroups: (1) a “high-risk” subgroup defined to include anyone in the sample population who was African-American, Hispanic, uninsured *or* enrolled in Medicaid’ and (2) a subgroup composed of all African-Americans and Hispanics in the study sample. The results of the logistic-regression analyses are shown in Tables 4 and 5.

Lifestyle Advice. As Table 4 indicates, the logistic regression also shows a significant correlation between regular CHC use by hypertensive adults and receiving dietary advice to lower blood pressure (odds ratio [OR]=1.89, $p<.01$) and patient reports of compliance with dietary advice (OR=2.05, $p<.05$). In addition, hypertensive CHC users are more likely to recall being asked about physical activity (OR=1.62, $p<.05$) and tobacco (OR=2.12, $p<.01$), alcohol (OR=2.39, $p<.01$), and drug use during their last routine check-up (OR=2.36, $p<.01$).

CHC users in the subgroup study populations-uninsured persons, African-Americans, Hispanics, and Medicaid beneficiaries-were the most likely to report they were following a health professional’s dietary advice to lower blood pressure or to recall getting provider inquiries about tobacco, alcohol, and drug use. For example, the CHC odds in the African-American/Hispanic subgroup were more than three times ($p<.01$) the odds for the comparison group for following dietary advice and recalling provider questions about alcohol or drug use.

Clinical Measures. There were far fewer differences between CHC users and the comparison groups with respect to the available clinical measures. While the odds of being prescribed anti-hypertensive medication were higher for regular CHC users compared with other hypertensive adults

⁷ Medicaid enrollees with other sources of coverage (i.e., Medicare) were not included.

TABLE 4

EFFECT OF BEING A REGULAR CHC USER ON RECEIVING LIFESTYLE ADVICE,
ADULTS WITH HYPERTENSION, LOGISTIC REGRESSION

Lifestyle Advice or Inquiry	CHC Response. Odds Ratio ^a (95% Confidence Interval)		
	Study Population ^b n=2,341	High-Risk Subgroup n=987	Racial or Ethnic Minority n=766
A doctor or other health professional has advised going on a diet or changing eating habits to lower blood pressure	1.89** (1.17-3.06)	1.73* (1.03-2.91)	1.54 (0.84-2.85)
Now following this advice	2.05* (1.17-3.60)	2.64** (1.43-4.88)	3.09** (1.42-6.74)
During last check-up, was asked about:			
Diet and eating habits	1.44 (0.83-2.48)	1.35 (0.68-2.68)	1.42 (0.65-3.11)
Amount of physical activity or exercise	1.62* (1.01-2.59)	1.71 (0.95-3.06)	1.71 (0.89-3.29)
Cigarette smoking or use of other forms of tobacco	2.12** (1.30-3.47)	2.71** (1.49-4.94)	3.03** (1.63-5.64)
How much and how often drink alcohol	2.39** (1.40-4.08)	3.63** (1.84-7.14)	4.35** (2.28-8.28)
Use of marijuana, cocaine, or other drugs	2.36** (1.42-3.93)	2.84** (1.55-5.22)	3.78** (2.04-7.03)

SOURCE: Mathematica Policy Research analysis of data from the 1995 CHC User Survey and the 1994 National Health Interview Survey

NOTE: Odds ratios greater than 1 indicate higher rate, among regular CHC Users, compared to other low-income adults in the U.S.

*Statistically significant difference from 1 .0 (vs. other low-income hypertensive adults) at $p < .05$ (one-tailed t test).

**Statistically significant difference from 1 .0 (vs. other low-income hypertensive adults) at $p < .01$ (one-tailed t test).

“The control variables were age, sex, family income, education level, health insurance status, **race/ethnicity**, health status, **disability** status, and whether overweight.

^bThe study population includes anyone 18 or older, with family income less than 300 percent of the federal poverty level, and who had at least one health encounter in the previous 12 months.

TABLE 5

EFFECT OF BEING A REGULAR CHC USER ON SELECTED CLINICAL MEASURES.
ADULTS WITH HYPERTENSION, LOGISTIC REGRESSION

Clinical Measure	CHC Response, Odds Ratio" (95% Confidence Interval)		
	Study ^b Population n=2,341	High-Risk Subgroup n=987	Racial or Ethnic Minority n=766
Was medication ever prescribed to lower blood pressure	1.70* (1.01-2.84)	1.34 (0.79-2.30)	1.25 (0.68-2.28)
Now taking this medication	0.77 (0.48-1.23)	0.89 (0.51-1.56)	0.86 (0.45-1.65)
Last blood pressure check by a doctor or health professional was less than 6 months ago	1.53 (0.87-2.72)	1.36 (0.67-2.78)	1.55 (0.68-3.50)
At the time blood pressure was last checked, the doctor or health professional said it was high, low, or normal	1.92 (0.57-6.49)	1.50 (0.40-5.65)	3.65 (0.38-35.30)
Blood pressure was checked at last checkup	1.15 (0.13-9.97)	1.17 (0.06-2.13)	1.50 (0.06-37.52)
Cholesterol was checked at last check-up	0.65 (0.43-1.00)	0.56* (0.35-0.90)	0.47** (0.29-0.78)
Hypertension is "under control"	1.73 (0.88-3.40)	2.13 (0.92-4.95)	3.32* (1.27-8.67)

SOURCE: Mathematica Policy Research analysis of data from the CHC User Survey and the 1994 National Health Interview Survey

NOTE: Odds ratios greater than 1 indicate higher rate, among regular CHC Users, compared to other low-income adults in the U.S.

*Statistically significant difference from 1.0 (CHC Users vs. other low-income hypertensive adults) at $p < .05$ (one-tailed t test).

**Statistically significant difference from 1.0 (CHC Users vs. other low-income hypertensive adults) at $p < .01$ (one-tailed t test).

"The control variables were age, sex, family income, education level, health insurance status, race/ethnicity, health status, disability status, and whether overweight.

^bThe study population includes anyone 18 or older, with family income less than 300 percent of the federal poverty level, and who had at least one health encounter in the previous 12 months.

(OR=1.70, $p<.05$), CHC users were not more likely to be taking medication (Table 5). Nor were hypertensive CHC users more likely to have had a blood pressure check within the last six months or at their last checkup.

There were, however, striking differences for the African-American/Hispanic subgroup. The odds of reporting that one's hypertension was "under control" were more than three times greater among CHC users compared with their peers in the general population (OR=3.32, $p<.05$).

In only one instance, was regular CHC use found to be negatively correlated with a clinical measure. Hypertensive CHC users, in the high risk and African-American/Hispanic subgroups, were less likely than their comparison groups, to recall having a cholesterol check at their last check-up; OR=0.56 ($p<.05$) and OR=0.47 ($p<.01$), respectively. However, for the overall study population, CHC use was neither negatively nor positively correlated with having a cholesterol check.

DISCUSSION

In this paper, we present population-based survey data comparing the experiences of hypertensive, adult CHC users with similar low-income, hypertensive adults. The purpose of this analysis was, first, to provide a picture of a particularly vulnerable subgroup of the nation's hypertensive population-those who rely on CHCs for basic, primary care-and, second, to assess the quality of the hypertension-related services they receive. Quality indicators were drawn from the HP 2000 lifestyle and clinical objectives for improving detection and control of high blood pressure.

Hypertension is clearly disproportionate among adult CHC users across a spectrum of ethnic and socioeconomic backgrounds. But why this is the case is not clear. It may be that low-income or uninsured, hypertensive adults who are aware of their condition, seek out the free or low cost,

continuous care at CHCs when it is nearby. Or, perhaps, due to the efforts of CHC providers, hypertensive CHC users are more likely to be aware of their condition compared with others. Estimates from the National Health and Nutrition Examination Survey suggest that, nationwide, almost one-third of people with hypertension are undiagnosed (Burt 1995). Regardless, CHCs are clearly in the position to meaningfully affect the early detection, management, and health outcomes of hypertension for many in the nation's safety net.

This is the first time that population-based survey data have been used to assess progress towards the federal government's *HP* 2000 objectives for improving the detection and control of hypertension among CHC users. The results of this analysis point favorably to CHC performance, especially regarding CHC health professionals' communication with and care of a vulnerable, poorly educated, and chronically ill patient population.

There are important limitations to this study. Population-based surveys are an effective means for capturing consumers' experiences and perceptions. But, by their very nature, such survey data are limited to patient knowledge and recall. Individuals are certainly not the definitive source for technical information about their health condition and the services they receive. While we can analyze patients' perceptions of the status of their condition, only a "hands on" study that documents clinical interventions and monitors blood pressure over time can yield conclusive evidence. It is also safe to assume that it is the rare person who is totally frank about eating habits. Nevertheless, the findings we present show significantly different responses by hypertensive CHC and NHIS respondents to identically worded survey questions and, consequently, are important and positive indicators that hypertensive CHC users are receiving high quality primary care.

It is evident that, compared with others, hypertensive CHC users are more likely to recall being advised to change their diet to lower blood pressure and to say that they are following this advice.

This has beneficial health implications. since losing as little as 10 pounds has been shown to reduce blood pressure and improve the effectiveness of anti-hypertensive medication.

The survey findings on 'routine check-ups conducted at CHCs are also positive; CHC users-especially "high-risk" CHC users such as ethnic minorities or those who are uninsured, have low family incomes, or rely solely on Medicaid coverage-are more likely than others to discuss physical activity and tobacco, alcohol, and drug use with their physician or other health professional.

Nine out of ten CHC User Survey and NHIS respondents surprisingly reported that their hypertension was under control. This far exceeds the HP 2000 goal that at least 50 percent of hypertensive persons have their condition under control. It is not possible to gauge the reliability of respondents' self-reports. However, it is nonetheless striking that the multivariate analysis revealed that hypertensive African-Americans and Hispanics who regularly use CHCs were significantly more likely to say that their condition was under control compared with other low-income, African-Americans and Hispanics in the general population (OR=3.32; $p<.01$).

On the other hand, while hypertensive CHC users are more likely to be prescribed medication, they are not more likely to be currently taking medication. Unfortunately, the survey data do not allow us to assess whether the lower rates of anti-hypertensive drug use compared with prescription rates are due to the clinical needs of CHC patients or barriers to obtaining and using anti-hypertensive medications. The data suggest that CHC users who receive their prescriptions at a CHC, rather than elsewhere, are more likely to be taking medication. Nonetheless, patient compliance with prescription drug recommendations is key to hypertension control. Thus, it is not only important that we work towards eliminating financial barriers to an ongoing, affordable supply of needed medications. It is also imperative that further research be conducted to determine how to best ensure continued patient compliance with anti-hypertensive medications.

Other pressing questions concerning the care of CHC users with high blood pressure remain.

including:

- How effective are the lifestyle messages that CHC users receive? Do CHC physician and other CHC professional staff discussions with patients on exercise, tobacco, alcohol, and drug use make a difference?
- Do CHC hypertensive patients really follow through on dietary advice? What are the health outcomes of their efforts? What are the stumbling blocks to patients' success?
- If CHCs are persuasive in getting lifestyle messages across to ethnically diverse patients, are there lessons from their successes for other providers who care for low-income, chronically ill adults?

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**Primary Care for Patients
Without Health Insurance
by Community Health
Centers**

Final Report

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***Barbara Lepidus Carlson
Jill Eden
Daniel O'Connor
Jerrilynn Regan***

Submitted to:

Health Resources and Services Administration
Bureau of Primary Health Care
4350 East-West Highway
Bethesda, MD 208 14

Submitted by:

Mathematica Policy Research, Inc.
600 Maryland Avenue, S. W.
Washington, DC 20024-25 12
(202) 484-9220

Project Officer: Jerrilynn Regan

Project Director: Jill Eden

PRIMARY CARE OF PATIENTS WITHOUT HEALTH INSURANCE BY COMMUNITY HEALTH CENTERS

Community Health Centers (CHCs) are private not-for-profit or public organizations that provide primary health care in medically-underserved areas throughout the U.S. and its territories. These health centers play an integral role in the nation's safety net for people who lack health insurance. As such, they receive substantial federal support through grant funds and the Medicaid and Medicare programs.

Until recently, comprehensive and nationally representative survey data that allow for comparisons of people who regularly use CHCs to low-income persons in the general population have not been available. In late 1994, the Bureau of Primary Health Care funded an in-person survey of CHC users modeled on the National Health Interview Survey (NHIS). The survey found that almost one in three CHC users was uninsured (Eden et al. 1997). More recent reports indicate that the CHCs' uninsured patient population has climbed along with increases in the nation's overall uninsured population (HRSA 1998, Department of Commerce 1998). Demand for CHC services is likely to be further fueled as welfare and immigration reforms lead to declines in Medicaid caseloads (Ellwood and Ku, 1998).

There is an extensive literature documenting that being uninsured is significantly correlated with having unmet health needs, lacking a usual source of care, using fewer health care services, poorer health outcomes, and even increased mortality (Cunningham and Kemper 1998). Recent findings from the Community Tracking Study further demonstrate that where an uninsured person lives is a critical determinant of one's ability to obtain medical care. Cunningham and Kemper conclude that this is because the adequacy of local safety net providers is largely determined by state and

local policy. They also comment that while CHCs can be an important primary care source for some uninsured persons, most people without health coverage do not live near a CHC.

The purpose of this paper is to provide a profile of uninsured CHC users in comparison with uninsured people nationwide. Using data from the CHC User Survey and the NHIS, we first compare the socioeconomic characteristics of uninsured CHC users and uninsured U.S. residents overall. We then analyze whether uninsured CHC users report greater access and satisfaction than uninsured persons overall and if CHC care of uninsured patients meets certain Healthy People (HP) 2000 goals. Our principal focus is on HP 2000 objectives related to routine primary care recommendations (see Figure 1).

METHODS

Sources of Data

Data for these analyses came primarily from two population-based surveys: the 1994 National Health Interview Survey (NHIS) and the 1995 Community Health Center (CHC) User Survey. NHIS has been a principal source of information on the health, health care utilization and health care access of U.S. residents for decades. The 1994 NHIS sample includes 116,179 individuals in 45,705 households.

Two supplements to the 1994 NHIS were included in this study: (1) A special Year 2000 supplement that was specifically designed to capture data on national progress toward the Healthy People 2000 goals. One sampled adult per family, in half of the NHIS households, was asked a series of questions on the content of provider-initiated discussions during his or her last checkup.

FIGURE 1
SELECTED HEALTHY PEOPLE 2000 GOALS

Target Population: All Persons
<i>Increase to 95% the percent of people who have a specific source of primary care</i>
<i>Assure that 90% of people who receive publicly funded primary care get, at a minimum, the services recommended by the U.S. Preventive Services Task Force</i>
<i>Increase to 75% the percent of primary care providers who routinely:</i>
Advise cessation and provide help for tobacco-using patients
Screen for alcohol/drug use and provide counseling/referral as needed.
Provide age-appropriate counseling on of HIV and STD prevention
Provide nutrition assessment, counseling and/or referral
Ask about type of work do now and in the past (adults, children 16+)
<i>Increase to 50% the percent of primary care providers who routinely:</i>
Ask about physical activity.
Review patients' cognitive, emotional, and behavioral functioning.
Provide counseling on seatbelts or putting [child] in a car seat.
Provide counseling on having smoke detectors in home.
Target Population: Children Only
<i>Increase to at least 80% the percent of providers of primary care for children who routinely provide vision screening</i>
<i>Increase to 75% the percent of primary care providers who review with parents their child's cognitive, emotional, and behavioral functioning</i>
<i>Increase to 50% the percent of primary care providers who provide counseling on:</i>
Hot water heater temperature not set too high
Having the poison control center telephone number
Having ipecac syrup
Using a bicycle helmet
Use of stairway gates or window guards

SOURCE: *Healthy People 2000: National Health Promotion and Disease Prevention Objectives* (U.S. Dept. of Health and Human Services, 199 1).

(2) An Access to Care Supplement included questions on health care access and satisfaction and was administered in all of the 1994 NHIS sample households. Both children and adults were asked access questions; only children (or their proxies) were questioned about satisfaction with care.

The CHC User Survey sample includes 1,932 users of a nationally representative sample of 48 CHCs. The survey had a multi-stage sample design, which included a stratified sample of CHCs selected from among the 501 CHCs (in the contiguous 48 states) receiving Section 330 CHC grant funding from the Bureau of Primary Health Care and providing primary care services in 1994. The last stage of sampling was the random selection of users within the 48 CHCs. To be eligible for the User Survey, a person must have made at least one medical visit to a selected CHC during 1994. Because migrant farm workers and the homeless--two important target populations for some CHCs--would have been difficult to locate, they were excluded from this study. (Details on the sample design of the CHC User Survey can be found in a methodology report available from the authors.)

The CHC survey instrument was specifically designed to enable direct comparisons with the 1994 NHIS and incorporated questions from the core NHIS survey as well as the two supplements described above. Data collection for the survey was conducted by **Mathematica** Policy Research, Inc., Princeton, New Jersey. The survey was administered in 1995 using computer-assisted personal interviews, arranged by appointment at the CHC (38 percent), at some other location that was convenient for the respondent (36 percent), or over the telephone if no personal interview could be arranged (26 percent). Interviews were conducted in the respondent's preferred language: 81 percent in English, 16 percent in Spanish, and 3 percent in Chinese or other languages.

Variables Used in the Analysis

The analyses used identically- or similarly-worded questions from both surveys. Two access indicators were used: usual source of care and number of physician contacts in the past 12 months.

Whether the respondent had a usual source of care was determined through the question: *Is there ONE particular person or place that you usually go to when you are sick or need advice about your health?* Data on physician contacts were drawn from the question, *In the past 12 months, about how many times did you see or talk to a medical doctor or assistant?*

Satisfaction with care was measured using the following questions: Thinking about the last time you visited the place you usually go to, were you satisfied with: *The waiting time to get an appointment? The waiting time to see the doctor? The way your questions were answered? Your ability to get all the care you thought you needed? The overall care you received?* In the CHC survey, respondents were directed to address their last CHC visit.

The Year 2000 NHIS and corresponding CHC survey questions were only directed to respondents who reported having had a check-up in the prior 12 months. Questions directed to adults included: During this last check-up, were you asked about: *Your diet and eating habits? The amount of physical activity or exercise you get? Whether you smoke cigarettes or use other forms of tobacco? How much and how often you drink alcohol? Whether you use marijuana, cocaine, or other drugs? Sexually transmitted diseases? If 18- to 44-years old, the use of contraceptives?* The CHC User Survey also asked adults if a CHC provider discussed the following topics: the use of condoms to prevent STDs, having smoke detectors, using seatbelts, mental or emotional problems, and the type of work the person does now and in the past.

The CHC User Survey also included a similar set of questions about children's visits to CHCs: During any of [child]'s visits to the CHC in the past 12 months, did someone: *Examine [child]'s eyes? Check [child] for lead poisoning? Give [child] a skin test for TB exposure? Did anyone talk to him/her/you about: The food [child] eats? The exercise [child] gets? Health risks of smoking? Risks of drug and alcohol use? Sexual behavior, safe sex, and avoiding pregnancy? Whether*

[child] has any behavior or emotional problems? Using child safety seat? (See Table 5 for the complete list of questions used in this analysis.) There were no similar inquiries in NHIS.

Study Sample Population

The study population, for this paper, was a pooled sample of uninsured CHC users and uninsured NHIS respondents under age 65. In order to ensure comparability between uninsured CHC users and uninsured NHIS respondents, we also limited our analyses to persons who reported having had at least one doctor visit in the past year and respondents with family incomes under 300 percent of the federal poverty level (FPL). In order to ensure a fair assessment of CHC performance, only survey responses from CHC respondents who reported that a CHC was their usual source of care were included¹--thereby eliminating occasional and one-time CHC users. The final, pooled study sample included 378 regular CHC users from the User Survey and 6,870 NHIS sample members (after excluding insured persons, the age 65 and over population, persons with family incomes of at least 300 percent of FPL, and those who had no physician contact in the last year).

Statistical Analysis

Because the sample designs for both the CHC User Survey and the NHIS involved stratification, clustering, and weighting, the observations are not independent and identically distributed, which is the assumption underlying the variance estimation formulas used in standard statistical computing packages such as SAS and SPSS. To analyze these data, we used SUDAAN, a specialized software package developed by the Research Triangle Institute that accounts for the complex sample designs of these two surveys when computing variances of the estimates. For all of the estimates presented, we combined the CHC and NHIS samples, and included a variable indicating the sample of origin.

¹Except for the estimate of respondents reporting a usual source of care.

The sample size for each estimate varies according to the number of persons responding to that question, so that the sample sizes indicated at the top of each column in the tables reflect the maximum number represented in the estimates below them. For any CHC estimates with no corresponding questions in the NHIS, we simply provide the weighted percents and confidence intervals for the CHC sample. For all other estimates, we provide the weighted percents and confidence intervals for each of the two samples, and indicate any significant differences in distributions between CHC users and the comparable U.S. population subgroup (as represented by NHIS) (Chi-square test p-values less than .05).

In addition to the bivariate analyses just described, multivariate analyses were conducted using logistic regression to control for potentially confounding variables such as age group (0- to 12-years, 13- to 17-years, 18- to 44-years, 45- to 64-years), sex, family income as a percent of the FPL (less than 100 percent FPL , 100 to 199 percent FPL, 200 to 299 percent FPL), Hispanic ethnicity and, if Hispanic, time in U.S. (less than 15 years, 15 years and over or born here), race (non-Hispanic white, non-Hispanic African-American), educational attainment (less than high school diploma or high school diploma), self-reported health status (excellent/good or fair/poor), and disability status (with or without a major limitation). Because the outcome variables were ordinal or categorical, we ran logistic regression models in SUDAAN, where the independent variables included the CHC/NHIS indicator variable as well as the control variables just described. If the CHC/NHIS indicator variable was significant (T-test for $H_0: \beta=0$), this indicated that there was a significant difference in the outcome variable between CHC users and the comparable U.S. population subgroup (as represented by NHIS), controlling for the other factors.

As part of each regression run, we also obtained the odds ratio (and associated 95 percent confidence interval) for the outcome variable, comparing the odds of having the characteristic in the

CHC sample to the odds in the NHIS sample, while holding control variables constant. An odds ratio greater than one indicates that the characteristic is more likely to occur in the CHC population than the U.S. population, whereas an odds ratio less than one indicates that it is less likely to occur in the CHC population. A significant finding for the T-test means that the confidence interval for the odds ratio does not contain the value of one. (An odds ratio of one means that the odds in the two samples are the same.)

RESULTS

Socioeconomic Characteristics

The makeup of the CHC uninsured population differed from the overall U.S. uninsured population in many ways (see Table 1). Perhaps most striking was the widespread poverty among uninsured CHC users; 54 percent of uninsured CHC users had family incomes under the FPL—fully 20 percentage points higher than uninsured persons in the U.S. overall.

While racial and ethnic minorities are disproportionately uninsured nationwide, they comprised the majority of uninsured CHC users. Overall, 39 percent of uninsured CHC users were Hispanic and 30 percent were African-American. Uninsured Hispanic CHC users were also “newer” to the U.S. compared with uninsured Hispanic persons in general; 24 percent of Hispanic CHC users reported being in the U.S. less than 15 years, compared with 14 percent of the comparison group. Only 31 percent of uninsured CHC users were white compared with 63 percent of uninsured persons nationwide.

CHC users were also disproportionately female and poorly educated. Nearly two-thirds of uninsured CHC users were female (64 percent) compared with 54 percent of uninsured NHIS

TABLE 1

CHARACTERISTICS OF NON-ELDERLY PERSONS WITHOUT HEALTH INSURANCE,
CHC USERS AND U.S. POPULATION

Respondent	Characteristic	CHC Users n=378	U.S. Population n=6,870
		(95% CI)	(95% CI)
Age*	10-12	28.8 (22.3-35.3)	25.0 (23.8-26.2)
	13-17	8.2 (5.8-10.6)	8.6 (8.0- 9.2)
	18-44	46.1 (41.0-51.2)	52.7 (51.3-54.1)
	45-64	17.0 (12.9-21.1)	13.7 (12.7-14.7)
Sex*** and Sex by Age***	Male	36.0 (3 1.7-40.3)	46.2 (44.8-47.6)
	o-17	15.9 (12.0-19.8)	16.7 (15.7-17.7)
	18-64	20.1 (16.6-23.6)	29.5 (28.3-30.7)
	Female	64.0 (59.7-68.3)	53.8 (52.4-55.2)
	o-17	21.1 (15.6-26.6)	16.9 (15.7-18.1)
	18-64	43.0 (37.1-48.9)	36.9 (35.7-38.1)
Poverty Status***	< 100% FPL	54.2 (48.3-60.1)	34.3 (32.3-36.3)
	100≤ 199% FPL	39.6 (34.1-45.1)	44.2 (42.2-46.2)
	200~299% FPL	6.2 (3.7- 8.7)	21.5 (19.9-23.1)
Race/ Ethnicity***	Hispanic	38.7 (27.5-49.9)	22.0 (19.8-24.2)
	In U.S. less than 15 years	24.2 (16.0-32.4)	14.2 (12.2-16.2)
	In U.S. 15 years or more (or born in U.S.)	14.5 (9.0-20.0)	7.8 (7.0- 8.6)
	African-American	30.4 (21.6-39.2)	15.2 (13.2-17.2)
	White	30.9 (21.3-40.5)	62.8 (60.1-65.5)
Sex by Race/ Ethnicity***	Male		
	Hispanic	16.0 (11.3-20.7)	10.1 (8.9-11.3)
	African-American	7.9 (4.8-11.0)	7.2 (6.2- 8.2)
	White	11.7 (7.4-16.0)	29.3 (27.7-30.9)
	Female		
	Hispanic	22.7 (15.4-30.0)	11.9 (10.5-13.3)
Education*** (adults only)	Less Than High School	60.6 (54.9-66.3)	48.6 (46.8-50.4)
	High School or More	39.4 (33.7-45.1)	51.4 (49.6-53.2)
Health Status*	Fair or Poor	19.5 (13.8-25.2)	13.4 (12.4-14.4)
	Excellent or Good	80.5 (74.8-86.2)	86.6 (85.6-87.6)
Disability Status	Has Major Limitation	14.4 (10.3-18.5)	13.2 (12.2-14.2)
	No Major Limitation	85.6 (81.5-89.7)	86.8 (85.8-87.8)

Source: Mathematica Policy Research analysis of data from the 1995 CHC User Survey and the 1994 NHIS.

* p<.05 (chi-square test for difference between uninsured CHC users and uninsured U.S. population overall)

***p<.001 (chi-square test for difference between uninsured CHC users and uninsured U.S. population overall)

respondents. Sixty-one percent of uninsured CHC adults reported not completing high school, compared with 49 percent in the general population of uninsured persons. Uninsured CHC users were also more likely than uninsured persons overall to report only fair or poor health status (20 percent vs. 13 percent, respectively).

Access to Care

We analyzed two classic indicators of access to care: having a usual source of care and number of doctor visits in the previous 12 months. Regular use of a CHC was a significant positive predictor of both indicators (see Table 2). Virtually all the uninsured CHC users (99 percent) reported having a usual source of care, far more than uninsured persons overall in the U.S. (75 percent).^{*} This finding was confirmed through multivariate analysis, controlling for a wide range of possible confounding factors, including age group, sex, poverty status, race, Hispanic ethnicity, time in U.S. (for Hispanics only), education, health status, and disability status (Odds Ratio [OR]=24.16, $p<.001$).

Compared with uninsured persons overall, uninsured CHC users were much *less* likely to report only one or two doctor visits in the past year (43 percent and 61 percent, respectively). Multivariate analysis also confirmed this finding (OR=.60, $p<.001$).

Satisfaction

Satisfaction with the way questions were answered, waiting time, ability to get care, and overall care was high for uninsured CHC children and adults (see Table 3). Among uninsured CHC children

^{*}This analysis was conducted before restricting the CHC user sample to respondents who reported a CHC as their usual source of care.

TABLE 2

USUAL SOURCE OF CARE AND RATES OF PHYSICIAN CONTACT,
UNINSURED CHC USERS AND U.S. POPULATION
(In Percent)

	CHC Users (95% CI)	U.S. Population (95% CI)	Odds Ratio (95% CI)
Has usual source of care***	n=417	n=6,803	
Yes	98.5 (97.1-99.9)	74.9 (73.3-76.5)	24.16 ^{†††} (9.89 - 59.03)
No	1.5 (0.1-2.9)	25.1 (23.5-26.7)	
Doctor visits in past year ***	n=378	n=6,870	
1 to 2	42.7 (36.0-49.4)	60.5 (59.1-61.9)	0.60 ^{†††} (0.48 - 0.75)
3 to 5	35.2 (30.3-40.1)	21.1 (20.1-22.1)	
6 or more	22.1 (17.8-26.4)	18.3 (17.1-19.5)	

SOURCE: Mathematica Policy Research analysis of data from the 1995 CHC User Survey and the 1994 NHIS.

NOTE: Odds ratios greater than 1 indicate higher rate, among uninsured CHC users, compared to uninsured U.S. residents. The control variables were age group, sex, poverty status, race/ethnicity, time in U.S. (Hispanics only), education, health status, and disability status.

***p<.001 (chi-square test for difference between uninsured CHC users and uninsured U.S. population overall)

†††p<.001 (one-tailed t-test for odds ratio significantly different from 1 .0)

TABLE 3
PERCENT SATISFIED WITH CARE.
UNINSURED CHC USERS AND U.S. POPULATION

Satisfaction Measure	Regular CHC Users Weighted Percent (95% CI)	U.S. Population Weighted Percent (95% CI)	Odds Ratio (95% CI)
Children (age 0-17)	n=136	n=694	
Waiting time to get appointment	87.8 (80.7-94.9)	90.7 (87.0-94.4)	1.31 (0.44-3.84)
Waiting time at doctor's office	79.1 (70.3-87.9)	84.6 (81.1-88.1)	1.26 (0.50-3.12)
The way questions were answered	98.7 (96.9-100.5)	95.5 (93.0-98.0)	315.98 ^{†††} (126.98-786.30)
Ability to get all the care needed	95.7 (92.4-99.0)	96.3 (94.5-98.1)	0.76 (0.22-2.69)
Overall care	96.7 (93.6-99.8)	95.7 (93.5-97.9)	0.72 (0.16-3.26)
Adults (age 18-64)	n=239	NA	
Waiting time to get appointment	88.0 (83.1-92.9)	NA	--
Waiting time at doctor's office	82.0 (75.5-88.5)	NA	--
The way questions were answered	94.0 (90.7-97.3)	NA	--
Ability to get all the care needed	90.9 (87.4-94.4)	NA	--
Overall care	91.1 (86.8-95.4)	NA	--

SOURCE: **Mathematica** Policy Research analysis of data from the 1995 CHC User Survey and the 1994 NHIS.

NOTE: Odds ratios greater than 1 indicate higher rate, among uninsured CHC users, compared to uninsured U.S. population overall. The control variables were age group, sex, poverty status, race/ethnicity, time in U.S. (Hispanics only), education, health status, and disability status.

NA = Not available

^{†††}p<.001 (one-tailed t-test for odds ratio significantly different from 1.0)

(or their parents),³ satisfaction rates ranged from a low of 79 percent regarding “waiting time at the doctor’s office” to 99 percent for “the way questions were answered.” Except for the latter measure, there were no significant differences in satisfaction between uninsured CHC children and uninsured children overall.

Uninsured CHC adults’ satisfaction with CHC services ranged from 82 percent regarding “waiting time at the doctor’s office” to 94 percent for “the way questions were answered.” Comparable data for uninsured adults were not collected by NHIS.

Do CHC s Meet Healthy People 2000 Objectives for Improving Primary Care?

The HP 2000 goals emphasize that primary care providers should discuss a wide range of prevention topics with their patients, ranging from physical activity, tobacco use, and nutrition to smoke detectors, seat belts, and bicycle helmets (see Figure 1). As noted in the Methods section, NHIS and the CHC User Survey contained a series of questions specifically designed to measure provider performance vis a vis these HP 2000 objectives.

Health Prevention Topics Discussed With Uninsured Adults

Uninsured adult CHC patients were more likely than their peers who got care elsewhere to discuss several priority HP 2000 prevention topics with their provider, although neither CHCs nor providers, recalled by NHIS respondents, met most of the HP 2000 goals by 1994. The prevention topics where CHC providers scored higher, than NHIS providers, include tobacco use (75% vs. 64%), alcohol use (68% vs. 52%), drug use (55% vs. 39%), and sexually transmitted diseases (54% vs. 36%) (see Table 4). Multivariate analysis confirmed this correlation between regular CHC use by uninsured adults and provider-patient discussions; tobacco use (OR=2.26,

³Most children ages 13- 17 responded for themselves.

TABLE 4

HEALTH PROMOTION TOPICS DISCUSSED WITH UNINSURED ADULTS
AND NATIONAL PROGRESS TOWARD HEALTHY PEOPLE 2000 GOALS

Topic	Healthy People 2000 Goal (%)	Healthy People 2000 Progress Report (%)	CHC Adults (% and 95% CI) n=95	U.S. Adults (% and 95% CI) n=511	Odds Ratio** (95% CI)
Lifestyle Issues					
Diet and eating habits	75	15-53	54.0 (43.4-64.6)	43.0 (38.1-47.9)	1.49 (0.86-2.56)
Amount of physical activity	50	14-40	57.0 (45.0-69.0)	48.5 (42.8-54.2)	1.38 (0.73-2.60)
Whether smokes/uses tobacco*	75	33-75	75.4 (67.2-83.6)	63.9 (59.0-68.8)	2.26 ^{††} (1.26-4.06)
How much/often drinks alcohol*	75	29-63	67.6 (58.4-76.8)	52.3 (46.8-57.8)	2.40 ^{††} (1.39-4.14)
Whether uses drugs**	75	23-43	55.2 (44.6-65.8)	38.7 (34.2-43.2)	2.32 ^{††} (1.30-4.12)
Sexually transmitted diseases (STDs)**	75	27-50	53.7 (43.7-63.7)	36.2 (31.3-41.1)	2.44 ^{††} (1.39-4.26)
Use of condoms to prevent STDs	75	27-50	49.6 (39.0-60.2)	NA	--
Type of work now and in past	75	4-17	33.0 (22.6-43.4)	NA	--
Use of contraceptives (1844 years)	60	18-53 ^b	46.1 (33.2-59.0)	43.2 (36.7-49.7)	0.86 (0.42-1.76)
Injury Prevention					
Have smoke detectors in home	50	NA	28.6 (18.0-39.2)	NA	--
Using seatbelts in car	50	15-58	31.7 (21.5-41.9)	NA	--
Mental Health					
Any mental, emotional problems	50	12-40	32.6 (22.4-42.8)	NA	--

SOURCE: Mathematica Policy Research analysis of data from the 1995 CHC User Survey and the 1994 NHIS; National Center for Health Statistics, *Healthy People 2000 Review (1997)*.

NOTE: CHC percentages represent the weighted percent of uninsured adults reporting that the health promotion topic was discussed during a check-up in the past year. Healthy People 2000 "Progress Report" data indicate the range in percent of health providers who, in response to the *1992 Primary Care Provider Survey*, reported routinely discussing the health topic with 81-100 percent of their patients -- regardless of patient age or health insurance coverage. Surveyed primary care providers, in this progress report, included pediatricians, family physicians, obstetrician/gynecologists, internists, nurses, and nurse practitioners.

"Odds ratios greater than 1 indicate higher rate, among uninsured CHC adults, compared to uninsured adults in the U.S. overall. The control variables were age group, sex, poverty status, race/ethnicity, time in U.S. (Hispanics only), education, health status, and disability status.

^bFemales of childbearing age.

*p<.05 (chi-square test for difference between uninsured, adult CHC users and uninsured adults overall)

**p<.01 (chi-square test for difference between uninsured, adult CHC users and uninsured adults overall)

^{††}p<.01 (one-tailed t-test for odds ratio significantly different from 1.0)

$p<.01$), alcohol use (OR=2.40, $p<.01$), drug use (OR = 2.32, $p<.01$), and sexually transmitted diseases (OR=2.44, $p<.01$).

We also compared CHC performance with published reports of national progress toward HP 2000 goals and found that, as of 1994, CHC providers had met or exceeded national estimates of primary care provider performance, in 1992, for all the measures in Table 4 (U.S. Dept. Of Health and Human Services 1997).

Routine Screening and Health Prevention Topics Discussed With Uninsured Children

We were not able to compare this aspect of routine care for uninsured CHC children with uninsured children overall, because this topic was not examined by NHIS. However, CHC providers met or exceeded HP 2000 progress report estimates of primary care provider performance. As we found in our analysis of adults, CHC providers, in 1994, did not yet meet most of the HP 2000 goals for discussing health prevention during routine encounters with uninsured children (see Table 5). Yet, the 95 percent confidence intervals around the CHC survey estimates did encompass most of the HP 2000 numeric objectives. This suggests that the “true” percentage of uninsured children who were asked about these topics during a CHC visit may meet (or exceed) most of the HP 2000 goals. This was not true, however, for provider inquiries about smoke detectors in the home and using bicycle helmets.

DISCUSSION

In this paper, we present population-based survey data comparing the primary care experiences of uninsured CHC users with those of uninsured persons in the U.S. overall. The purpose of this analysis was, first, to provide a picture of a particularly vulnerable subgroup of the nation’s population—uninsured persons who rely on CHCs for basic, primary care—and, **second**, to assess

**HEALTH PROMOTION SERVICES RECEIVED BY UNINSURED CHILDREN AT CHCS AND
NATIONAL PROGRESS TOWARDS HEALTHY PEOPLE 2000 GOALS**

Service or Topic (Age group)	Healthy People 2000 Goal %	Unweighted Sample Size(n)	CHC Child or Parent (% and 95% CI)	Healthy People 2000 Progress Report (%)
Routine Screening				
Eyes examined (2-6 years)	80	43	77.3 (63.6-91.0)	30-67
Checked for lead poisoning (0-6 years)	NA	54	53.1 (36.8-69.4)	NA
Given a skin test for TB exposure (2-17 years)	NA	107	49.3 (33.6-65.0)	NA
Lifestyle Issues				
Food [child] eats (0-17 years)	75	132	63.3 (51.9-74.7)	15-53
Ways to prepare for school (learning colors, shapes, letters, numbers, etc.) (2-6 years)	NA	42	34.0 (15.4-52.6)	NA
The exercise [child] gets (2-17 years)	50	112	51.3 (39.0-63.6)	14-40
The health risks of smoking (13-17 years)	75	30	60.6 (42.6-78.6)	33-75
Effect of second hand smoke (0-6 years)	NA	65	51.8 (41.4-62.2)	NA
Risks of alcohol and drug use (13-17 years)	75	30	60.6 (42.6-78.6)	23-63
Sexual behavior, safe sex, avoiding pregnancy (13-17 years)	50-75	30	73.1 (56.6-89.6)	18-53
Mental Health				
Behavior at home [and school] (2-17 years)	NA	104	31.0 (20.2-41.8)	NA
Behavioral or emotional problems (0-6 years)	75	64	52.0 (35.1-68.9)	47
Injury Prevention				
Using child safety seat or seatbelt in car (0-17 years)	50	132	41.1 (29.7-52.5)	15-58
Having smoke detectors in home (0-17 years)	50	130	37.7 (27.1-48.3)	NA
Hot water heater temperature not set too high (0-6 years)	50	62	41.0 (26.9-55.1)	NA
Stairway gates/window guards (0-6 years)	50	63	39.6 (25.1-54.1)	NA
Storing dangerous substances (0-12 years)	50	100	39.3 (27.7-50.9)	NA
Poison control center number / ipecac syrup (0-6 years)	50	62	50.8 (35.5-66.1)	NA
Using a bicycle helmet (2-17 years)	50	108	20.0 (11.6-28.4)	NA
Dental Health				
Not letting child sleep with bottle (0-1 years)	NA	20	76.4 (51.9-100.9)	NA
Need to brush teeth, visit dentist (2-17 years)	NA	111	49.8 (37.5-62.1)	NA

SOURCE: MPR analysis of data from the 1995 CHC User Survey; National Center for Health Statistics, *Healthy People 2000 Review* (1997).

Note: CHC percentages represent the weighted percent of uninsured children (or parents) reporting that the service was provided, or that the health promotion topic was discussed during any CHC visit in the past year. Healthy People 2000 "Progress Report" data indicate the range in percent of health providers who, in response to the 1992 *Primary Care Provider Survey*, reported routinely providing the service or discussing the health topic with 81-100 percent of their patients regardless of patient age or health insurance coverage. Surveyed primary care providers, in this progress report, included pediatricians, family physicians, obstetrician/gynecologists, internists, nurses, and nurse practitioners.

NA = not available

whether uninsured CHC users report greater access and satisfaction than uninsured persons in general, and the content of physician-patient discussions during routine encounters at a CHC. Quality indicators were drawn from the Healthy People 2000 goals.

Meeting the primary care needs of uninsured persons is a principal mission of CHCs. Thus, it is not surprising that earlier research has documented that as many as one of three CHC users did not have health coverage in 1994. The numbers are even higher today. We learned in this analysis that there are important differences in the makeup of the uninsured CHC population compared with uninsured persons in the U.S. in general. Compared with uninsured persons overall, uninsured CHC users are much more likely to live in poverty, to be poorly educated, and to be Hispanic or African-American. Many uninsured CHC users face daunting challenges in navigating today's health care system.

We learned that uninsured CHC users are significantly more likely to have a usual source of care and to have more frequent contacts with physicians or other health professionals, compared with uninsured persons overall. Based on the foundation of literature showing that better health outcomes are associated with having a usual source of care, this could indicate that, for uninsured persons, access to a CHC may also mean the opportunity for improved health outcomes as well. Uninsured CHC users also reported generally high rates of satisfaction that were similar to uninsured persons in our study population. This also clearly documents that CHCs are in a strong position to meaningfully contribute to the health prevention, early detection, and overall health outcomes of some of the most vulnerable persons in the nation.

The HP 2000 goals emphasize that primary care providers should discuss a wide range of prevention topics with their patients, ranging from physical activity, tobacco use, and nutrition to smoke detectors, seat belts, and bicycle helmets. Earlier research has shown that physicians,

nationwide, fall far short of these national goals for the year 2000 (DHHS, 1998; Taira, et al., 1997). While we also found that the proportion of uninsured CHC users and NHIS respondents who recalled discussing important health prevention topics with their physicians did not reach HP 2000 goals, we did find a significant, positive correlation between regular CHC use by uninsured adults and provider-patient discussions of smoking, alcohol use, drug use, and sexually transmitted diseases. Furthermore, compared to federal reports of national progress toward HP 2000 goals, *uninsured* CHC users were more likely than primary care patients—regardless of age or health insurance coverage—to discuss a wide range of prevention topics during a recent visit. (Data limitations precluded comparing similar measures for uninsured CHC children to uninsured children in general.)

This is the first time that population-based survey data have been used to assess progress towards the federal government's *HP* 2000 objectives for improving primary care for uninsured CHC users. Some important limitations should be noted. Population-based surveys are an effective means for capturing consumers' experiences and opinions. But, by their very nature, such survey data are limited to patient knowledge, recall, and perceptions. Individuals are not the optimal source for technical information about their own health condition and the services they receive. Poorly educated individuals are at an even greater disadvantage in this regard. Only a hands-on study documenting clinical interventions and monitoring patient outcomes over time can yield conclusive evidence. Nevertheless, the findings we present show significantly different responses by uninsured CHC and NHIS respondents to similarly- or identically-worded survey questions and, consequently, are important indicators of uninsured CHC users' health care experiences relative to their peers.

The results of this analysis generally point favorably to CHC performance, especially regarding CHCs' health promotion efforts with a vulnerable, poorly educated population. Researchers should focus next on the nature and health outcomes of CHC physician-patient health promotion discussions

focus next on the nature and health outcomes of CHC physician-patient health promotion discussions to learn more about “what works” in motivating children and adults to modify difficult-to-change behaviors.

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**The Role of Community
Health Centers in Caring
for Low-Income Adults
with Diabetes**

Final Report

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***Suzanne Felt-Lisk
Daniel O'Connor
Jill Eden
Jerrilyn Regan
Barbara Lepidus Carlson***

Submitted to:

Health Resources and Services Administration
Bureau of Primary Health Care
4350 East West Highway
Rm. 71A1
Bethesda, MD 208 14

Project Officer: Jerrilyn Regan

Submitted by:

Mathematica Policy Research, Inc.
600 Maryland Avenue, SW
Washington, DC 20024
(202) 424-9220

Project Director: Jill Eden

Federally funded community health centers (CHCs) are an important source of primary care for low-income populations in the U.S. In 1997, CHCs provided primary care to 8.3 million people, 85 percent of whom were in low-income households (households with an income of less than 200 percent of the federal poverty level). Facing an increasingly competitive market, CHCs are being challenged to justify their costs and to demonstrate the quality of care and service that they provide. To bring new information to these issues, the Health Resources and Services Administration (HRSA) contracted with **Mathematica** Policy Research (MPR) to use survey data from 1994 to perform a descriptive analysis of the role of CHCs in caring for adults with diabetes. The data are from nationally representative samples of CHC users and visits. Comparative data are from the 1994 National Health Interview Survey (NHIS) and National Hospital Ambulatory Medical Care Surveys (NHAMCS) for 1993 and 1994 (merged). In our analysis, we explored the prevalence of diabetes among CHC users, the demographic characteristics and health status of adults with diabetes who use CHCs, and their care experience at CHCs.

RESEARCH DESIGN AND METHODS

Data Sources

For our analysis, the data on CHC users came from two surveys, the CHC User Survey and the CHC Visit Survey. The survey questions were based on the NHIS and the outpatient department (OPD) component of the NHAMCS, respectively, to facilitate comparison of CHC Survey results with results from nationally representative surveys. Both surveys were sponsored by the Bureau of Primary Health Care (BPHC) within HRSA, and both were fielded by MPR.

The CHC User Survey collected information from 1,932 users of a nationally representative sample of 48 CHCs. To be eligible for the sample, a CHC must have received Section 330 funding from BPHC and provided primary care services in 1994. To be eligible for the user sample, a

person must have made at least one medical visit to a selected center during 1994. The questionnaire was administered by a trained interviewer using computer-assisted interviews over the telephone, at the CHC, or at some other location that was convenient for the respondent. Information was collected on seven broad topics: demographics and income, access to care and insurance coverage, chronic health conditions and disabilities, health behaviors and injury control, utilization and decisions about source of health care, cancer screening and preventive health care, and satisfaction with care. The overall response rate was 76.4 percent.

Data from the CHC Visit Survey were abstracted from billing information and medical charts representing 2,878 randomly selected medical encounters that took place in 1994 at the 48 CHCs participating in the CHC User Survey. The information was abstracted at the CHCs by a trained MPR or CHC staff member. Information was collected on demographics, reimbursement and sources of payment, reasons for visit, diagnoses, medications, disposition, providers seen, and services received. Information was successfully abstracted for 98.0 percent of selected visits.

The NHIS and NHAMCS provide data for comparison to the User and Visit surveys, respectively. For decades, researchers have relied on the NHIS as a prime source of information on the health of Americans.' NHIS collects an extensive range of health data, including information on acute conditions, episodes of personal injuries, limitations in activity, prevalence of chronic conditions, respondent-assessed health status, and the use of medical services. The 1994 NHIS sample consists of 45,705 households containing 116,179 individuals.*

The NHAMCS is an annual national survey conducted by the National Center for Health Statistics. It has been fielded since 1991 to collect information on the health care services provided by outpatient and emergency departments in nonfederal, short-stay general hospitals. The 1994 NHAMCS includes information that was collected from 489 hospitals from December 1993 through

December 1994. The 1993 NHAMCS includes information from the same number of hospitals between December 1992 and December 1993. For the OPD component of this survey, hospital staff were asked to complete an OPD record form for a random sample of patient visits occurring during a randomly selected four-week period. In 1993 and 1994, 28,357 and 29,095 patient record forms were completed, **respectively**.^{3,4}

There are important limitations to this study. Population-based surveys are an effective means for capturing consumers' experiences and perceptions. But the data are limited to patient knowledge and recall. Individuals are not the definitive source for technical information about their health condition and the services they receive. Abstracts of medical records from the Visit Survey and NHAMCS are also not an ideal data source, since the coding was general and thus did not identify some key components of visits for diabetic adults, such as checking patients' feet or ordering or conducting specific blood tests. Visit data are also point-in-time data, whereas one would ideally want to obtain patient-level data spanning a period of several years.

Population Definition and Comparison Groups

We defined our population of interest as adults (age 18 or older) with diabetes who had at least one medical visit during 1994. In the User Survey and in the NHIS, the specific question asked to identify those with diabetes was whether the respondent had diabetes during the last 12 months. The NHIS survey questions did not permit us to more narrowly define the population of interest. For example, we could not distinguish between people with Type I and Type II diabetes, nor could we identify those with gestational diabetes. However, we believe that the effect of this on our results is small; in the CHC User Survey sample, only 2 (1.7 percent) of the 116 adults with diabetes reported being told they had diabetes when pregnant, and 16 (13.8 percent) reported being told they had diabetes for the first time before age 18.

In the Visit Survey and NHAMCS, we identified visits made by adults with diabetes as those with ICD-9 diagnosis code 250 (diabetes mellitus). As a crude way to exclude adults with gestational diabetes, we excluded visits with a reason-for-visit code showing a prenatal care visit. Before they were excluded, prenatal care visits accounted for 4 percent of the visits by adults with diabetes in NHAMCS. No such visits were reported in the CHC Visit Survey. We also limited our NHAMCS sample to adults with diabetes who visited primary care clinics at the OPDs. The idea was to make the OPD care setting more comparable to the CHC setting, which almost exclusively provides primary care. In making this decision, we excluded 9 percent of all visits by people with diabetes as coded in the NHAMCS. We are aware of some coding problems related to the types of clinics -- primary care or specialty care -- in the NHAMCS. However, we do not believe that the coding errors greatly affect our results; in fact, the errors are most likely in the direction of including patients who visited specialists in primary care clinics rather than the reverse. We consider this possible bias in interpreting our results.

To create comparison groups, we excluded respondents to the CHC User Survey who reported that their usual source of care was a site other than a CHC.⁵ However, we did not exclude any respondents to the NHIS based on their usual source of care because the way in which usual source of care is coded in the NHIS does not allow us to accurately identify people whose usual source of care is a federally funded CHC. However, this should have only a limited effect on our ability to identify differences between groups. The proportion of U.S. residents who use a federally funded CHC is about 3.2 percent.

For most comparisons, we tested the difference between regular CHC users and the U.S. population as a whole, and then between low-income CHC users and the low-income U.S. population. (These four groups are collectively referred to as our “study groups.”) The latter

comparison, in recognizing that most CHC users are low-income while most of the U.S. population is not, allows us to better separate the role of income from other factors affecting our results. “Low-income” was defined as a household income below 200 percent of the federal poverty level for sampled individuals in the CHC User Survey and NHIS. We did not have information on income for those in the Visit Survey or the NHAMCS, so we used the following payer sources as a proxy for low income: Medicaid, “no charge,” and self-pay (where self-pay was the only source of payment). Comparisons of low-income people based on the Visit Survey and the NHAMCS are not presented in the tables below as the results were similar to the overall results except where mentioned in the text.

Weighting

We weighted the data from the CHC User and Visit surveys to account for the probability of selection of each CHC and each user or visit, and to account for nonresponse among selected units assumed to be eligible. The standard errors and significance tests we report were calculated consistent with the method of estimation and the sample design.

Statistical Comparisons

All statistical analyses based on data from the CHC User and Visit surveys and the NHIS were performed with SUDAAN, a specialized software package for survey data. SUDAAN incorporates the design structure (stratification and clustering) as well as the analysis weights when estimates and their corresponding standard errors are constructed. To analyze NHAMCS data, we used SAS to generate estimates, then Lotus Release 5 to generate standard errors using the formulas provided by the National Center for Health Statistics as part of the file documentation for NHAMCS.

Results are expressed as percentages \pm standard errors, unless otherwise indicated. For categorical variables with three or more values, differences between CHC users and comparison groups (described below) were examined with a chi-square test; for dichotomous and continuous variables, estimates were compared with a two-tailed t-test.

We also performed two logistic regression analyses. The first model was developed to identify factors related to the likelihood of having diabetes, so the dependent variable was whether or not the individual had diabetes (yes coded as 1). Independent variables are listed in Table 2. The second model was developed to identify factors associated with a measure of regular monitoring of low-income adults with diabetes. Therefore, only those with diabetes and a household income of less than 200 percent of the poverty level were included in the model. The dependent variable was the time since the last visit to the doctor for diabetes, with less than six months coded as 1 and all other times coded as 0. Independent variables were age, sex, race/ethnicity, poverty status (below the poverty level or not), education level (completed high school or not), insurance status, obesity (yes/no), and membership in the CHC regular user or U. S. population groups. Because our ability to detect significant results with this model was limited by a relatively small sample size, we could not conclude that the variables that were *not* statistically significant were in fact unrelated to the outcome variable. However, where the variance for a coefficient indicated a stable estimate, and the *p* value for the coefficient was less than .05, we concluded that there was a significant relationship between the independent variable and the outcome variable.

RESULTS

Prevalence of Diabetes Among Adult CHC Users

The prevalence of diabetes in adult users of CHCs is higher than it is in either the general U.S. population or the low-income U.S. population (Table 1). This finding holds true even within

TABLE 1

PERCENTAGE OF ADULT CHC USERS WHO HAVE
DIABETES COMPARED WITH THE PERCENTAGE
IN THE GENERAL POPULATION OF HEALTH SERVICE USERS, 1994¹

	Adult Users of Health Services		Low -Income ² Adult Users of Health Services	
	Regular CHC Users	U.S. Population	Regular CHC Users	U.S. Population
	n=948	n=10,413	n=657	n=2,871
Percentage with Diabetes	10±1**	5±0.2	12±1**	7±0.5
<u>Race/Ethnic</u>				
African-American, Non-Hispanic	13±2*	8±0.8	13±2	10±1
Hispanic	10±2*	6±1	12±2*	6±2
White, Non-Hispanic	9±2*	5±0.2	11±3	7±0.6
<u>Poverty Level</u>				
100%FPL	11±2	7±0.9	11±2	7±0.9
100-199%FPL	14±2**	7±0.5	14±2**	7±0.5
200+FPL	7±2	4±0.2	NA	NA
<u>Age</u>				
18-44	4±1*	2±0.2	5±1	2±0.4
45-64	17±3**	8±0.5	21±3*	14±2
65+	23±4**	11±0.7	26±5*	15±1
<u>Sex</u>				
Male	11±2*	5±0.3	13±3	8±0.8
Female	10±1**	5±0.3	12±1**	7±0.6
<u>Body Mass Index</u>				
<25	4±0.9	3±0.2	5±1	4±0.5
≥25	14±2**	8±0.4	15±2*	10±0.8
25-29	8±2	6±0.4	9±2	8±0.9
30+	20±3**	12±0.8	22±3*	14±1

SOURCE: **Mathematica** Policy Research analysis of 1994 data from the CHC User Survey and the National Health Interview Survey.

*p<.05 (t-test for difference between regular CHC users and U.S. population)

**p<.01

¹Includes only those with at least one medical visit in the past year.

²Household income less than 200% of the federal poverty level.

TABLE 2

LOGISTIC REGRESSION MODEL TO IDENTIFY SOCIOECONOMIC
AND OTHER FACTORS ASSOCIATED WITH DIAGNOSIS OF DIABETES
IN ADULTS WITH LOW INCOMES¹

Characteristics	Adjusted Odds Ratio (95% Conf. Int.)	<i>p</i> value
<u>CHC User Status</u>		
Regular CHC User	1.52 (1.04-2.22)	0.03
U. S . Population	Reference Group	1
<u>Age</u>		
18-44	0.14 (0.09-0.23)	<.001
45-64	0.88 (0.60-1.30)	.518
65+	Reference Group	
<u>Sex</u>		
Male	1.34 (0.97-1.86)	.076
Female	Reference Group	
<u>Race/Ethnicity</u>		
African-American, Non-Hispanic	1.54 (1.04-2.28)	.031
Hispanic	0.94 (0.55-1.60)	.823
White, Non-Hispanic	Reference Group	
<u>Poverty Status</u>		
<100% Federal Poverty Level (FPL)	1.24 (0.89-1.72)	.197
100-200% FPL	Reference Group	
<u>Years of Education</u>		
<12 years	1.31 (0.92-1.86)	.133
12 or more	Reference Group	
<u>Insured</u>		
No	0.46 (0.27-0.80)	.006
Yes	Reference Group	
<u>Obese (BMI = 30 or more)</u>		
Yes	2.62 (1.90-3.61)	<.001
No	Reference Group	

SOURCE: Mathematica Policy Research analysis of 1994 data from the CHC User Survey and the National Health Interview Survey.

¹Low income was defined as household income less than 200% of the federal poverty level.

racial/ethnic groups, income level, age and sex strata, and within the group of people defined as being obese (having a body mass index value of 30 or more). As expected from the literature, the prevalence of diabetes in African-Americans in the U.S. population is higher than in whites (t-test, $p < .05$). (This pattern is similar within the CHC sample; the relatively small sample size is probably responsible for the lack of statistical significance.)

The logistic regression analysis for the subset of low-income adults further suggests that CHC users are more likely to have diabetes even when other factors have been accounted for (Table 2). That is, we found that even after controlling for the known risk factors for diabetes of age, obesity, and race/ethnicity, CHC users are significantly more likely to have the disease.

Patient Profile of Adults With Diabetes Who Use CHCs

Demographic Characteristics. Relative to the national group of adults with diabetes, CHC users with diabetes are more often female, African-American or Hispanic, poor, uninsured, and poorly educated (Table 3). Even relative to low-income U.S. adults with diabetes, CHC users are more often nonwhite and less often have health insurance other than Medicaid. Nearly one-fourth of the CHC group is uninsured. These characteristics reflect the overall demographics of CHC users.⁶

Health Status and Service Use. The self-reported health status of the CHC users with diabetes is relatively poor, with over half reporting only fair to poor health. This is similar to the health status of the U.S. population with diabetes (both all, and low-income). Not surprisingly, the adults with diabetes in all the study groups are frequent users of health services--a majority visited a health professional at least six times in the past 12 months, and over 80 percent visited a health professional at least three times.

TABLE 3

DEMOGRAPHIC PROFILE, HEALTH STATUS, AND SERVICE USE
OF ADULTS WITH DIABETES WHO USE CHCs, 1994'
(Percentages \pm Standard Error)

	Adults With Diabetes		Low-Income Adults with Diabetes	
	Regular CHC Users	U.S. Population	Regular CHC Users	U.S. Population
1. Demographic Characteristics	n=98	n=574	n=76	n=223
<u>Age Group</u>				
18-44	22 \pm 5	16 \pm 2	24 \pm 6	18 \pm 3
45-64	39 \pm 6	41 \pm 2	40 \pm 6	35 \pm 4
65+	39 \pm 6	43 \pm 2	36 \pm 7	47 \pm 4
<u>Sex</u> ^{††}				
Male	29 \pm 5	46 \pm 2	29 \pm 6	41 \pm 4
Female	71 \pm 5	54 \pm 2	71 \pm 6	59 \pm 4
<u>Race/Ethnicity</u> ^{††,‡‡}				
African-American, Non-Hispanic				
Hispanic	43 \pm 8	19 \pm 2	40 \pm 9	25 \pm 4
Hispanic	24 \pm 6	9 \pm 2	27 \pm 6	10 \pm 3
White, Non-Hispanic	33 \pm 8	72 \pm 2	33 \pm 9	66 \pm 4
<u>Poverty Category</u> ^{††}				
< 100% FPL	45 \pm 6	17 \pm 2	52 \pm 6	37 \pm 4
100-199% FPL	42 \pm 6	29 \pm 2	48 \pm 6	63 \pm 4
200+% FPL	13 \pm 3	54 \pm 2	NA	NA
<u>Health Insurance</u> ^{††,‡}				
Uninsured	23 \pm 6	9 \pm 2	23 \pm 7	13 \pm 3
Medicaid	50 \pm 6	16 \pm 2	54 \pm 7	36 \pm 5
Other	28 \pm 6	74 \pm 3	23 \pm 6	51 \pm 5
<u>Years of Education</u> [†]				
<10	43 \pm 6	29 \pm 2	46 \pm 7	43 \pm 3
10-11	18 \pm 4	12 \pm 1	15 \pm 4	14 \pm 2
12	31 \pm 6	37 \pm 2	33 \pm 6	29 \pm 3
13 or more	8 \pm 4	22 \pm 2	7 \pm 5	14 \pm 3

[†]Includes only those with at least one medical visit in the past year.

TABLE 3 (Contd..)

	Adults With Diabetes		Low-Income Adults with Diabetes	
	Regular CHC Users	U.S. Population	Regular CHC Users	U.S. Population
2. Health Status				
<u>Reported Health</u>				
Excellent	3±2	6±1	4±3	4±2
Very good	9±3	12±1	9±3	9±2
Good	29±4	30±2	25±5	24±3
Fair/poor	59±6	52±2	62±6	63±3
<u>Limitation of Activity</u>				
Not Limited	39±6	45±2	36±7	32±3
Limited in Some Activity	9±3	14±2	11±4	13±2
Limited in Major Activity	12±3	17±2	13±4	22±3
Unable to Perform Major Activity	40±6	24±2	40±8	33±3
<u>Number of Ambulatory Medical Visits in Past 12 Months</u>				
0-2	15±5	20±2	13±5	17±3
3-5	27±4	28±2	26±5	23±3
6-11	22±5	25±2	23±5	21±3
12-49	35±6	25±2	36±7	35±3
50+	2±1	2±0.7	2±2	4±1
<u>Overweight</u>	85±3	74±2	83±4	74±3

SOURCE: **Mathematica** Policy Research analysis of 1994 data from the CHC User Survey and the National Health Interview Survey.

[†]p<.05 (chi-square value for all adults with diabetes)

^{††}p<.01

[‡]p<.05 (chi-square value for low-income adults with diabetes)

[#]p<.01

We did not find with statistical significance that diabetic CHC users are more limited in their activity than the national samples of adults with diabetes. However, we did find a statistically significant relationship between income and limitation of activity within the group of U.S. adults with diabetes. Nationally, lower-income adults with diabetes were more likely than the general population of adults with diabetes to have reported that they are limited in or unable to perform their major activity (e.g., work) (**chi-square, $p < .01$**). It is likely that this result reflects greater disability among the poor with diabetes and/or that, compared with other groups, they tend to engage in different types of major activities. For example, less educated, lower-income workers may tend to work in jobs that require greater physical activity and so may be less able to perform this work given a particular health problem.

Complications, Co-Morbidity, and Risk Factors for Complications. To assess complications, co-morbidity, and risk factors for complications, we analyzed CHC User Survey and NHIS data as well as data on both diagnosis and reasons for visit that were abstracted from patient medical records for the CHC Visit Survey and the NHAMCS. Obesity, hypertension, and lipid disorders were assessed as important co-morbid conditions and risk factors for complications related to diabetes. CHC users with diabetes are much more likely to be obese than are all U.S. residents or low-income U.S. resident groups with diabetes. For example, 59 percent (± 7) of low-income CHC users with diabetes are obese compared with 38 percent (± 3) of low-income U.S. residents.^{7,8} The CHC Visit Survey and NHAMCS show a diagnosis of hypertension for the people with diabetes who made about one third of the visits to hospital OPDs and CHCs, and a diagnosis of a lipid disorder for the people who made about 5 percent of the visits. There was no significant difference between those visiting CHCs and those visiting hospital OPDs (standard errors shown in Table 4).

TABLE 4

PERCENTAGE OF VISITS BY ADULTS WITH DIABETES WHOSE
CHARTS INDICATED OTHER RISK FACTORS AND COMPLICATIONS,
AND COUNSELING TO ADDRESS RISKS*

	Visits by Adults with Diabetes	
	To CHCs	To Hospital OPDs
	n=140	n=1,753
<u>Risk Factors and Complications</u>		
Hypertension	34±4	32±2
Lipid Disorders	5±2	5±0.8
Complicated Diabetes	4±2	6±1
<u>Counseling: Ordered or Provided to Address Risks</u>		
Weight reduction	4±2**	16±1
Smoking cessation	2±1	2±0.6
Exercise	10±4	13±1

SOURCE: **Mathematica** Policy Research analysis of 1994 data from the CHC User Visit Survey and 1993-1994 data from the NHAMCS.

*p<.05 (t-test for difference between regular CHC users and U.S. population)

**p<.01

We examined the number of reasons for visits made by people with diabetes as a potential indicator of case mix. More visits in the CHC Visit Survey included multiple-coded reasons than did visits to hospital OPDs captured in NHAMCS (41 compared with 29 percent, t-test, $p<.01$). This could indicate that the case mix at CHCs is more complex. Other reasons for the difference between survey data could include different levels of completeness in chart documentation or different levels of staff effort devoted to abstracting.

The low rates of serious complications related to diabetes in the CHC visit sample--such as ketoacidosis, blindness, amputation of lower extremity--as well as the survey methodology prevented us from assessing whether these outcomes differ for CHC users relative to U.S. residents with diabetes.' Only 4 (± 2) percent of visits made by people with diabetes to CHCs and 6 (± 1) percent of visits to hospital OPDs included a diagnosis of complicated diabetes (ICD-9 codes 250.1-250.9). Further study appears warranted, however, as 9 of the 98 regular CHC users with diabetes in our sample reported blindness in one or both eyes. Intuitively, this rate is high, but we do not have comparable figures at the national level. The rate of blindness in both eyes for people with diabetes nationally was reported to have been 2.2 per 1,000 in 1988.¹⁰

The Care Experience of Adults with Diabetes Who Visit CHCs

Reasons for Visits. Table 5 shows the most common reasons for visits to CHCs and OPDs by adults with diabetes. Visits to CHCs by people with diabetes were more often for diagnosis/screening/prevention than were visits to OPDs. However, visits to OPDs were more often for treatment.

A closer examination of the most common reasons for visits within these categories suggests that there is less variation in these reasons, and by extension, in services provided, between the two types of facilities than one might expect from these overall numbers. Both types of facilities appear

TABLE 5
REASONS FOR VISITS, AND PERCENTAGE OF VISITS
DUE TO EACH TYPE OF REASON

	Visits by Adults with Diabetes	
	To CHCs	To Hospital OPDs
	n=140	n=1,753
<u>Symptoms</u>	32±4	29±2
<u>Most Common:</u>		
General Symptoms (not related to a specific body system)	9±3	7±1
Referable to the Musculoskeletal System	9±2	9±1
<u>Diagnosis/Screening/Prevention</u>	26±4**	13±1
<u>Most Common:</u>		
General medical exam	9±4	7±1
Glucose level determination	10±3**	2±0.6
<u>Treatment</u>	23±4**	36±2
<u>Most Common:</u>		
Progress visit	13±3**	26±2
Medication-related	9±2*	4±0.8
<u>Disease</u>	30±5	28±2
<u>Most Common:</u>		
Diabetes	29±5	21±2
Hypertension	7±2	5±0.8

SOURCE: Mathematica Policy Research analysis of 1994 data from the CHC User Visit Survey and 1993/94 data from the NHAMCS.

NOTE: Categories grouping more detailed codes were developed by NCHS ("A Reason for Visit Classification for Ambulatory Care," November 1994) and have been previously used in other research, for example, see Barbara Starfield, *Primary Care: Concept, Evaluation, and Policy*, NY: Oxford University Press 1992.

*p<.05 (t-test for difference between regular CHC users and U.S. population)

**p<.01

to be providing general medical examinations and progress visits to patients with diabetes in addition to treating their symptoms and disease. A slightly higher percentage of CHC visits were prompted by the diabetes condition itself, though this may be due to differences in coding rather than to a real difference in the pattern of care.¹¹ The major difference between the two types of facilities in terms of services provided appears to be that OPDs offer a more varied array of treatments, as measured by reasons listed for the OPD visits; these reasons include pre-operative and post-operative visits, and radiation and chemo-therapies, which would not likely be provided in a primary care setting such as a CHC. Fourteen codes related to different treatments as a reason for the visit appear in the OPD sample from the NHAMCS. In contrast, only four such codes appear in the sample from the CHC Visit Survey. This difference may reflect a real difference in the scope of practice at hospital primary care clinics relative to CHCs, or it may be due to errors in coding such that some visits to specialty clinics were included with the primary care clinic visits in the NHAMCS (see methods section above). Although the sample of CHC visits in the Visit Survey is much smaller than the sample of OPD visits in NHAMCS, data from both surveys indicate that about the same number of different types of diagnosis/screening/prevention services were listed as reasons for visits (nine codes described such visits in the OPD sample, and eight in the CHC sample).

Regular Monitoring of Diabetes. We did not find a clear difference between the CHC and OPD settings in terms of the regular monitoring of diabetes, as measured by contact with a physician during the past six months, blood pressure checks, urinalysis, and scheduled follow-up visits. The CHC User Survey and the NHIS show that a large majority of adults with diabetes (83 percent of CHC users and 89 percent of the U.S. population) had seen or talked to a doctor or an assistant about their diabetes within the past 6 months (no difference between groups). To identify factors related to having had such a contact, we performed a multivariate analysis. Controlling for age, sex,

race/ethnic@, education level, obesity, health status, and presence of insurance, we found that patients with a household income below the federal poverty level were less likely to have had a contact. As might be expected, patients in excellent or good health were also less likely to have had a contact (data not shown).

Blood pressure checks are another element of regular monitoring, given the high co-occurrence of diabetes and hypertension, and the potential health consequences of the combination. The Visit Survey and NHAMCS show that blood pressure is checked consistently during visits to both CHCs and hospital OPDs. The CHC Visit Survey and NHAMCS also show that a follow-up visit is almost always planned, and that a urinalysis is done in 18 to 21 percent of the visits (Table 6). We found no difference between groups on these measures.

TABLE 6
REGULAR MONITORING: FREQUENCY OF BLOOD
PRESSURE CHECKS, URINALYSIS, AND FOLLOW-UP
SCHEDULING DURING VISITS
(by percent)

	Visits by Adults with Diabetes	
	To CHCs	To Hospital OPDs
	n=140	n=1,753
Blood Pressure Check	87±4	82±2
Urinalysis	21±4	18±2
Follow-up Scheduled	97±2	99±0.5

SOURCE: Mathematica Policy Research analysis of 1994 data from the CHC User Visit Survey and 1993/94 data from the NHAMCS.

Glucose level determination and medication-related reasons--also elements of regular monitoring--are responsible for a higher percentage of visits among CHC users than among users of hospital OPDs (Table 5).¹² However, “progress visits” are responsible for a higher percentage of visits to OPDs than to CHCs. Some variation in coding or documentation may have caused these apparent differences.

Addressing Risk Factors. Our survey data offer two types of evidence on CHC performance in encouraging and facilitating change in typically hard-to-change behaviors, including eating habits, physical activity and smoking. First, the CHC Visit Survey and NHAMCS provide data abstracted from medical records on counseling and educational services **ordered or provided** during the sampled medical encounter. These services include exercise, weight reduction, and smoking cessation (Table 4). Second, the CHC User Survey includes a series of questions that ask respondents to recall discussions with their CHC physician or other CHC staff (Table 7) on weight control, quitting smoking, and eye examinations. For these questions, there are no comparable data available from NHIS.

Losing Weight. The medical records data in the CHC Visit Survey and NHAMCS clearly show that weight reduction counseling is either ordered or provided more often to diabetic patients who visit hospital OPDs than to those who visit CHCs (16 percent (± 1) and 4 percent (± 2), respectively; see Table 4). A similar proportion of hospital OPD and CHC visits included orders for or records of exercise counseling (13 percent (± 1) and 10 percent (± 1), respectively). Unfortunately, we cannot discern whether these findings relate more or less to **orders** than to actual services provided.

The CHC User Survey includes a series of questions that focus specifically on CHC interventions with overweight patients, independent of the survey respondents’ health status or clinical diagnoses. CHC users who view themselves as overweight and are told they are overweight

TABLE 7

CHC EFFORTS TO MANAGE DIABETES AMONG OVERWEIGHT PATIENTS
(by percent)

Control Measure/Intervention	Overweight CHC Adults with Diabetes (BMI >25) n=78
A CHC doctor or other CHC health professional has ever told me I was overweight <i>and</i> I consider myself overweight	83 ± 5
Someone at the CHC has ever talked to me about things I can do to control my weight (e.g., meal planning, nutrition, or exercise program)	76 ± 6
Ever followed this CHC advice	66 ± 6
Now following this CHC advice	56 ± 5
In the past 3 years, has lost weight through a diet or exercise program	66 ± 7
Someone at the CHC has given me booklets or other educational materials on ways to control my weight	63 ± 5
Someone at the CHC staff told me about classes at the health center on ways to control weight	37 ± 6
Ever gone to any of these classes	15 ± 5

SOURCE: Mathematica Policy Research Analysis of data from the 1995 CHC User Survey.

by a CHC doctor are asked about CHC efforts to promote changes in lifestyle, including discussions with CHC staff on how to lose weight, patient compliance with dietary advice, CHC provision of educational materials on weight control, and CHC weight control classes. Eighty-three percent (± 5) of overweight, diabetic CHC users responded that they perceived themselves as being overweight and were also told so by a CHC physician. Seventy-six percent (± 6) of overweight, diabetic CHC Users recalled discussing weight control measures with CHC staff, and 66 percent (± 6) reported “ever” following CHC advice on losing weight (Table 7). In addition, 63 percent (± 5) of overweight diabetic CHC patients reported receiving booklets or other educational materials on weight control from CHC staff. Only 37 percent (± 6), however, said they were told about CHC weight control classes, and few (15 percent ± 5) report ever going.

Preventing Blindness Among CHC Users. In 1994, 43 percent (± 5) of the CHC users group with diabetes reported not having had an eye exam in which their pupils were dilated within the past two years, and 28 percent (± 5) reported never having had such an exam. This clearly indicates room for improvement; other research suggests that many providers fall short on these measures.¹³ For example, the NHIS in 1989 showed 34 percent of adults with diabetes had not had a dilated eye exam in the past two years.¹⁴

Quitting Smoking. Most CHC users who smoked were given multiple aids for quitting, such as a prescription for a patch and advice to try quitting with a friend or relative who needs to quit. No single strategy was particularly common, except providing a pamphlet or book. Of the 18 adults with diabetes in the CHC user sample who smoke or smoked at some point in the past year, 13 reported that they were advised to quit in the past 12 months, and 11 of the 13 said they received this advice from a doctor or dentist at the CHC.¹⁵ Only 3 of these 11 individuals said they were not given help to quit through prescriptions for nicotine replacement products, a pamphlet or book, or a stop-smoking class.

And only these three said they were not advised to ease the process by quitting with a friend or relative.

Satisfaction with Care Among CHC Users. CHC User Survey data show that of the adults with diabetes, 96 percent (± 2) were satisfied overall with the care they received during their last visit. They were similarly satisfied with their ability to get all the care they needed ($95\% \pm 2$), to get answers to their questions ($94\% \pm 2$), and with the waiting time until an appointment ($96\% \pm 2$).

DISCUSSION

In this paper, we present population-based survey data and outpatient medical records data comparing the experience of diabetic, adult CHC users with the experience of other diabetic adults. The purpose of this analysis was, first, to profile a particularly vulnerable subgroup of the nation's diabetic population—those who rely on CHCs for basic, primary care—and second, to assess the quality of the diabetes-related services they receive, insofar as this is feasible from available surveys.

The prevalence of diabetes is clearly disproportionate among adult CHC users even controlling for ethnic and socioeconomic background. Why this is the case is not clear. It may be that low-income or uninsured, diabetic adults who are aware of their condition prefer the treatment provided at CHCs. Or, perhaps CHC providers are more likely than other providers to test for and diagnose this condition. Regardless, CHCs are clearly in the position to meaningfully affect the early detection, management, and health outcomes of diabetes for many who depend on the nation's safety net.

The patient profile of CHC users with diabetes suggests that CHCs face greater challenges than other providers in effectively treating diabetes. For example, it may be more difficult to provide effective education on self-monitoring, weight control, and smoking because a high percentage of CHC users has fewer than 10 years of education. Further, we learned that very low-income people

with diabetes are more limited in their major activity and less likely to have had contact with a doctor or assistant in the past six months for their diabetes compared with other diabetes patients. Thus, CHCs, which “specialize” in caring for people with low incomes, face the challenge of treating a diabetic population that needs *more* outreach. Outreach itself may be more difficult for this group, however, since many have neither telephones nor a stable residence.

Despite these challenges, our analysis of several measures of regular monitoring suggests that the pattern of care at CHCs is similar to that at hospital OPDs. For example, blood pressure was consistently checked, and follow-up visits consistently scheduled during visits in both settings.

Abstracts from CHC and hospital OPD medical records suggest that hospital-based clinics either order or provide weight reduction counseling to patients with diabetes more frequently than do CHCs. However, we **cannot** discern the extent to which OPD and CHC orders for counseling are carried out. Also, the difference between OPDs and CHCs appears to be one of emphasis, not presence or absence of counseling; a large majority of overweight CHC users with diabetes recalled getting advice on how to lose weight from CHC staff at some point, and many also reported following this advice.

Data from the CHC User Survey and national data indicate that many people with diabetes do not receive adequate eye care. This finding suggests that follow-up research is needed to determine whether the recent national emphasis on preventive care for diabetic patients has improved this situation in CHCs as well as in other primary care settings.

To summarize, the high prevalence of diabetes among CHC users suggests that CHCs have a strong reason to focus on improving quality of care for people with diabetes as part of their regular quality improvement programs. The profile of CHC patients with diabetes and the relationship we found between low-income levels and less-than-regular monitoring of the disease also highlight the

challenges CHCs face in effectively treating a poor and less educated patient population. Despite these challenges, it appears that patterns of care in CHCs and hospital OPDs are roughly equivalent. Further, the higher prevalence of diagnosed diabetes among CHC users, even when other factors are controlled for, may mean that CHCs do a better job than other providers of testing for and diagnosing the disease in the low-income population.

ENDNOTES

1. Centers for Disease Control and Prevention, National Center for Health Statistics. "National Health Interview Survey," Hyattsville, MD: October 3 1, 1996.
2. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics. *Current Estimates From the National Health Interview Survey*, 1994. DHHS Publication (PHS) 96-1521, Series 10, No. 193. Hyattsville, MD: December 1995.
3. Lipkind, Karen L., "National Hospital Ambulatory Medical Care Survey: 1993 Outpatient Department Summary," *Advance Data*, Number 268, October 6, 1995.
4. For a full description of the NHAMCS methodology, see L. F. McCaig and T. McLemore, "Plan and Operation of the National Hospital Ambulatory Medical Care Survey." *Vital Health Statistics* 1(34), 1994.
5. Most survey questions about care referred to the past 12-month period, so we aimed to ensure most of the care being referenced by the survey respondents was provided at a CHC.
6. Eden, Jill, Barbara Carlson, and Daniel O'Connor. *CHC Profiles Chart Book*. Report submitted to the U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Primary Health Care. Washington, DC: Mathematica Policy Research, Inc., November 1997.
7. The pattern was similar within racial/ethnic groups, with CHC users in the sample consistently showing a higher prevalence of obesity; small sample size was likely responsible for the lack of statistical significance within racial/ethnic strata.
8. Obese was defined as body mass index of 30 or greater, where body mass index = weight (kg)/height(meters)².
9. In the NHIS, respondents are asked whether they have certain conditions that are listed on a card. Not every respondent is asked about each condition; only one-sixth of the sample was asked whether they had diabetes, and those individuals were asked only about the other conditions listed on the same card.
10. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Health Statistics. *Current Estimates From the National Health Interview Survey 1991*. DHHS Publication (PHS) 93- 15 12, Series 10, No. 184. Hyattsville, MD: December 1992.
11. Twenty-nine percent of CHC visits versus 21 percent of OPD visits were coded as due to diabetes, no significant difference for the overall comparison; however, 33 percent of CHC visits versus 18 percent of OPD visits by those with insurance status indicating low-income were due to diabetes, which was significant ($p<.05$). Insurance status was the best available proxy for low income on the NHAMCS.

12. Although optimal monitoring of diabetes includes periodic measurement of hemoglobin A 1 C, we did not have data on this test, so we used glucose level determination as a proxy for monitoring diabetic control.
13. J.P. Weiner et al., "Variation in Office-Based Quality: A Claims-Based Profile of Care Provided to Medicare Patients With Diabetes." *Journal of the American Medical Association*, Vol. 273, No. 19, May 17, 1995, pp. 1503-1508.
14. R.J. Brechner et al. "Ophthalmic Examination Among Adults with Diagnosed Diabetes Mellitus." *Journal of the American Medical Association*, Vol. 270, no. 14, October 13, 1993. pp. 1714-171s.
15. Sample numbers are used instead of percentages due to the small number of diabetic patients in the sample who smoked.