

Racial/Ethnic Differences in Clinical Quality Performance Among Health Centers

Lydie A. Lebrun, PhD, MPH; Leiyu Shi, DrPH, MBA, MPA; Jinsbeng Zbu, MEd; Ravi Sharma, PhD; Alek Sripipatana, PhD, MPH; A. Seiji Hayashi, MD, MPH; Charles A. Daly, MHA; Quyen Ngo-Metzger, MD, MPH

Abstract: More than 1100 federally funded health centers provide primary and preventive care to about 20 million underserved patients in the United States. Since 2008, the Health Resources and Services Administration has implemented a clinical quality improvement initiative to measure and evaluate the quality of care across all health centers. We assessed racial/ethnic disparities in clinical quality among US health centers, and examined whether performance on quality measures varied across 3 health center characteristics. National data came from the 2009 Uniform Data System. We examined performance across 3 indicators of clinical quality: poorly controlled hypertension among adult patients, poorly controlled diabetes among adult patients, and low birth weight among newborns. We compared results for each measure across racial/ethnic groups, as well as across 3 health center characteristics: health center patient volume, duration of health center funding, and extent of managed care penetration. Non-Hispanic Asian patients had the best results among racial/ethnic groups for 2 of the 3 measures examined: lowest rates of poorly controlled diabetes (26%) and hypertension (34%). Hispanics/Latinos had similar rates of poor hypertension control compared with non-Hispanic whites (38% for both), and lower rates of low birth weight (8% vs 10%). Poor diabetes control was more prevalent among Hispanic/Latino patients than non-Hispanic white patients, but the absolute difference was small (5 percentage points). Non-Hispanic black/African American patients had statistically worse outcomes than non-Hispanic white patients, but the absolute differences were also small (2-6 percentage points, depending on outcome). Health centers with larger patient volume fared better than their counterparts with smaller volume for all racial/ethnic groups. For Hispanic/Latino patients, more established health centers compared favorably to new health centers for all 3 outcomes. Health centers with some managed care penetration did better for diabetes and hypertension control relative to health centers without managed care penetration. Compared with national rates, health centers report minimal racial/ethnic disparities in clinical outcomes. Health center characteristics are also associated with clinical outcomes. More research is needed to determine the nature of disparities after accounting for health center patient, provider, and institutional characteristics. **Key words:** *community health, health care disparities, quality of care, race/ethnicity*

Author Affiliations: Bureau of Primary Health Care, Health Resources and Services Administration, US Department of Health and Human Services, Rockville, Maryland (Drs Lebrun, Sharma, Sripipatana, Hayashi, and Ngo-Metzger, and Mr Daly); Johns Hopkins Primary Care Policy Center, Baltimore, Maryland (Dr Shi and Ms Zbu).

This study received financial support from the Health Resources and Services Administration (HRSA) of the US Department of Health and Human Services (HHS) (Contract No. HHS250200646022D).

The views expressed in this article are those of the authors and do not necessarily reflect the official policies

of HHS or HRSA, nor does mention of the department or agency imply endorsement by the US government.

The authors have disclosed that they have no significant relationships with, or financial interest in, any commercial companies pertaining to this article.

Correspondence: Lydie A. Lebrun, PhD, MPH, US Department of Health & Human Services, Health Resources and Services Administration, Bureau of Primary Health Care, Office of Quality and Data, 5600 Fishers Lane, 6A-55, Rockville, MD 20857 (llebrun@brsa.gov).

DOI: 10.1097/JAC.0b013e3182473523

AMONG ITS VARIOUS ACTIVITIES, the Bureau of Primary Health Care (BPHC), in the Health Resources and Services Administration (HRSA), funds more than 1100 health center grantees to provide primary and preventive care to about 20 million patients throughout the United States (Health Resources and Services Administration, 2010a). In 2008, HRSA implemented a clinical quality improvement initiative to measure and evaluate quality of care, as well as disparities in care, across BPHC-funded health centers (Health Resources and Services Administration, 2010c; Health Resources and Services Administration BPHC, 2011). Quality performance measures currently tracked by HRSA are consistent with those endorsed by the National Quality Forum and other national quality organizations. They address a number of priority health conditions among communities served by HRSA grantees and are amenable to quality improvement. The array of measures emphasizes a combination of process of care indicators and health outcomes throughout the life cycle.

Processes of care can be improved in health centers, particularly in the presence of concerted quality improvement efforts. Starting in 1998, the various Health Disparities Collaboratives sought to improve the quality of care and reduce disparities for prevalent chronic conditions throughout health centers; these Collaboratives showed improvements in numerous processes of care for diabetes, including hemoglobin A_{1c} (HbA_{1c}) testing, eye examinations, foot examinations, lipid assessments, urine microalbumin assessments, and dental referrals (Chin et al., 2004, 2007; Landon et al., 2007). Recent analysis of hypertension care in health centers in 2008-2009 found that a high proportion of hypertensive health center patients reported receiving advice regarding diet changes, salt intake, alcohol consumption, exercise, and home management plans (Sripipatana et al., 2011).

However, evidence from health centers as well as other settings indicates that even with improvements in processes, improved outcomes are especially difficult to achieve or may require longer-term follow-up to de-

tect. The Collaboratives reported mixed evidence regarding their impact on longer-term patient outcomes, such as control of glycated hemoglobin levels for diabetes and control of blood pressure for hypertension (Chien et al., 2007; Landon et al., 2007). In addition, research in Veterans Affairs and managed care settings showed that even with good clinical processes for diabetic patients, glycemic control may not necessarily follow because clinicians often have little influence over what their patients do outside the health care setting regarding diet, exercise, medication adherence, and self-care (Mangione et al., 2006; Trivedi et al., 2011).

In light of the challenges involved in improving clinical outcomes, this study aimed to assess health centers' current performance regarding selected outcomes. Thus, we focused the current analyses on 3 indicators: inadequate blood pressure control among hypertensive patients, poor glycemic control among diabetic patients, and low birth weight among newborns. To date, a limited number of studies have examined the extent to which racial/ethnic disparities exist for these performance measures among the health center patient population. One study, using data from 1996 to 2001, found slightly higher rates of low birth weight among black patients relative to white patients in health centers; however, the racial gap in health centers was smaller than the nationwide disparity (Shi et al., 2004).

Other studies examined quality of care indicators for hypertensive or diabetic health center patients, to determine whether gaps in quality existed as a function of race/ethnicity. Two studies, in Colorado and California (both using data from 1999 to 2001), found no significant differences in blood pressure control between white and black or Hispanic hypertensive patients (Eisert et al., 2008; Maizlish et al., 2004). During the same time frame, analysis of a larger sample of health centers distributed throughout the United States found that white patients received recommended care more often than black patients, for hypertension as well as diabetes; however, these disparities disappeared after accounting for

differences in insurance status (Hicks et al., 2006).

The aforementioned studies provide some context, but may not present an accurate picture of the current status of racial/ethnic disparities in clinical quality within the Health Center Program. These studies relied on data sources dating back to the late 1990s, preceding the current quality improvement initiative at HRSA. To address this gap in the health center literature, we sought to provide the most recent analyses of racial/ethnic disparities in clinical quality performance across health centers in the United States, using 2009 data from HRSA. The purpose of the study was to determine the presence and extent of disparities between non-Hispanic white patients and nonwhite minority patients. We also examined interaction effects between race/ethnicity and 3 specific health center characteristics: health center patient volume, duration of health center funding, and extent of managed care penetration.

METHODS

Data sources

Data came from the 2009 Uniform Data System (UDS). The UDS is a tracking system requiring annual reporting from all HRSA grantees regarding a variety of information, including patient demographics, services provided, staffing, clinical indicators, utilization rates, costs, and revenues (Health Resources and Services Administration, 2010b; Health Resources and Services Administration, 2011). The system collects aggregated grantee-level data. The 2009 UDS is the most recent data set available, and includes data on clinical quality performance indicators from 1131 health center grantees serving about 20 million patients (Health Resources and Services Administration, 2008). Health centers are required to submit clinical outcome data to the UDS for specific racial/ethnic groups, including Hispanic/Latino, non-Hispanic white, non-Hispanic black/African American, and non-Hispanic Asian patients.

Measures

For this study, the quality of care-related clinical outcomes in health centers was examined across racial/ethnic groups. Three measures were included in the current study: (a) inadequate hypertension control, defined as the percentage of adults aged 18 to 85 years with diagnosed hypertension whose most recent blood pressure level was greater than 140/90 mm Hg; (b) poorly controlled diabetes, defined as the percentage of adults aged 18 to 75 years with diagnosed type 1 or type 2 diabetes with most recent HbA_{1c} levels greater than 9%; and (c) low birth weight, defined as the percentage of newborns with birth weight less than 2500 g. A more stringent cutoff of 130/80 for hypertension control is sometimes used by researchers; however, we focused on the 140/90 threshold to be consistent with the HEDIS measure endorsed by the National Committee for Quality Assurance (Agency for Healthcare Research and Quality, 2011c). Similarly, although a lower cutoff of 7% for glycated hemoglobin is often used as a measure of diabetes control, we followed National Committee for Quality Assurance guidelines, which endorse the 9% cutoff as an indication of poorly controlled diabetes (Agency for Healthcare Research and Quality, 2011c).

Patient race/ethnicity was categorized into non-Hispanic white, non-Hispanic black/African American, Hispanic/Latino, and non-Hispanic Asian. Other groups, including native Hawaiians/other Pacific Islanders and American Indians/Alaska Natives, were excluded from analyses because of small sample sizes, as were patients reporting multiple races. Institutional characteristics included health center patient volume (large vs small), duration of health center funding (established vs new), and managed care penetration. Health center size was considered "large" if the number of patients was equal to or greater than the median number of total patients across all health centers, and "small" if the number of patients was less than the median. Health centers were categorized as "established" if the grantees had received HRSA funding and been in operation for 3 years or

more, and “new” if they had received funding for less than 3 years. Health centers with less than 5% of their patient population enrolled in managed care programs were considered to have no managed care penetration; all centers with at least 5% of patients in managed care were considered to have some managed care penetration.

Analysis

SAS version 9.1 was used for all analyses. For each clinical quality measure, the mean health center rate was calculated for each race/ethnicity. Analyses of variance were used to determine whether differences across racial/ethnic groups were statistically significant.

In addition to overall racial/ethnic disparities, separate analyses were performed to obtain the mean rates of clinical outcomes for each race/ethnicity by health center patient volume, duration of funding, and managed care penetration. Student *t* tests were conducted to assess whether clinical outcomes significantly differed across these health care settings, separately for each racial/ethnic group. Interactions between race/ethnicity and health center patient volume were examined to explore the hypothesis that centers with higher patient volume might be more likely to serve more diverse populations and address disparities in health care, compared with smaller centers. Higher volume centers may allow economies of scale and specialization of labor, and may have a larger proportion of funding from non-BPHC grants, thus larger centers may be better equipped to designate specific personnel to address sources of disparities (eg, patient outreach and follow-up, language interpretation). Analyses were also stratified by duration of health center funding because established centers were expected to be more experienced in addressing racial/ethnic disparities than new centers. Longer duration of funding may allow the establishment of trusting relationships between providers and patients, as well as between health centers and the communities they serve, thus facilitating collaborations to improve health among vulnerable popu-

lations. Finally, racial/ethnic disparities were examined separately for health centers with some versus no managed care penetration, to account for the possibility that health centers serving more managed care patients might be more likely to engage in outreach to patients with chronic conditions, employ disease management techniques, or monitor provider adherence to standard protocols of care regardless of patient race/ethnicity.

RESULTS

Overall, 36.9% of health center patients with hypertension had inadequately controlled blood pressure, 29.3% of patients with diabetes had their HbA_{1c} levels poorly controlled, and 7.3% of births were low birth weight. Table 1 summarizes the unadjusted mean health center rates for the 3 quality indicators for each racial/ethnic group. Differences across racial/ethnic groups were statistically significant for all 3 outcomes; however, the magnitude of these differences was small. Across all health centers, rates of inadequate hypertension control were lowest for non-Hispanic Asian patients (34%) and highest for non-Hispanic black/African American patients (44%), with non-Hispanic white and Hispanic/Latino patients falling in the middle. Rates of poorly controlled diabetes were lowest for non-Hispanic Asian and non-Hispanic white patients (26%-27%), with rates of non-Hispanic African American and Hispanic patients being several percentage points higher (31%-32%). Rates of low birth weight were lowest among Hispanic patients (8%) and highest among non-Hispanic African American patients (12%).

Closer examination of outcomes for non-Hispanic white versus minority health center patients points to several interesting findings. Health center performance for non-Hispanic Asian patients was the best of all racial/ethnic groups for 2 of the 3 outcome measures. Specifically, non-Hispanic Asians had the lowest rates of poorly controlled diabetes (26%) and lowest rates of inadequate hypertension control (34%). In addition, outcomes for Hispanics were better than non-Hispanic

Table 1. Health Center Clinical Outcome Measures by Race/Ethnicity: 2009 Uniform Data System

	Health Center Mean Rate, % (SE) ^a		
	Inadequate Hypertension Control (>140/90 mm Hg), (N = 1122)	Poor Diabetes Control (>9% HbA _{1c}), (N = 1121)	Low Birth Weight (<2500 g), (N = 707)
White (non-Hispanic)	37.54 (18.66)	27.41 (18.29)	10.02 (16.81)
Black/African American (non-Hispanic)	43.87 (24.00)	31.40 (22.60)	12.17 (15.59)
Asian (non-Hispanic)	34.45 (34.92)	25.57 (32.07)	11.42 (22.18)
Hispanic/Latino	37.66 (24.42)	32.40 (22.26)	7.98 (13.29)

^a $P < .001$, based on analysis of variance of means across racial/ethnic groups in health centers.

Abbreviation: SE, standard error.

whites for low birth weight (8% vs 10%) and comparable to non-Hispanic whites for poor hypertension control (38% for both). Poor diabetes control was higher among Hispanic patients than non-Hispanic white patients, but the absolute difference was small (5 percentage points). Outcomes were generally worse among non-Hispanic African American patients relative to non-Hispanic white patients, but again the absolute differences were small (2-6 percentage points, depending on the outcome).

Health center patient volume

Table 2 shows mean rates of clinical outcomes for each racial/ethnic group stratified by health center patient volume. In general, health centers with larger patient volume reported better clinical outcomes than smaller health centers. For each racial/ethnic group except Hispanics, large health centers had significantly better performance than small health centers for diabetes control. For instance, 30% of non-Hispanic African American patients in large centers had poor diabetes control, compared with 34% in small centers ($P < .01$). In addition, poor hypertension control among Hispanics was less common in large centers than small centers (35% vs 41%, $P < .001$), and low birth weight among non-Hispanic Asians was less common in large centers than small centers (10% vs 17%, $P < .05$).

Duration of health center funding

Table 3 shows mean outcomes for each racial/ethnic group stratified by health center duration of funding. Generally, more established health centers reported better results than their newer counterparts. Older health centers had lower rates of poor diabetes control than newer centers for non-Hispanic white (27% vs 32%, $P < .001$) and Hispanic patients (32% vs 38%, $P < .01$). Older health centers also had lower rates of poor hypertension control (37% vs 43%, $P < .05$) and low birth weight (8% vs 13%, $P < .05$) among Hispanic patients.

Managed care penetration

Table 4 summarizes the same statistics for each racial/ethnic group, stratified by health centers' level of managed care penetration. Health centers with at least 5% of their patient population enrolled in managed care consistently performed better for hypertension control and diabetes control, compared with centers with few to no managed care patients. For instance, 42% of non-Hispanic African American patients had inadequate hypertension control in health centers with managed care penetration, compared with 47% of non-Hispanic African American patients in health centers with no managed care penetration ($P < .01$). Similarly, 26% of non-Hispanic white patients had poor diabetes control in health

Table 2. Health Center Clinical Outcome Measures by Race/Ethnicity and Health Center Patient Volume: 2009 Uniform Data System

	Inadequate Hypertension Control (>140/90 mm Hg)						Poor Diabetes Control (>9% HbA _{1c})						Low Birth Weight (<2500 g)					
	Large			Small			Large			Small			Large			Small		
	n	Rate (%)	SE	Mean Rate (%)	SE	n	Mean Rate (%)	SE	n	Mean Rate (%)	SE	n	Mean Rate (%)	SE	n	Mean Rate (%)	SE	
White (NH)	1035	36.47	17.24	38.59	19.93	1023	25.69 ^a	16.25	29.10 ^a	19.97	566	9.69	14.26	10.83	21.88			
Black/African American (NH)	857	42.66	21.57	45.30	26.53	834	29.54 ^a	19.11	33.64 ^a	26.07	472	12.19	13.73	12.13	20.69			
Asian (NH)	481	33.80	32.27	35.25	37.96	467	22.60 ^b	29.02	30.35 ^b	36.03	355	10.10 ^b	19.18	17.11 ^b	31.59			
Hispanic/Latino	833	34.68 ^c	21.63	41.14 ^c	26.94	865	31.31	19.11	33.70	25.45	574	7.32	9.68	9.72	19.82			

^a*P* < .01, based on *t* test between large and small volume health centers, for each racial/ethnic group.

^b*P* < .05, based on *t* test between large and small volume health centers, for each racial/ethnic group.

^c*P* < .001, based on *t* test between large and small volume health centers, for each racial/ethnic group.

Abbreviations: NH, non-Hispanic; SE, standard error.

Table 3. Health Center Clinical Outcome Measures by Race/Ethnicity and Health Center Duration of Funding: 2009 Uniform Data System

	Inadequate Hypertension Control (>140/90 mm Hg)						Poor Diabetes Control (>9% HbA _{1c})						Low Birth Weight (<2500 g)					
	Established			New			Established			New			Established			New		
	Mean Rate (%)	SE	n	Mean Rate (%)	SE	n	Mean Rate (%)	SE	n	Mean Rate (%)	SE	n	Mean Rate (%)	SE	n	Mean Rate (%)	SE	n
White (NH)	37.10	18.50	1035	40.45	19.49	1023	26.68 ^a	18.12	566	32.36 ^a	18.77	566	9.73	15.95	566	13.79	25.41	566
Black/African American (NH)	43.85	23.62	857	44.01	26.62	834	30.83	22.03	472	35.35	26.06	472	11.98	14.78	472	15.05	24.82	472
Asian (NH)	34.97	34.78	481	31.30	35.86	467	24.99	31.47	355	29.73	36.15	355	11.33	22.05	355	13.15	25.05	355
Hispanic/Latino	36.91 ^b	24.03	833	42.68 ^b	26.49	865	31.60 ^c	21.63	574	37.86 ^c	25.62	574	7.59 ^b	12.05	574	12.92 ^b	23.69	574

^a*P* < .001, based on *t* test between established and new health centers, for each racial/ethnic group.

^b*P* < .05, based on *t* test between established and new health centers, for each racial/ethnic group.

^c*P* < .01, based on *t* test between established and new health centers, for each racial/ethnic group.

Abbreviations: NH, non-Hispanic; SE, standard error.

Table 4. Health Center Clinical Outcome Measures by Race/Ethnicity and Managed Care Penetration: 2009 Uniform Data System

	Inadequate Hypertension Control (>140/90 mm Hg)						Poor Diabetes Control (>9% HbA _{1c})						Low Birth Weight (<2500 g)					
	Managed Care			No Managed Care			Managed Care			No Managed Care			Managed Care			No Managed Care		
	n	Mean Rate (%)	SE	n	Mean Rate (%)	SE	n	Mean Rate (%)	SE	n	Mean Rate (%)	SE	n	Mean Rate (%)	SE	n	Mean Rate (%)	SE
White (NH)	910	36.56	18.51	38.26	19.28	899	25.82 ^a	16.89	29.07 ^a	19.45	507	9.90	17.50	9.05	14.78	507	9.90	17.50
Black/African American (NH)	756	41.74 ^a	21.85	46.92 ^a	26.97	737	29.79 ^b	19.68	33.65 ^b	25.62	431	11.51	13.81	12.08	18.20	431	11.51	13.81
Asian (NH)	429	31.32 ^b	31.97	39.21 ^b	38.31	414	22.93 ^b	28.92	30.98 ^b	36.54	331	10.48	20.21	10.95	23.58	331	10.48	20.21
Hispanic/Latino	743	35.23 ^b	21.89	39.69 ^b	26.20	773	30.87 ^b	19.68	34.06 ^b	24.24	516	7.59	11.78	8.21	15.53	516	7.59	11.78

^a*P* < .01, based on *t* test between managed care and no managed care, for each racial/ethnic group.

^b*P* < .05, based on *t* test between managed care and no managed care, for each racial/ethnic group.

Abbreviations: NH, non-Hispanic; SE, standard error.

centers with managed care penetration, compared with 29% in health centers with low or no managed care penetration ($P < .01$).

DISCUSSION

This study sheds some light on health centers' performance on 3 particular clinical outcome measures, and focuses analyses on disparities based on race/ethnicity as well as the interaction of race/ethnicity and the following 3 institutional characteristics: health center size, duration of operation, and managed care penetration. The latest National Healthcare Quality Report and National Healthcare Disparities Report have highlighted a lack of improvement regarding disparities in quality of care, yet findings from this study suggest that within the Health Center Program, racial/ethnic disparities in quality of care-related clinical outcomes are minimal in magnitude (Agency for Healthcare Research and Quality, 2011a and b). Non-Hispanic Asians had better results than non-Hispanic whites for hypertension and diabetes outcomes, and Hispanics/Latinos had comparable outcomes to non-Hispanic whites for hypertension control and low birth weight. Hispanic/Latino patients had rates of poor diabetes control, which were statistically worse than non-Hispanic white patients, but the absolute difference was small; the same was true for comparisons of non-Hispanic black/African American patients and non-Hispanic white patients for the 3 outcomes. The small racial/ethnic disparities among health centers are consistent with previous findings (Eisert et al., 2008; Maizlish et al., 2004; Shi et al., 2004), and are particularly striking when compared against disparities found nationwide. Black-white and Hispanic-white differences for each of the 3 measures were smaller among health centers than across the general US population (based on population-based rates obtained from the National Health and Nutrition Examination Survey and the National Vital Statistics System for similar time periods) (National Center for Health Statistics, 2010; Redmond et al., 2011; Saydah et al., 2007). This is a note-

worthy finding given that health centers serve predominantly vulnerable populations.

Study findings also indicate that within each racial/ethnic group, there were differences in clinical outcomes on the basis of 3 health center characteristics. Health centers with large patient volumes reported better clinical outcomes than their smaller counterparts, to varying degrees for different outcomes. Specifically, high-volume centers did better on diabetes control among non-Hispanic white, African American, and Asian patients, and on hypertension control among Hispanic patients. Larger centers also did better on low birth weight among non-Hispanic Asian patients, although this finding may be spurious due to the low number of small health centers reporting data for Asians on this measure. Health centers with higher patient volume are likely to have larger revenues and may achieve economies of scale that allow more resources to be dedicated toward patient support and care. In addition, these centers may benefit from more frequent opportunities to refine care approaches for more common conditions such as hypertension and diabetes, much the same way that high-volume hospitals have been reported to obtain better outcomes for a range of procedures, including cancer therapy, cardiac procedures, and orthopedic surgery (Begg et al., 1998; Birkmeyer et al., 2002; Halm et al., 2002).

Among Hispanic patients, established health centers also had better outcomes than newer health centers for all 3 outcome measures. Newer health centers may still be in the process of transitioning to a steady state of operations, hence their staffing, clientele, and other features may still be in development. In addition, established health centers may have had more opportunities to engage with their local communities, address issues of trust that might dissuade patients from seeking care, and establish outreach efforts and enabling services to improve health care utilization and health-related behaviors (Deavenport et al., 2011; Meade et al., 2011; Ndumele et al., 2009).

Finally, for each racial/ethnic group, health centers with some managed care penetration

consistently reported better hypertension and diabetes outcomes, compared with health centers without managed care penetration. Additional stratified analyses indicated that centers with some managed care penetration were more often established or larger-volume centers; conversely, those without managed care penetration were more often newer or smaller-volume centers. However, the relationship between managed care and better clinical outcomes held for both large- and small-volume centers, as well as for established and newer centers (detailed results not shown, available upon request). In other words, health centers with at least some managed care penetration performed better than those without any penetration, regardless of size or duration of existence. Potential explanations for this finding include the possibility that managed care organizations follow disease management protocols more scrupulously or that they may give greater incentives for preventive care. Managed care is also more prevalent in some geographic regions than others, and the geographic distribution of health centers may explain some of the variation in clinical outcomes based on managed care penetration. The role of managed care in health centers warrants additional investigation, given the association with better outcomes documented here and the concomitant potential for cost savings that might occur from improved outcomes.

The reader should consider several study limitations. First, this analysis used health center-level data rather than individual-level patient data. Any associations, therefore, are subject to ecologic fallacy. The inferences drawn from these results are suggestive of associations rather than indications of causation. In addition, the analyses gave equal weight to each health center regardless of patient volume, so average rates of clinical outcomes may have been disproportion-

ately influenced by smaller health centers. Additional analyses using individual-level data would help draw more conclusive findings.

Finally, we used descriptive analyses to compare measures across racial/ethnic groups, and stratified analyses to examine the impact of several health center characteristics. In so doing, we were limited by small sample sizes so we did not account for additional potential confounding that might impact the clinical outcome measures. We considered employing multiple regression models, but there were concerns regarding the small numbers of observations that would result for each racial/ethnic group after incorporating other covariates. In addition, health center-level effect sizes would be difficult to interpret.

Despite these limitations, the 2009 UDS is the most comprehensive national source of data for the Health Center Program. These data provide a unique opportunity to examine racial/ethnic disparities in clinical outcomes within a critical component of the safety-net system for medically underserved populations. The current findings indicate that health centers report minimal disparities in clinical outcomes among racial/ethnic groups. Further analyses using more complete data from subsequent years may document the efficacy of HRSA's clinical quality improvement initiative launched in 2008 and direct future activities. In addition, future research should be directed toward exploring factors that contribute to the black-white differences in clinical outcomes, as well as identifying health centers that report no disparities between these groups. Following these inquiries, intervention strategies could target black-white gaps by focusing on the causal factors underlying these disparities, and applying lessons learned from benchmark centers that have been successful in reducing disparities.

REFERENCES

Agency for Healthcare Research and Quality. (2011a). *National Healthcare Disparities Report*. Rockville, MD: U.S. Department of Health and Human Services.

Agency for Healthcare Research and Quality. (2011b). *National Healthcare Quality Report*. Rockville, MD: U.S. Department of Health and Human Services.

- Agency for Healthcare Research and Quality. (2011c). *National Quality Measures Clearinghouse*. Retrieved from <http://www.qualitymeasures.ahrq.gov/content.aspx?id=23968&search=hypertension+blood+pressure+control>.
- Begg, C., Cramer, L., Hoskins, W., & Brennan, M. (1998). Impact of hospital volume on operative mortality for major cancer surgery. *JAMA*, *280*(20), 1747-1751.
- Birkmeyer, J., Siewers, A., Finlayson, E., Stukel, T., Lucas, F., Batista, I., & Wennberg, D. E. (2002). Hospital volume and surgical mortality in the United States. *New England Journal of Medicine*, *346*(15), 1128-1137.
- Chien, A., Walters, A., & Chin, M. (2007). Community health center quality improvement: A systematic review and future directions for research. *Progress in Community Health Partnerships*, *1*(1), 105-116.
- Chin, M., Drum, M., Guillen, M., Rimington, A., Levie, J., Kirchhoff, A., & Schaefer, C. T. (2007). Improving and sustaining diabetes care in community health centers with the health disparities collaboratives. *Medical Care*, *45*(12), 1135-1143.
- Chin, M., Cook, S., Drum, M., Ma, L.-J., Guillen, M., Humikowski, C., & Schaefer, C. T. (2004). Improving diabetes care in midwest community health centers with the health disparities collaborative. *Diabetes Care*, *27*(1), 2-8.
- Deavenport, A., Modeste, M., Marshak, H., & Neish, C. (2011). Closing the gap in mammogram screening: An experimental intervention among low-income Hispanic women in community health clinics. *Health Education & Behavior*, *38*(5), 452-461.
- Eisert, S., Mehler, P., & Gabow, P. (2008). Can America's urban safety net systems be a solution to unequal treatment? *Journal of Urban Health*, *85*(5), 766-778.
- Halm, E., Lee, C., & Chassin, M. (2002). Is volume related to outcome in health care? A systematic review and methodologic critique of the literature. *Annals of Internal Medicine*, *137*(6), 511-520.
- Health Resources and Services Administration. (2008). *2008 national total summary data*. Retrieved from http://www.hrsa.gov/data-statistics/health-center-data/NationalData/2008/2008_national_tot_summary_data.html.
- Health Resources and Services Administration. (2010a). *Health center data: 2010 national data*. Retrieved from <http://bphc.hrsa.gov/uds/view.aspx?year=2010>.
- Health Resources and Services Administration. (2010b). *Health center data*. Retrieved from <http://www.hrsa.gov/data-statistics/health-center-data/index.html>.
- Health Resources and Services Administration. (2010c). *HRSA clinical quality performance measures: A commitment to quality improvement in the safety net*. Retrieved from <http://www.hrsa.gov/healthit/coreclinicalmeasures.pdf>.
- Health Resources and Services Administration. (2011). *Report to Congress: Efforts to expand and accelerate health center program quality improvement*. Rockville, MD: U.S. Department of Health and Human Services.
- Hicks, L., O'Malley, A., Lieu, T., Keegan, T., Cook, N., McNeil, B., & Guadagnoli, E. (2006). The quality of chronic disease care in U.S. community health centers. *Health Affairs*, *25*(6), 1712-1723.
- Landon, B., Hicks, L., O'Malley, A., Lieu, T., Keegan, T., McNeil, B., & Guadagnoli, E. (2007). Improving the management of chronic disease at community health centers. *New England Journal of Medicine*, *356*(9), 921-934.
- Maizlish, N., Shaw, B., & Hendry, K. (2004). Glycemic control in diabetic patients served by community health centers. *American Journal of Medical Quality*, *19*(4), 172-179.
- Mangione, C., Gerzoff, R., Williamson, D., Steers, W., Kerr, E., Brown, A., & Selby, J. V. (2006). The association between quality of care and the intensity of diabetes disease management programs. *Annals of Internal Medicine*, *145*(2), 107-116.
- Meade, C., Menard, J., Luque, J., Martinez-Tyson, D., & Gwede, C. (2011). Creating community-academic partnerships for cancer disparities research and health promotion. *Health Promotion Practice*, *12*(3), 456-462.
- National Center for Health Statistics. (2010). *Health, United States, 2009*. Hyattsville, MD: U.S. Department of Health and Human Services.
- Ndumele, C., Russell, B., Ayanian, J., Landon, B., Keegan, T., O'Malley, A., & Hicks, L. S. (2009). Strategies to improve chronic disease management in seven metro Boston community health centers. *Progress in Community Health Partnerships*, *3*(3), 203-211.
- Redmond, N., Baer, H., & Hicks, L. (2011). Health behaviors and racial disparity in blood pressure control in the National Health and Nutrition Examination Survey. *Hypertension*, *57*, 383-389.
- Saydah, S., Cowie, C., Eberhardt, M., De Rekeneire, N., & Narayan, K. (2007). Race and ethnic differences in glycemic control among adults with diagnosed diabetes in the United States. *Ethnicity and Disease*, *17*, 529-535.
- Shi, L., Stevens, G., Wulu, J., Politzer, R., & Xu, J. (2004). America's health centers: Reducing racial and ethnic disparities in perinatal care and birth outcomes. *Health Services Research*, *39*(6, Part 1), 881-901.
- Sripipatana, A., Sharma, R., Lebrun, L., Shi, L., Hayashi, A., Daly, C., & Ngo-Metzger, Q. (2011). *Addressing racial/ethnic disparities in hypertension in health center patients*. Seattle, WA: Academy Health's Annual Research Meeting.
- Trivedi, A., Grebla, R., Wright, S., & Washington, D. (2011). Despite improved quality of care in the veterans affairs health system, racial disparity persists for important clinical outcomes. *Health Affairs*, *30*(4), 707-715.