Impact of Health Disparities Collaboratives on Racial/Ethnic and Insurance Disparities in US Community Health Centers

LeRoi S. Hicks, MD, MPH; A. James O'Malley, PhD; Tracy A. Lieu, MD, MPH; Thomas Keegan, PhD; Barbara J. McNeil, MD, PhD; Edward Guadagnoli, PhD; Bruce E. Landon, MD, MBA

Background: The Health Resources and Services Administration Health Disparities Collaboratives (HDCs) were developed to improve care for chronic medical conditions in community health centers (CHCs).

Methods: We examined whether HDCs reduced disparities in quality by race/ethnicity or insurance status in CHCs nationally. We performed a controlled preintervention/postintervention study of 44 CHCs participating in HDCs for asthma, diabetes mellitus, or hypertension and 20 "external" control CHCs that had not participated. Each intervention center also served as an "internal" control for another condition. For each condition, we created an overall quality score, defined disparities in care as the differences in care between racial/ethnic groups and insurance groups, and examined changes in disparity through a series of hierarchical models using a 3-way interaction term among period, patient characteristics of interest, and treatment group.

Results: Overall, HDCs had little effect on disparities in composite measures for asthma, diabetes, and hypertension. For asthma care, collaborative centers had a baseline Hispanic-white disparity of 6.5%, which changed to a higher quality of recommended care for Hispanic patients over white patients by 0.8%, resulting in a significantly reduced Hispanic-white disparity compared with the change in disparity seen in external controls ($P = .04$). There were no other improvements in racial/ethnic or insurance disparities for any other conditions.

Conclusions: Although HDCs are known to improve quality of care in CHCs, they had minimal effect on racial/ethnic and insurance disparities. In addition to targeting improvement in overall quality, future initiatives should include activities aimed at disparity reduction as an outcome.

Arch Intern Med. 2010;170(3):279-286

Author Affiliations:
Department of Health Care Policy, Harvard Medical School (Drs Hicks, O'Malley, Lieu, Keegan, McNeil, Guadagnoli, and Landon); Division of General Internal Medicine and the Brigham and Women's–Faulkner Hospitalist Program (Dr Hicks) and Department of Radiology (Dr McNeil), Brigham and Women's Hospital; Center for Child Health Care Studies, Department of Ambulatory Care and Prevention, Harvard Pilgrim Health Care and Harvard Medical School and Division of General Pediatrics, Children's Hospital (Dr Lieu); and Division of General Medicine and Primary Care, Beth Israel Deaconess Medical Center (Dr Landon), Boston, Massachusetts.

Several studies[1-5] examining the quality of health care provided in the United States have documented significant problems with quality and disparities according to patient race and socioeconomic status. These issues are of particular concern for publicly supported community health centers (CHCs), which are responsible for caring for more than 15 million Americans, many of whom are members of groups that have previously been documented to receive care of lower quality.[2,5,6] Furthermore, federally qualified CHCs are likely to have an increasing role in providing care for these populations.[7]

A few studies[8-10] have examined the effectiveness of quality improvement programs aimed at improving overall quality to determine whether broad improvements in quality of care reduce disparities in processes of care, with conflicting results reported. One important national initiative designed to narrow disparities by improving overall quality is the Health Disparities Collaboratives (HDCs) sponsored by the Health Resources and Services Administration (HRSA). These collaboratives bring CHCs together to learn and disseminate quality improvement techniques developed by the Institute for Healthcare Improvement.[11-13] Since 1998, approximately two-thirds of the CHCs (645 centers) have voluntarily participated in a collaborative focusing on improving care for chronic medical conditions using the chronic care model.[14]

Previously, we conducted a controlled national evaluation[15] of the HRSA HDCs and found that they significantly improved the extent to which processes of care were followed for asthma and diabetes mellitus. To date, however, whether the HDCs reduced previously documented racial/ethnic and insurance quality gaps in CHCs remains unknown.[16] In this study, we examine racial/ethnic and insurance differences in quality of care for asthma, diabe-

tes mellitus, and hypertension before and after participation in the HDCs to provide a better understanding of whether these programs differentially narrowed disparities in care in addition to improving overall quality.

METHODS

OVERVIEW

We examined medical record data from patients receiving care in a nationally representative sample of 64 CHCs participating in this evaluation of the HRSA collaboratives to improve the care of patients with asthma, diabetes, or cardiovascular disease. For the cardiovascular disease collaborative, we focused the assessment on the improvement of care for patients with hypertension. We included 44 CHCs that participated in 1 of 3 HDCs and 20 CHCs that were not HDC participants for any condition; because HDC participants may be different from CHCs that never participated in a collaborative, each intervention center was compared with a participating center in a collaborative for 1 of the other conditions (eg, diabetic HDC participants for analyses of hypertension HDC outcomes) and were classified as internal controls because they would not reasonably be considered the same as other controls that never participated in an HDC. Therefore, CHCs that had never participated in a collaborative were classified as external controls.[15]

From each CHC, we abstracted medical record data from random samples of patients with the condition of interest before and after participation in a collaborative. For each condition, we defined disparities in care as the difference in quality of care between white patients and members of racial/ethnic minority groups and between those with commercial or Medicare insurance and those with Medicaid insurance or no insurance. We compared changes in disparities across time by race/ethnicity and insurance status for intervention clinics vs internal and external controls using a difference-in-differences design. We hypothesized that participating in an HDC would result in a narrowing of disparities, leading us to observe smaller disparities in intervention CHCs compared with both types of control clinics.

STUDY SITE SELECTION AND CONTROLS

The methods of CHC selection have been described in detail previously.[15] Of 238 eligible CHCs identified by the HRSA as participating in the asthma I or II, diabetes II or III, or cardiovascular I collaboratives, 138 (58%) agreed to participate in this independent evaluation. From these, 48 intervention centers were selected for participation: 17 for diabetes, 16 for asthma, and 15 for hypertension on the basis of region, location (rural/urban/mixed), number of sites, and caseload. Each of these CHCs was also asked to serve as an "internal" control for one of the other conditions under study. The earliest collaborative started on January 1, 2000, and the latest collaborative started on August 1, 2001. Potential "external" control centers that had never participated in a collaborative were then matched with intervention centers using the same variables as noted previously, yielding 34 potential external control centers, of which 22 (65%) agreed to participate in the study. Subsequent to sampling, 4 intervention centers and 2 control centers dropped out of the evaluation because they were unable to prepare appropriate patient lists, leaving a final study sample of 44 intervention and 20 external control centers. The Committee on Human Studies of Harvard Medical School, Boston, Massachusetts, approved the study protocol.

PATIENT SAMPLE

We selected random samples of patients with one of the diagnoses of interest during the 1 year before the beginning of the applicable quality improvement collaborative and 1 year after completion of the collaborative. Each CHC used administrative data to generate lists of unique patients who had at least 1 visit to the center during the appropriate 12-month period and in the year before the study period and who had received care for asthma, diabetes, or hypertension. From each list, we randomly selected 40 patients for each condition after excluding patients with end-stage renal disease, malignant neoplasm, and human immunodeficiency virus infection. For diabetes and hypertension, we excluded patients younger than 18 years and pregnant women; for asthma, we excluded patients younger than 2 years.

MEDICAL RECORD REVIEW

One to 4 clinic staff members at each health center were trained to be medical record abstractors in condition-specific conference calls led by a clinical consultant. Abstractors then completed 2 sample medical record abstracts that were compared with a criterion gold standard completed by the consultant. Abstractors who scored 90% or more correct were certified to abstract medical records at their centers. Data abstracted from the medical records included sociodemographic information (such as age, sex, race-ethnicity, insurance status, and zip code), comorbid medical and psychiatric illnesses, and disease-specific quality indicators in the areas of preventive care and screening, disease monitoring and treatment, and intermediate outcomes of care for each condition.

QUALITY INDICATORS

We chose quality-of-care indicators based on national guidelines or standards, such as the Health Plan Employer Data and Information Set, the Diabetes Quality Improvement Project, and the National Asthma Education and Prevention Program (**Table 1**). We supplemented these with indicators identified by the Bureau of Primary Health Care HDCs and additional measures of quality we considered important in the care of asthma, diabetes, and hypertension. Because relatively few patients qualified for the smoking cessation advice measure, we created a composite measure that included assessment and advice. To qualify as having met this measure, patients had to be documented as nonsmokers or have received smoking cessation advice if documented as smokers.

DEFINITIONS OF KEY TERMS

We created composite scores for quality in the clinical domains of prevention and screening, disease monitoring and treatment, and outcomes for each condition by averaging the scores across all the indicators applicable to that patient, with higher mean scores indicating better quality of care.[15,16] We define *disparity score* as the difference in mean quality scores between 2 racial/ethnic groups or between 2 groups with different levels of insurance coverage. We focus on disparities because they negatively affect ethnic minority groups and the uninsured; therefore, disparity score is the difference in quality between white patients and some other ethnic group or between a group with Medicare or private insurance coverage and uninsured individuals or Medicaid recipients. A positively valued disparity score indicates that a disparity is present (eg, a white-Hispanic diabetes disparity score of +6 indicates a 6% higher mean quality score for white patients compared with Hispanic patients). The *change in disparity score* is the disparity score for the postcollaborative period minus the dispar-

Table 1. Quality-of-Care Indicators and Eligibility by Condition

Indicator	Condition		
	Asthma[a]	Diabetes Mellitus[b]	Hypertension[c]
Preventive care and screening			
Smoking status assessed and cessation advice to smokers	All patients	All patients	All patients
Influenza vaccination	All patients	All patients	
Assessment of nephropathy		All patients	
Annual dilated eye examination		All patients	
Annual dental examination		All patients	
Annual foot examination		All patients without bilateral amputation	
Disease monitoring and treatment			
≥2 HbA1c assessments during year		All patients	Patients with diabetes
Daily aspirin use		Patients ≥40 y	Patients with CAD
Lipid profile during year		All patients	All patients
ACE inhibitor or AII receptor blocker use		Patients with proteinuria and no contraindications to ACE inhibitors or AII receptor blockers	Patients with diabetes or congestive heart failure and no contraindications
β-Blocker use			Patients with CAD and no contraindications
≥1 Creatinine measurement during year			All patients
≥2 Blood pressure measurements documented during year			All patients
Asthma severity assessment within 3 most recent visits during year	All patients		
Anti-inflammatory medication use	All patients with persistent asthma		
Exposure to smoke or other environmental triggers assessed during year	All patients		
Use of asthma management plan	All patients		
Outcome			
Most recent blood pressure control ≤140/90 or ≤130/80 mm Hg for diabetes or renal failure, respectively		All patients	All patients
Most recent HbA1c control ≤9%		All patients	All patients
Most recent LDL cholesterol ≤100 mg/dL		Patients with ≥1 LDL cholesterol measurement during year	Patients with CAD or diabetes who had ≥1 LDL cholesterol measurement during year
≤2 Urgent care visits and no hospital or ED visits for asthma during year	All patients		

Abbreviations: ACE, angiotensin-converting enzyme; AII, angiotensin II; CAD, coronary artery disease; ED, emergency department; HbA1c, hemoglobin A_{1c}; LDL, low-density lipoprotein.

SI conversion factor: To convert LDL cholesterol to millimoles per liter, multiply by 0.0259.

[a] The smoking cessation and asthma management plan measures match the Bureau of Primary Health Care/Health Resources and Services Administration Disparities Collaboratives key and supplemental measures. The influenza vaccination, severity assessment, and anti-inflammatory medication use measures match National Asthma Education and Prevention Program key clinical activities guidelines. The urgent care visit, ED visits, and hospitalizations measures match National Asthma Education and Prevention Program updates and Healthy People 2010 asthma guidelines.

[b] The smoking cessation, aspirin use, and ACE inhibitor/AII receptor blocker use measures match the Bureau of Primary Health Care/Health Resources and Services Administration Disparities Collaboratives key and supplemental measures. The nephropathy assessment, annual eye and foot examinations, HbA1c concentration of 9% or less, and LDL cholesterol determinations match the Diabetes Quality Improvement Project accountability measures. The influenza vaccination, HbA1c assessment, and HbA1c level of 7.0% or less determination match the American Diabetes Association clinical guidelines.

[c] The smoking cessation and creatinine measures match the Bureau of Primary Health Care/Health Resources and Services Administration Disparities Collaboratives key and supplemental measures. The β-blocker and ACE inhibitor/AII receptor blocker use measures match the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure and the American Heart Association/American College of Cardiology clinical guidelines. The blood pressure control determinations match the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure guidelines and Health Plan Employer Data and Information Set standards.

ity score for the precollaborative period. The *difference-in-difference disparity* is the change in disparity score for the intervention group minus the change in disparity score for a control group (internal or external control).

DATA ANALYSES

We compared the characteristics of the intervention centers and the internal and external control centers and their patient populations for each condition under study. Disparity scores were computed for each period. Using center-level quality scores as the outcome, we then compared mean changes in quality from baseline to follow-up for the intervention clinics and both types of control clinics using hierarchical linear regression models that controlled for patient characteristics and that accounted for the grouped error structure of the longitudinal data. Results are reported in terms of the change in disparity score for each treatment group. To determine whether disparities in quality narrowed or widened across time and whether changes in disparities across time differed by clinic type, we included a

Table 2. Community Health Center Characteristics[a]

Variable	Collaborative Center	Control Centers	
		Internal	External
Overall			
CHCs, No.	44	40	20
Region, %			
Northeast	24.4	24.3	25.0
Southeast	29.3	27.0	20.0
Midwest	22.0	21.6	30.0
West	24.4	27.0	25.0
Urban	47.7	52.5	45.0
Sites, mean (SD), No.	7.0 (4.1)	8.8 (13.1)	5.6 (3.8)
Users, mean (SD), No.	16 843 (10 619)	16 785 (11 735)	18 523 (13 693)
Asthma			
CHCs, No.	13	16	19
Region, %			
Northeast	38.5	28.6	26.3
Southeast	15.4	14.3	15.8
Midwest	15.4	21.4	31.6
West	30.8	35.7	26.3
Urban	53.9	50.0	47.4
Sites, mean (SD), No.	7.4 (3.9)	9.7 (15.1)	5.8 (3.8)
Users, mean (SD), No.	19 275 (12 648)	17 438 (13 107)	19 115 (13 802)
Diabetes mellitus			
CHCs, No.	17	14	18
Region, %			
Northeast	21.4	28.6	27.8
Southeast	28.6	28.6	16.7
Midwest	21.4	14.3	33.3
West	28.6	28.6	22.2
Urban	47.1	64.3	50.0
Sites, mean (SD), No.	10.9 (14.8)	6.8 (4.2)	5.8 (3.9)
Users, mean (SD), No.	18 107 (12 562)	14 327 (6680)	19 817 (13 849)
Hypertension			
CHCs, No.	14	10	18
Region, %			
Northeast	14.3	11.1	27.8
Southeast	42.9	44.4	22.2
Midwest	28.6	33.3	33.3
West	14.3	11.1	16.7
Urban	42.9	40.0	44.4
Sites, mean (SD), No.	5.2 (3.9)	7.4 (4.5)	5.6 (4.0)
Users, mean (SD), No.	13 057 (6251)	20 725 (13 909)	19 060 (14 156)

Abbreviation: CHCs, community health centers.
[a] Due to rounding, data may not total 100%.

3-way interaction term among period (preintervention vs postintervention), patient characteristic of interest (race/ethnicity or insurance status), and treatment group (intervention vs control) in each model. Patient control variables included age, sex, race/ethnicity, insurance status, and an adapted version of the Charlson Comorbidity Index.[15,16] Results are reported in terms of the difference-in-difference disparity of the intervention group vs each control group.

RESULTS

CHC AND PATIENT CHARACTERISTICS

Approximately half of the clinics were located in urban areas, and the clinics were well distributed throughout the country. No statistically significant differences were noted in clinic characteristics in intervention and control centers for any of the 3 conditions of interest (**Table 2**).

Overall, we studied 10 153 patients with 1 of the 3 target conditions in the experimental and control groups (3887 with asthma, 2904 with diabetes, and 3362 with hypertension). The mean number of patients per center in the precollaborative and postcollaborative periods was 41 (range, 16-84; median, 40) (**Table 3**). Approximately 60% of the patients were female in all 3 groups, and the mean age was approximately 46 years. Approximately 30% of the patients were covered by Medicaid insurance, and another 19% to 20% had no insurance. Except for insurance status and Charlson Comorbidity Index score for asthma ($P < .01$), no significant differences were noted between the intervention group and either of the control groups for any of the 3 conditions.

BASELINE DISPARITIES BY RACE/ETHNICITY AND INSURANCE STATUS

We observed differences in patterns of racial/ethnic disparities in care comparing intervention and control CHCs (**Table 4**). For all of the conditions, white patients received significantly higher-quality care than did black or Hispanic patients in control CHCs. For example, white patients in external control clinics received 67% of the recommended care for hypertension compared with 63% for Hispanic patients and 62% for black patients ($P < .001$). However, this pattern of racial/ethnic disparity existed only at baseline for asthma care in intervention CHCs.

For diabetes and hypertension, we observed significant disparities in care by insurance status at baseline for the intervention and control clinics (Table 4). In most instances, uninsured patients received lower-quality care than did those insured privately, by Medicare, or by other public funding. For example, uninsured individuals in collaborative clinics received 34% of the recommended care for diabetes compared with 39% for the insured groups ($P < .001$).

EFFECT OF COLLABORATIVES ON RACIAL/ETHNIC DIFFERENCES IN QUALITY

Comparing disparity scores in the preintervention and postintervention periods, we found that the intervention had a variable effect on narrowing disparities (Table 4). For asthma care, there was a significant reduction in the Hispanic-white disparity score in collaborative clinics, and this change was significantly greater than the disparity seen in the external controls ($P = .04$). However, there were greater reductions in Hispanic-white disparities for diabetes care in external control centers and for hypertension care in internal control clinics compared with changes in disparities in collaborative participating centers for these conditions across time ($P < .004$ for all).

When examining each domain of quality, we found that the observed improvement in Hispanic-white disparities in asthma care in collaborative clinics was because of a nonsignificantly greater reduction in these disparities in all 3 domains of care compared with external controls (**Figure**). For diabetes care, the greater reduc-

tion in Hispanic-white disparity in external controls was because of more significant reductions in quality gaps in the domains of monitoring and treatment and outcomes in these clinics ($P \leq .01$ for both) compared with collaborative clinics. For hypertension care, the better performance of internal control clinics in reducing the Hispanic-white disparity compared with collaborative clinics was because of an increasing Hispanic-white disparity in disease monitoring and treatment in collaborative participants during the study ($P = .007$). We found no significant reductions in black-white disparities in overall care for any of the conditions.

IMPACT OF COLLABORATIVES ON INSURANCE DIFFERENCES IN QUALITY

Comparing disparity scores in the preintervention and postintervention periods, we found that the intervention had little effect on insurance disparities. There were no improvements in insurance disparities in overall care for any of the 3 conditions comparing collaborative clinics with controls (Table 4). For diabetes care, there was a significant increase in the Medicaid-private insurance disparity across time in collaborative clinics that led to a significantly greater increase in disparity compared with external controls ($P = .01$).

COMMENT

In this large controlled evaluation of a national program examining improvements in disparities in care for CHC patients with asthma, diabetes, and hypertension, we found that although overall quality of care improved across all involved CHCs, barriers according to race/ethnicity or insurance status did not change appreciably. This evaluation of the effectiveness of the HRSA HDCs in reducing disparities is particularly relevant today because of substantial growth in the number of CHCs during the past decade and the possibility that the current administration may further increase their number to increase access to care for the uninsured.

We found previously that participation in an HDC improved processes of care related to prevention and screening and disease monitoring and treatment.[15] In this study, however, we found that these global improvements in quality had minimal effect on any baseline racial/ethnic and insurance disparities in care in individual CHCs. Specifically, although collaborative participation reduced disparities in quality of asthma care between Hispanics and non-Hispanic whites, participation was not effective in reducing racial/ethnic disparities for diabetes and hypertension and was associated with an increase in disparity of diabetes care between Medicaid and insured patients compared control CHCs. These findings may, in part, reflect the significantly smaller disparity present in HDC-participating CHCs compared with controls. Theoretically, participating CHCs had much less room for improvement compared with controls and, thus, were less likely to differentially improve. Note, however, that for many of the conditions, disparities differentially increased in HDC-participating CHCs during the intervention period compared with controls. Whether these differences in disparity trends across outcomes and diseases are related to the variable improvement across time for intervention and control centers for most individual measures is unknown.[15]

Table 3. Patient Characteristics in Collaborative and Control Sites[a]

Variable	Collaborative Site	Control Site	
		Internal	External
Asthma			
Female sex, %	60.9	64.3	60.5
Age, mean (SD), y	24.8 (19.6)	30.8 (20.5)[b]	28.0 (21.0)
Race, %			
White	38.4	39.7	32.0
Black	22.4	31.8	18.9
Hispanic	25.8	17.1	23.4
Other[c]	13.4	11.5	25.7
Insurance, %			
Private	20.6	12.4	20.0
Medicaid	47.4	43.0	48.1
Medicare	4.1	11.7[d]	8.1[d]
None	6.3	16.3[d]	14.0[d]
Other	21.1	16.0	9.2
Language not English, %	15.4	12.1	27.9
Charlson Comorbidity Index score, mean (SD)	0.28 (0.66)	0.48 (1.00)[c]	0.35 (0.82)
Diabetes mellitus			
Female sex, %	63.5	59.5	60.0
Age, mean (SD), y	54.1 (14.1)	54.0 (13.1)	56.5 (13.6)
Race, %			
White	34.7	30.6	34.9
Black	30.8	15.7	17.6
Hispanic	24.1	32.5	29.4
Other[b]	10.3	21.2	18.1
Insurance, %			
Private	10.9	13.2	17.4
Medicaid	24.2	25.2	25.3
Medicare	29.6	20.0	31.4
None	25.6	26.0	20.1
Other	9.3	15.0	5.7
Language not English, %	19.1	40.9	33.8
Charlson Comorbidity Index score, mean (SD)	1.69 (1.34)	1.58 (1.10)	1.68 (1.17)
Hypertension			
Female, %	56.2	62.8	60.6
Age, mean (SD)	56.1 (13.3)	54.4 (13.9)	58.3 (14.3)
Race, %			
White	52.3	43.5	36.3
Black	13.2	29.7	21.5
Hispanic	23.0	22.7	25.2
Other[b]	11.5	4.2	17.1
Insurance, %			
Private	15.7	23.8	18.4
Medicaid	17.1	13.6	23.1
Medicare	28.3	24.6	33.2
None	29.4	27.8	16.1
Other	9.0	10.1	8.9
Language not English, %	26.0	14.9	29.0
Charlson Comorbidity Index score, mean (SD)	0.87 (1.17)	0.79 (1.07)	0.90 (1.20)

[a] Due to rounding, data do not total 100%.
[b] $P < .05$.
[c] There were no significant differences between the preintervention and postintervention populations, so these populations were combined for this table.
[d] $P < .001$.

Table 4. Mean Overall Preintervention and Postintervention Performance and Disparity Scores on Adjusted Quality-of-Care Indicators for Intervention and Control Clinics According to Participant Characteristics[a]

	Disparity Score[b]					
	Collaborative Clinics		Internal Control Clinics[c]		External Control Clinics[c]	
Variable	Preintervention Quality	Postintervention Quality	Preintervention Quality	Postintervention Quality	Preintervention Quality	Postintervention Quality
Asthma						
Overall quality	**38.7**	**51.7**	**39.3**	**45.4**	**42.7**	**45.2**
Race/ethnicity						
White	40.3	52.3	40.1	44.9	41.9	47.7
Black	39.2 (1.1)[d]	51.4 (0.9)[e]	39.4 (0.7)	43.0 (1.9)	43.4 (–1.5)[d]	41.6 (6.1)[d]
Hispanic	33.8 (**6.5**)[d]	53.1 (**–0.8**)[e]	34.7 (5.4)	48.9 (–4.0)	39.9 (**2.0**)[d]	45.0 (**2.7**)[d]
Insurance status						
Private/Medicare/other	38.1	50.0	38.7	43.9	42.7	45.9
Uninsured	40.5 (–2.4)	52.2 (–2.2)	35.0 (3.7)	47.0 (–3.1)[d]	41.6 (1.1)	41.6 (4.3)[d]
Medicaid	36.6 (1.5)	53.0 (–3.0)	39.1 (–0.4)	44.2 (–0.3)[d]	41.7 (1.0)	44.8 (1.1)[d]
Diabetes mellitus						
Overall quality	**38.9**	**50.1**	**38.6**	**42.2**	**37.3**	**43.9**
Race/ethnicity						
White	37.7	53.0	39.3	44.6	38.9	42.3
Black	38.2 (–0.5)[d]	49.3 (0.7)[d]	40.2 (–0.9)[d]	33.6 (11.0)[d]	35.3 (3.6)[d]	38.3 (4.0)[d]
Hispanic	38.2 (**–0.5**)[d]	49.2 (**0.8**)[d]	36.1 (3.2)[d]	43.3 (1.3)[d]	38.0 (**0.9**)[d]	47.9 (**–5.6**)[d]
Insurance status						
Private/Medicare/other	39.4	51.3	39.5	43.0	41.1	45.5
Uninsured	34.1 (5.3)[d]	48.5 (2.8)[e]	31.9 (7.6)[d]	39.3 (3.7)	32.9 (8.2)[d]	40.5 (5.0)[d]
Medicaid	42.6 (–3.2)[d]	48.5 (2.8)[e]	42.7 (–3.2)[d]	42.3 (0.7)	35.8 (5.3)[d]	43.8 (1.7)[d]
Hypertension						
Overall quality	**61.8**	**67.5**	**60.1**	**63.6**	**63.5**	**70.3**
Race/ethnicity						
White	61.1	67.0	62.4	61.2	66.8	69.4
Black	59.2 (1.9)	69.3 (–2.3)	56.3 (6.1)	61.2 (0.0)	61.5 (5.3)[d]	70.0 (–0.6)
Hispanic	67.2 (**–6.1**)	68.6 (**–1.6**)	59.8 (**2.6**)	69.5 (**–8.3**)	62.9 (3.9)[d]	69.4 (0.0)
Insurance status						
Private/Medicare/other	63.3	68.3	61.4	63.2	64.9	69.9
Uninsured	57.9 (5.4)[d]	63.1 (5.2)[d]	56.2 (5.2)	61.6 (1.6)	65.1 (–0.2)[d]	71.8 (–1.9)
Medicaid	62.2 (1.1)[d]	70.0 (–1.7)[d]	60.2 (1.2)	67.8 (–4.6)	58.7 (6.2)[d]	69.3 (0.5)

[a] Measures adjusted for age, sex, insurance status, and Charlson Comorbidity Index score using hierarchical linear regression models.
[b] Scores in bold font represent $P < .05$ for comparison of differences in disparity across time (difference-in-difference disparity) for collaborative centers compared with control groups.
[c] Internal control clinics were participating in a collaborative for a different condition. External control clinics had never participated in a collaborative.
[d] $P \leq .001$ for difference in performance compared with the reference group.
[e] $P \leq .05$ for difference in performance compared with the reference group.

The HDCs were designed to improve the processes and outcomes of care for CHC patients with prevalent medical conditions and, in so doing, to decrease disparities in care. There are 2 potential mechanisms through which the HDCs could reduce disparities. The collaboratives themselves could lead to a narrowing of disparities in the target health centers akin to a rising tide lifting all boats. Alternatively, these collaboratives could reduce disparities nationally by raising performance for CHCs overall because CHCs care for disproportionate shares of minority and underserved populations. The present findings suggest that the HDCs did not reduce disparities in the targeted CHCs compared with a contemporaneous control group. This finding raises concerns that generalized quality improvement programs may be unsuccessful in reducing disparities, as many had believed, and that such programs may need to specifically target underserved populations if reducing intracenter disparities is an explicit goal.

These findings are supported by previous research examining the effects of similar broad quality improvement initiatives and have yielded mixed results, with some studies showing a reduction in disparities in processes of care with little effect on differences in clinical outcomes.[8,10] For example, in a longitudinal study examining the effectiveness of a Centers for Medicare and Medicaid Services national initiative to improve the intensity and outcomes of hemodialysis, Sehgal[10] observed that the proportion of patients receiving adequate hemodialysis dosing increased 2-fold during a 7-year period and that the gap in intensity between white and black patients significantly decreased during that time. However, racial gaps in hemoglobin and albumin levels persisted.[10]

Similarly, in a study that examined managed care plans participating in Medicare, Trivedi et al[8] found that reporting performance on quality-of-care measures from the Health Plan Employer Data and Information Set was associated with a reduction in disparities between white and black patients for 7 of 9 measures studied and an increase or no change in disparity in clinical outcomes related to blood glucose and cholesterol control. More re-

cently, Moylan et al[17] found that previously documented racial disparities in wait listing for liver transplantation were eliminated after introduction of the Model for End-Stage Liver Disease score. These previous studies, however, either used a historical cohort or examined general trends in quality and, thus, did not isolate specific effects from a quality improvement intervention. The present study results demonstrate a similar narrowing of black-white disparities across time at centers participating in the HDCs; however, these changes were not significantly different than those that occurred in control clinics. Furthermore, because CHCs provide care for many Hispanic patients,[5,6,18] we were able to go beyond these previous studies by examining disparities in quality of care between Hispanic and non-Hispanic patients.[19]

In addition, because CHCs provide care for many uninsured and Medicaid patients, we were able to address limitations of previous assessments of the impact of broad quality improvement programs on disparities that have been limited to populations who were adequately insured.[8-10] In a previous study[16] examining quality of care for patients with chronic disease in CHCs, we found that Medicare patients received significantly higher quality of asthma and diabetes care compared with Medicaid and uninsured patients. In the present study, we found that the collaboratives had minimal effect on insurance disparities in the CHCs. We also found that although secular trends in control centers were associated with persistent insurance-based gaps in quality, the gap in diabetes quality between Medicaid and insured patients increased with collaborative participation.

The present assessment of the effectiveness of the HDCs in reducing disparities has limitations. First, we evaluated quality improvement collaboratives that were based on the Institute for Healthcare Improvement model, the most prevalent and reproducible type of quality improvement program, but there are many variations on this model and multiple other approaches to quality improvement that have been tried.[20,21] Consequently, there is still much to know about quality improvement collaboratives, and a broader understanding of the tools and methods used for quality improvement and their potential effectiveness is missing.[22] As a result, we cannot determine which aspects of collaborative participation were associated with increasing insurance disparities in diabetes care and improving racial disparities in asthma care. More research would likely be helpful regarding the operations and effectiveness of individual collaboratives and the broad range of organizational contextual factors that can impact the success of quality improvement collaboratives.[20-23] Furthermore, we had only 44 HDC-participating CHCs in this study, limiting our ability to examine whether there are significant differences between collaborative participating centers for each condition to determine whether there are activities conducted in settings that may be more effective at disparity reduction than others.

Second, we could not perform a pure randomized trial of the intervention, instead relying on matching and statistical models to adjust for potential confounding variables. Third, although we assessed important markers of care quality that were the main focus of the collaboratives, some clinics might have improved in areas of care that we did not measure (eg, patient experiences with care). Fourth, we note that the cardiovascular collaboratives (the collaboratives involved in hypertension management) were focused on a broader set of goals than just hypertension, so there might have been improvement in other areas of care or for other cardiovascular disease populations that we did not study. Fifth, some of the improvements we observed might have resulted from improved documentation rather than from improved care. We[15] previously noted, however, that measures that might be more sensitive to documentation effects (eg, smoking related) did not improve more than did measures that required an action (eg, glycohemoglobin assessment).

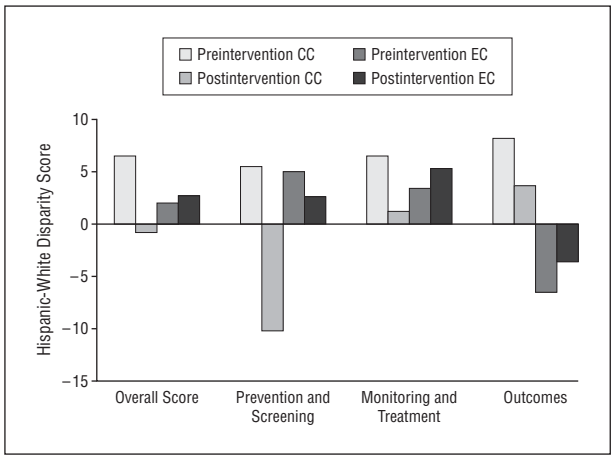

Figure. Preintervention and postintervention Hispanic-white disparity scores for asthma quality of care for collaborative (CC) participating and external control (EC) centers. Significant differences in change in disparity across time between center types are presented for overall quality, and nonsignificant differences are presented for the dimensions of prevention and screening, disease monitoring and treatment, and clinical outcomes. Measures are adjusted for age, sex, insurance status, and Charlson Comorbidity Index score; difference in performance for white patients was used as a reference group for all comparisons. Negative values denote higher performance for Hispanic compared with white patients (reverse disparity).

The HRSA HDCs are among the most important national health initiatives attempting to reduce disparities by targeting the quality of care for underserved populations. In this controlled study, these collaboratives significantly improved the quality of care in intervention centers, which affects disparities broadly because of the large share of underserved patients being cared for by CHCs, but had minimal effect on racial/ethnic disparities and insurance disparities in the health centers. These findings suggest that approaches that specifically target racial/ethnic and insurance disparities should be included as part of broad quality improvement initiatives and that future initiatives should assess disparity reduction as an outcome in addition to examining overall improvement in quality.

Accepted for Publication: September 30, 2009.
Correspondence: LeRoi S. Hicks, MD, MPH, Division of General Internal Medicine, Brigham and Women's Hospital, 1620 Tremont St, Boston, MA 02120 (lhicks1@partners.org).
Author Contributions: Dr Hicks had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Hicks, O'Malley, Lieu, McNeil, Guadag-

noli, and Landon. *Acquisition of data:* Hicks, Keegan, McNeil, Guadagnoli, and Landon. *Analysis and interpretation of data:* Hicks, O'Malley, Keegan, and Landon. *Drafting of the manuscript:* Hicks, O'Malley, and Guadagnoli. *Critical revision of the manuscript for important intellectual content:* Hicks, O'Malley, Lieu, Keegan, McNeil, and Landon. *Statistical analysis:* O'Malley. *Obtained funding:* O'Malley, Lieu, McNeil, Guadagnoli, and Landon. *Administrative, technical, and material support:* Keegan, McNeil, and Guadagnoli. *Study supervision:* Hicks, Keegan, and Landon.

Financial Disclosure: Dr Hicks serves as a consultant for Health Management Corp and on the board of directors to Health Resources in Action.

Funding/Support: This project was supported by grant 1 U01 HS13653 from the Agency for Healthcare Research and Quality, with support from the Health Resources and Services Administration, and by grant 20030185 from The Commonwealth Fund.

Previous Presentation: An abstract of this project was accepted for oral presentation at the Society of General Internal Medicine 2007 annual meeting; April 25-28, 2007; Toronto, Ontario, Canada.

Additional Contributions: Yang Xu, MA, provided statistical programming; Rebecca Ouellette, MPA, assisted with project management; Mary Ly, MPH, Lynn Huynh, BA, and Adam Lessler, BA, provided research assistance, and Laura Peterson, RN, MS, assisted with developing chart abstraction instruments and training of abstractors.

REFERENCES

1. National healthcare quality report, 2004. AHRQ Website. http://www.ahrq.gov/qual/nhqr04/nhqr04.htm. Accessed January 2007.
2. National healthcare disparities report, 2004. AHRQ Website. http://www.ahrq.gov/qual/nhdr04/nhdr04.htm. Accessed January 2007.
3. McGlynn EA, Asch SM, Adams J, et al. The quality of health care delivered to adults in the United States. *N Engl J Med*. 2003;348(26):2635-2645.
4. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academies Press; 2001.
5. Institute of Medicine. *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*. Washington, DC: National Academies Press; 2003.
6. Dievler A, Giovannini T. Community health centers: promise and performance. *Med Care Res Rev*. 1998;55(4):405-431.
7. The Safety Net on the Edge. http://www.chnwa.org/PolicyAdvocacy/ResearchAndReports/SafetyNetOnTheEdgeAugust2005.pdf. Accessed November 19, 2009.
8. Trivedi AN, Zaslavsky AM, Schneider EC, Ayanian JZ. Trends in the quality of care and racial disparities in Medicare managed care. *N Engl J Med*. 2005;353(7):692-700.
9. Jha AK, Fisher ES, Li Z, Orav EJ, Epstein AM. Racial trends in the use of major procedures among the elderly. *N Engl J Med*. 2005;353(7):683-691.
10. Sehgal AR. Impact of quality improvement efforts on race and sex disparities in hemodialysis. *JAMA*. 2003;289(8):996-1000.
11. Berwick DM. Continuous improvement as an ideal in health care. *N Engl J Med*. 1989;320(1):53-56.
12. Shortell SM, O'Brien JL, Carman JM, et al. Assessing the impact of continuous quality improvement/total quality management: concept versus implementation. *Health Serv Res*. 1995;30(2):377-401.
13. Kilo CM. A framework for collaborative improvement: lessons from the Institute for Healthcare Improvement's Breakthrough Series. *Qual Manag Health Care*. 1998;6(4):1-13.
14. Wagner EH. Chronic disease management: what will it take to improve care for chronic illness? *Eff Clin Pract*. 1998;1(1):2-4.
15. Landon BE, Hicks LS, O'Malley AJ, et al. Improving the management of chronic disease at community health centers. *N Engl J Med*. 2007;356(9):921-934.
16. Hicks LS, O'Malley AJ, Lieu TA, et al. The quality of chronic disease care in U.S. community health centers. *Health Aff (Millwood)*. 2006;25(6):1712-1723.
17. Moylan CA, Brady CW, Johnson JL, Smith AD, Tuttle-Newhall JE, Muir AJ. Disparities in liver transplantation before and after introduction of MELD score. *JAMA*. 2008;300(20):2371-2378.
18. O'Malley AS, Forrest CB, Politzer RM, Wulu JT, Shi L. Health center trends, 1994-2001: what do they portend for the federal growth initiative? *Health Aff (Millwood)*. 2005;24(2):465-472.
19. Cooper LA, Hill MN, Powe N. Designing and evaluating interventions to eliminate racial and ethnic disparities in health care. *J Gen Intern Med*. 2002;17(6):477-486.
20. ØVretveit J, Bate P, Cleary P, et al. Quality collaboratives: lessons from research. *Qual Saf Health Care*. 2002;11(4):345-351.
21. Wilson T, Berwick DM, Cleary PD. What do collaborative improvement projects do? experience from seven countries. *Jt Comm J Qual Saf*. 2003;29(2):85-93.
22. Mittman BS. Creating the evidence base for quality improvement collaboratives. *Ann Intern Med*. 2004;140(11):897-901.
23. Gustafson DH, Sainfort F, Eichler M, Adams L, Bisognano M, Steudel H. Developing and testing a model to predict outcomes of organizational change. *Health Serv Res*. 2003;38(2):751-776.