DOI: 10.1111/j.1475-6773.2006.00638.x

Socioeconomic and Racial/Ethnic Differences in the Discussion of Cancer Screening: "Between-" versus "Within-" Physician Differences

Yuhua Bao, Sarah A. Fox, and José J. Escarce

Objective. To determine the extent to which socioeconomic and racial/ethnic differences in cancer screening discussion between a patient and his/her primary care physician are due to "within-physician" differences (the fact that patients were treated differently by the same physicians) versus "between-physician" differences (that they were treated by a different group of physicians).

Data Sources. We use data from the baseline patient and physician surveys of two community trials from the Communication in Medical Care (CMC) research series. The two studies combined provide an analysis sample of 5,978 patients ages 50–80 nested within 191 primary care physicians who practiced throughout Southern California.

Study Design. Our main outcomes of interest are whether the physician has ever talked to the patient about fecal occult blood test (FOBT; for colorectal cancer screening), mammogram (for breast cancer screening, female patients only) and the prostate-specific antigen test (PSA, male patients only). We consider five racial/ethnic groups: non-Hispanic white, non-Hispanic black, Hispanic, Asian, and other race/ethnicity. We measure socioeconomic status by both income and education. For each type of cancer screening discussion, we first estimate a probit model that includes patient characteristics as the only covariates to assess the overall differences. We then add physician fixed effects to derive estimates of "within-" versus "between-" physician differences.

Principal Findings. There was a strong education gradient in the discussion of all three types of cancer screening and most of the education differences arose within physicians. Disparities by income were less consistent across different screening methods, but seemed to have arisen mainly because of "between-physician" differences. Asians were much less likely, compared with whites, to have received discussion about FOBT and PSA and these differences were mainly "within-physician" differences. Black female patients, however, were much more likely, compared with whites treated by the same physicians, to have discussed mammogram with their physicians.

Conclusions. Differences in cancer screening discussion along the different dimensions of patient SES may have arisen because of very different mechanisms and therefore call for a combination of interventions. Physicians need to be aware of the persistent disparities by patient education in clinical communication regarding cancer screening

and tailor their efforts to the needs of low-education patients. Quality-improvement efforts targeted at physicians practicing in low-income communities may also be effective in addressing disparities in cancer screening communication by patient income.

Key Words. Cancer screening, discussion, disparities, race/ethnicity, socioeconomic status

---

Cancer is the leading cause of death in the United States for those younger than 85, surpassing cardiovascular disease (Jemal et al. 2005). Effective screening techniques are available for early stage detection of several major types of cancer such as colorectal cancer for men and women and breast and cervical cancer among women. Prostate cancer screening for men is effective although controversial.

In recent years, increased public awareness and adherence to cancer screening guidelines have contributed to a continued decline in cancer death rates and improved 5-year survival (Jemal et al. 2004). However, the rate of adherence to cancer screening, like that for many other preventive services, is much lower among populations of low socioeconomic status (SES) compared with people on the higher rungs of the socioeconomic ladder (Ponce et al. 2003; National Center for Health Statistics 2004). Studies using data from the Surveillance, Epidemiology and End Results (SEER) Program of the National Cancer Institute have shown disparities in stage at diagnosis by income or poverty (Singh et al. 2003), occupation or profession (Schwartz et al. 2003) and insurance coverage (Roetzheim et al. 1999; McDavid et al. 2003). It is thus not surprising that a socioeconomic gradient in cancer mortality and survival exists. According to the National Healthcare Disparities Report (DHHS 2004), those with a high school education or less had higher mortality rates from almost all types of cancer compared with those with some college education. Differences in cancer survival by neighborhood poverty and by insurance status are also substantial (Singh et al. 2003; Bradley et al. 2005). Although racial/ethnic disparities in early stage diagnosis are less consistent

---

Address correspondence to Yuhua Bao, Ph.D., Department of Health Behavior and Administration, University of North Carolina at Charlotte, 9201 University City Blud., Charlotte, NC 28223. Sarah A. Fox, Ed.D., M.S.P.H., is with the Center for Community Partnerships in Health Promotion, Division of General Internal Medicine and Health Services Research, David Geffen School of Medicine at UCLA, Los Angeles, CA. Jose J. Escarce, M.D., Ph.D., is with the Division of General Internal Medicine and Health Services Research, David Geffen School of Medicine at UCLA, Los Angeles, CA.

across different types of cancer and across different minority groups relative to whites, mortality from all cancers is highest among blacks (DHHS 2004; Ward 2004).[1]

Disparities in adherence to cancer screening guidelines are partly due to racial/ethnic and socioeconomic disparities in access to health care. All major cancer screening procedures are either ordered by a physician (e.g., endoscopies for colorectal cancer screening and prostate-specific antigen test [PSA] test for prostate cancer) or performed in a physician's office (e.g., pap smear), making a visit to a physician's office or clinic a precondition for screening. However, disparities in cancer screening utilization exist even among people with a usual source of care or who regularly visit their physicians (for example, McMahon et al. 1999; also see Table 2). Studies have examined patient-reported barriers to cancer screening and found that a greater proportion of minority and low-SES persons cite "lack of awareness" and "not recommended by a doctor" as the main barriers (Finney, Nelson, and Meissner 2004), suggesting that racial/ethnic and SES disparities in physician–patient communication regarding cancer screening may have contributed to disparities in screening rates.

In this study, we examine two potential sources of disparities in discussion of several important types of cancer screening: (1) "between-physician" differences, which arise because racial/ethnic minority or low-SES patients receive care from different physicians than white patients or patients of higher SES, and (2) "within-physician" differences, which arise because patients of different race/ethnicity or SES receive different care from the same physicians. We make use of two unique data sets that match patients to their primary care physicians. This feature of these data enables us to study the relative importance of between- versus within- physician differences as causes of disparities in cancer screening discussion. Our data also enable us to identify the patient characteristics (race/ethnicity or the different aspects of SES) that are associated with between- or within- physician differences, which in turn sheds light on policies designed to close the racial/ethnic or socioeconomic gap in cancer and cancer screening.

Conceptual Framework

The 2002 Institute of Medicine (IOM) report on racial and ethnic disparities in health care (Institute of Medicine 2002) categorized the various sources of disparities in health care into systems-, patient- and clinical encounter- level

factors. Systems-level factors are aspects of the health care system that may exert different effects on patients of different racial/ethnic or SES backgrounds. Patient-level factors refer to differences in patient preferences, trust of the health care system, biological factors that would justify differences in care and other factors. Factors that arise in clinical encounters include provider bias or prejudice, greater uncertainty in assessing the need of minority patients and provider stereotypes.

"Within-physician" differences may develop because of patient- and clinical encounter- level factors. Racial/ethnic minorities and people of low-SES are less likely to be aware of the need for cancer screening (Finney, Nelson, and Meissner 2004). Minority and low-SES patients may be less likely to initiate discussion with their physician about cancer screening as a result of knowledge deficits. On the other hand, physicians may perceive minority or low-SES patients to be less interested in cancer screening and/or less likely to adhere to screening (van Ryn and Burke 2000) and thus may be more likely to forgo discussing cancer screening in the first place. Uncertainty in assessing individual patient need in a brief clinical encounter could lead physicians to rely more on population profiles, for example, cancer incidence and mortality for certain racial/ethnic groups, in deciding whether to give advice regarding cancer screening (Balsa and McGuire 2001, 2003). Potential language barriers between a minority patient and his/her physician may further discourage patients as well as physicians from pursuing a conversation regarding a topic of low urgency such as cancer screening. Finally, patient preferences and physician attitudes and perceptions may interact to reinforce each other over time.

"Between-physician" differences may be viewed as a consequence of systems-level factors such as the geographical distribution of different types of physicians coupled with residential segregation by SES and race/ethnicity. Physicians treating patients of different racial/ethnic or SES backgrounds may differ in their training in physician–patient communication and preventive care. There is evidence that physicians who treat black patients are less likely to be board-certified and more likely to see themselves as unable to provide high-quality health care (Bach et al. 2004). Also, physicians serving in low-income, minority communities are more likely to be graduates of foreign medical schools and less likely to be board certified (Mitchell and Cromwell 1980; Perloff, Kletke, and Neckerman 1986; Bellochs and Carter 1990; Fosset et al. 1990; Mitchell 1991). Ashford et al. (2000) found that inner-city physicians were not as knowledgeable about national guidelines for preventive care as physicians in general. Disparities in the quality of training and knowl-

edge of prevention are likely to result in less frequent discussion of cancer screening among physicians treating patients of racial/ethnic minority and/or low-SES.

Additionally, it is likely that disparities exist in the availability of screening facilities on-site or within easy reach by referral (Bach et al. 2004). If physicians practicing in minority and low-income communities have a hard time finding an appropriate facility to refer their patients to, it is likely that they would choose not to bring up cancer screening in their conversation in the first place. Further, institutional support for preventive care (e.g., clinical reminder systems and financial incentives for physicians to perform preventive services such as smoking cessation advice and cancer screening) may differ with practice settings, with large physician groups more likely to have these institutions in place compared with small groups and solo practices.

"Between-physician" differences may also develop because of the influences of the aggregate characteristics of the patients on physicians' practice patterns. The high proportion of minority or low-SES patients treated by a physician may reinforce some of the "within-physician" differences discussed previously. As a result, lower likelihood of cancer screening discussion with minority or low-SES patients may become a practice pattern of the physician.

METHODS

Data and Sample

We use baseline data from two studies in the Communication in Medical Care (CMC) Research Program series. The CMC is a longitudinal research program aimed at developing and testing a physician–patient communication model to change patient health behaviors and has so far focused on patient adherence to cancer screening. The second CMC (CMC2, 1998–2004) and the third CMC (CMC3, 2000–2006) studies were community-based, randomized controlled trials to test the communication model by teaching it in a Continuing Medical Education (CME) program. The two studies differed in the populations and geographic areas covered: CMC2 focused on patients aged 50–80 whose primary care physicians were located in Los Angeles County; CMC3 covered all of Southern California except Los Angles County and focused on elderly patients (65–79).

CMC2 and CMC3 followed a two-stage recruitment procedure. In the first stage, the most current data from the American Medical Association (AMA) was used to enumerate all primary care physicians with selected

specialties (general internal medicine, family practice or general practice for CMC2; for CMC3, geriatrics in addition to the three specialties included in CMC2) who were practicing in communities in relevant geographic areas. Because of the focus of CMC2 on Latino physicians, enumeration of physicians was supplemented by using Latino Physicians' Directory in addition to the AMA data. Physicians were contacted in random order and recruited into the study if they met eligibility requirements (office-based and practicing at least 50 percent of their time) and if they consented. In the second stage, patients of eligible age and who spoke either English or Spanish were recruited using an invitation letter from their physicians, which also served as an eligibility screening and consent form.

Initial data collection consisted of baseline surveys of the physicians and their patients. The physician surveys asked about their practice settings, attitudes and self-assessment of communication with their patients, performance of communication behaviors when discussing cancer screening with patients, cultural competency, job satisfaction and demographic characteristics. Patient surveys collected data on the patient-physician relationship and patient physical and mental health, knowledge about cancer screening guidelines, assessment of their physician's communication about cancer screening, adherence to gender-appropriate cancer screening guidelines, insurance coverage and their demographic characteristics.

The CMC2 baseline surveys collected data from 111 physicians and 3,172 patients; in CMC3, 80 physicians and 3,188 patients were included in the baseline data. As the two studies used nearly identical survey instruments and collected compatible data, we pooled the two sets of data for this study. Pooling the data provides greater analytical power and more comprehensive coverage in terms of patient age eligibility for cancer screening and geographical distribution. As we are interested in disparities in physician–patient communication regarding cancer screening, we excluded from the CMC3 data patients who had a diagnosis of breast, cervical, prostate or colorectal cancer at the time of the baseline interview. (In CMC2, patients with any of these cancer diagnoses were excluded from the study.) The study data thus had 191 physicians and 5,978 patients in total. The number of patients per physician ranged from 2 to 83 with a mean of 31 and median of 30.

Variables

The main outcome of interest was patients' report of whether their physicians discussed a particular type of cancer screening with them as appropriate for

age and gender. We used a dichotomous measure of such discussion, based on the following question in the patient survey: "Did Dr. ___ (last name of study physician) ever talk to you about _____(the Fecal Occult Blood Test or FOBT/sigmoidoscopy/mammogram/the Prostate Antigen Test or PSA)?" In CMC3, the question on physician discussion of PSA was only asked if the patient reported ever had a PSA test, making it incompatible with the measure in CMC2 and those of other cancer screening discussion. We therefore restrict our PSA analysis to the CMC2 sample.

The key explanatory variables in the study were patient race/ethnicity (non-Hispanic white, black, Hispanic, Asian, other) and socioeconomic status, assessed by educational attainment (less than high school, high school, some college and college graduates) and annual family income categories ($<$15k, 15–35k, 35–75k, 75k+). Patient-level covariates included age, gender, health insurance coverage (Medicare only, Medicaid only, Medicaid-Medicare dual coverage, private insurance, uninsured), language (English or Spanish, as indicated by the language used for the interview) and a dichotomous indicator for a family history of the related cancer. Although patient insurance coverage might be an important predictor of physician cancer screening discussion, we choose not to include differences by insurance as one of our prime results of interest, primarily because of extremely small size of some insurance categories in our sample (the uninsured and the Medi-Cal only group) and thus unreliable inferences. Physician characteristics used as covariates included: physician gender, age, race/ethnicity; their practice setting (solo, Kaiser, or other group practice); their specialty (general internal medicine versus family practice/general practice), and where they obtained medical training (United States versus foreign). Based on the conceptual framework and findings of previous studies (e.g., Bach et al. 2004), these physician characteristics may account for some portion of the between-physician differences that lead to disparities in discussion of cancer screening.

Analytical Approach

We used multivariate probit regression to model the discussion of each type of cancer screening as a function of patient race/ethnicity and SES, controlling for different sets of covariates that defined alternative models. In our base model, we controlled for other patient characteristics. This model provides an assessment of the overall disparities, i.e., the combined "within-" and "between-" physician differences.

To assess the contribution of "between-" versus "within-" physician differences to disparities in physician discussion of cancer screening, we exploited the fact that multiple patients were nested within physicians in our data and estimated the model with physician fixed effects, i.e., by including a dummy variable for each physician in the study sample. Differences by patient race/ethnicity and SES that remain after controlling for these (fixed) between-physician differences[2] reflect within-physician differences.

We also conducted a secondary analysis to determine whether the "between-physician" differences were explained by observed or measured physician characteristics. We added observed physician characteristics including basic demographics, practice setting, specialty and training to the base model and compared the results to those of the fixed-effects model.

Robust standard errors of all probit model coefficient estimates were derived using the Heuber–White "sandwich" method. To make our results easier to interpret, we report the incremental probabilities of cancer screening discussion associated with each racial/ethnic or SES group relative to the reference category ("white" for racial/ethnic comparison, "college graduates" for comparison by education, and "annual household income of $75k+" for comparison by income). Specifically, we derived the incremental probabilities by maintaining all other variables at their original values but switching the variable of interest for the entire sample. We also derived empirical standard errors of these estimates using the bootstrap method by conducting the resampling within physicians (Efron and Tibshirani 1993).

RESULTS

Descriptive Data

For the two types of colorectal cancer screening—FOBT and sigmoidoscopy—rates of discussion in our sample were at 37 percent and 31 percent, respectively. Sixty-seven percent of female patients reported that their physicians ever discussed a mammogram with them; 46 percent of the men reported physician discussion of a PSA test.

Table 1 presents summary statistics of the variables used in the models. These patient profiles suggest a patient population diverse in racial/ethnic composition and SES: Hispanic patients accounted for 21 percent of the colorectal cancer (CRC) screening sample, reflecting both the ethnic composition in Southern California and the oversampling of Hispanic physicians in CMC2; each level of education had adequate representation in the sample

Table 1: Summary Statistics of Analysis Samples

	CRC Screening Discussion Sample (n = 5,978)	*Mammogram Discussion Sample (n = 3,584)*	*Prostate-Specific Antigen Test Discussion Sample (n = 1,179)*
Demographics			
Age			
50–59	18.5	19.6	34.2
60–69	31.7	30.4	38.4
70+	49.8	50.1	27.4
Gender (%)			
Male (versus female)	40.1	—	—
Ethnicity (%)			
Non-Hispanic white	67.6	64.2	55.7
African American	6.7	7.8	8.3
Hispanic	20.9	23.5	28.8
Asian	3.7	3.5	5.8
Other	1.1	1.0	1.4
Education (%)			
Less than high school	18.9	20.8	22.2
High school graduates	23.7	27.7	17.0
Some college	27.3	28.9	25.0
College or higher	30.1	22.7	35.8
Income (%)			
<15k	22.5	28.3	18.6
15–35k	29.9	32.8	24.7
35–75k	31.3	27.9	31.3
75k+	16.3	10.9	25.4
Insurance (%)			
Uninsured	3.4	3.8	4.2
Private only	23.9	24.1	45.7
Medi-Cal only	2.7	3.1	4.0
Medicare only	58.7	56.8	36.4
Medi-Cal medicare dual coverage	11.2	12.2	9.7
Family history of cancer (%)			
Family history of colorectal cancer	9.2	—	—
Family history of breast cancer	—	13.4	—
Family history of prostate cancer	—	—	9.2
Other patient characteristics			
Interviewed in Spanish (%)	13.9	15.8	19.9
Physician characteristics			
Gender (%)			
Male (versus female) doctor	75.9	68.6	81.0
Ethnicity (%)			
Dr. is white	59.8	56.8	48.8
Dr. is Hispanic	16.3	16.4	25.1
Dr. is Asian	17.9	19.2	20.3
Dr. is of other ethnicity	6.0	7.6	5.8

continued

Table 1. *Continued*

	CRC Screening Discussion Sample (n = 5,978)	*Mammogram Discussion Sample (n = 3,584)*	*Prostate-Specific Antigen Test Discussion Sample (n = 1,179)*
Training (%)			
Dr. is U.S. MD	66.2	63.9	66.0
Practice setting (%)			
Solo practice	49.7	50.6	40.0
Kaiser	13.8	14.8	25.0
Other group practice	36.5	34.6	35.0
Specialty (%)			
GIM (versus FP/GP)	47.7	48.0	46.3

Notes: Patient is the unit of analysis for all estimates, including the physician profiles. GIM, General Internal Medicine; FP, Family Practice; GP, General Practice.

that ranged from 19 percent for the group with less than high school education to 30 percent for college graduates. In terms of income, the two groups in the middle—those with household income between 15k–35k and 35k–75k—accounted for 60 percent of the sample, with the low (<15 k) and high (75 k+) income groups accounting for 23 and 16 percent, respectively. Not surprisingly, the modal insurance is Medicare, followed by private insurance (24 percent) and Medicare-Med-Cal dual coverage (11 percent). Nine to 13 percent of the sample had a family history of either colorectal, breast or prostate cancer and about 14 percent of the patients opted to be interviewed in Spanish.

Bivariate analyses of discussion rates by race/ethnicity and SES showed substantial and statistically significant differences in almost all comparisons (Table 2). For all screening tests, white and black patients reported much higher rates of discussion than Hispanics and Asians. Comparing whites and blacks, our data indicated that black patients were slightly more likely than whites to have discussed FOBT and sigmoidoscopy with their physicians and much more likely to have discussed mammograms. However, blacks were less likely to have discussed the PSA test (43 percent among black men versus 55 percent among white men).

Low-SES patients were less likely than their high-SES counterparts to have discussed cancer screening with their physicians. The gradient was especially steep among patients with different educational attainment; except for mammogram, the rate of discussion more than doubled among college graduates compared with those with a less than high school education. Moreover, the gain from more schooling was present throughout the range of educational

Table 2: Unadjusted Rates of Cancer Screening Discussion by Patient Race/Ethnicity and SES (%)

	Fecal Occult Blood Test		*Sigmoidoscopy*		*Mammogram (Female Only)*		*Prostate-Specific Antigen Test (Male Only)*	
	Rate	*p-Value*	*Rate*	*p-Value*	*Rate*	*p-Value*	*Rate*	*p-Value*
Entire sample	36.8		30.9		67.1		46.0	
By race/ethnicity		<.001		<.001		<.001		<.001
White	40.4		33.7		64.2		55.2	
Black	44.2		36.7		82.2		43.3	
Hispanic	24.2		21.0		69.6		31.7	
Asian	28.7		23.7		70.7		37.1	
Other	35.0		26.2		58.8		28.6	
By education		<.001		<.001		.102		<.001
Less than high school	22.5		18.9		66.0		26.2	
High school graduates	32.1		26.2		65.4		39.5	
Some college	40.0		33.3		66.9		48.5	
College or higher	46.9		40.0		70.6		59.0	
By income		<.001		<.001		.196		<.001
<15k	25.8		19.3		66.9		28.8	
15k–35k	33.5		28.2		66.3		39.6	
35k–75k	43.7		38.1		70.4		53.6	
75k+	47.4		42.7		69.9		56.3	

Note: *p*-value is based on a chi-square test for differences by patient race/ethnicity or SES, socioeconomic status.

attainment. Findings by household income paralleled those by education, but the gains from additional income were highest at the low-income levels.

Regression Results: Between- versus Within-Physician Differences

We conducted a series of probit analyses as described in the Methods section for the discussion of all four types of cancer screening. Results for the discussion of sigmoidoscopy were qualitatively similar to those of FOBT. For brevity, we present the results regarding FOBT, mammogram, and PSA; results of sigmoidoscopy are available upon request. We present the estimated probit models for the three types of cancer screening discussion in the Appendices (Appendix Tables A–C, available online as supplementary materials). Table 3 presents the (adjusted) differences in cancer screening discussion rates associated with each racial/ethnic or SES group relative to the reference group. We show the overall differences based on the base model, the

Table 3: Adjusted Rates of Cancer Screening Discussion: Overall, Between-, and Within-Physician Differences

	Ever Discussed Fecal Occult Blood Test			*Ever Discussed Mammogram*			*Ever Discussed Prostate-Specific Antigen Test*		
	Overall	*Between*	*Within*	*Overall*	*Between*	*Within*	*Overall*	*Between*	*Within*
By race/ethnicity (ref grp: Pt is white)									
Pt is Hispanic	−0.048	−0.019	−0.029	0.048	0.016	0.032	−0.073	−0.038	−0.035
	(0.032)	(0.022)	(0.030)	(0.030)	(0.022)	(0.029)	(0.047)	(0.032)	(0.054)
Pt is black	0.082	0.02	0.062	0.170**	0.014	0.156**	−0.047	−0.094	0.047
	(0.052)	(0.040)	(0.040)	(0.034)	(0.033)	(0.033)	(0.078)	(0.091)	(0.105)
Pt is Asian	−0.122**	−0.02	−0.102**	0.044	0.008	0.036	−0.192**	−0.016	−0.176*
	(0.034)	(0.028)	(0.035)	(0.052)	(0.036)	(0.046)	(0.064)	(0.034)	(0.081)
Pt is of other race/ethnicity	−0.039	−0.035	−0.004	−0.084	0.000	−0.084	−0.197	−0.142*	−0.055
	(0.064)	(0.027)	(0.060)	(0.084)	(0.036)	(0.088)	(0.115)	(0.063)	(0.144)
Education (ref grp: college or higher)									
<high school	−0.160**	−0.034*	−0.126**	−0.075*	−0.004	−0.071*	−0.202**	−0.010	−0.192**
	(0.023)	(0.014)	(0.022)	(0.031)	(0.015)	(0.032)	(0.058)	(0.027)	(0.063)
High school	−0.118**	−0.029**	−0.089**	−0.041	−0.013	−0.028	−0.118*	0.026	−0.144**
	(0.020)	(0.011)	(0.019)	(0.022)	(0.009)	(0.022)	(0.054)	(0.021)	(0.054)
Some college	−0.061**	−0.019*	−0.042*	−0.042	−0.005	−0.037	−0.075	−0.012	−0.063
	(0.019)	(0.009)	(0.019)	(0.024)	(0.008)	(0.023)	(0.042)	(0.014)	(0.043)
Annual household income (ref grp: 75+)									
< 15k	−0.076*	−0.061**	−0.015	−0.008	−0.007	−0.001	−0.089	0.019	−0.108
	(0.030)	(0.019)	(0.026)	(0.037)	(0.015)	(0.037)	(0.066)	(0.034)	(0.074)
15k–35k	−0.059*	−0.043*	−0.016	0.009	−0.004	0.013	−0.049	−0.028	−0.021
	(0.026)	(0.017)	(0.021)	(0.034)	(0.013)	(0.034)	(0.047)	(0.024)	(0.052)
35k–75k	−0.009	−0.033*	0.024	0.047	−0.003	0.05	−0.007	−0.03	0.023
	(0.023)	(0.014)	(0.019)	(0.029)	(0.011)	(0.030)	(0.045)	(0.018)	(0.052)

Notes: Numbers shown are adjusted differences between the racial/ethnic or SES group relative to the reference group. Bootstrap standard errors in parentheses.

*$p<.05$,

**$p<.01$ for a comparison with the reference group.

Pt, patient; ref grp, reference group.

"within-physician" differences based on the fixed effects model and the "between-physician" differences (overall differences net the within differences). We focus our discussion of results on Table 3.

Discussion of FOBT

Results of the base model suggested that, for Asian patients, the adjusted rate of discussion was 12 percentage points lower compared with whites ($p<.01$), almost identical to results of the unadjusted analysis. Results of the fixed effects model suggest that the much lower discussion rate of Asian patients compared with their white counterparts mainly stemmed from differences between Asians and whites treated by the same physicians (i.e., "within-physician" differences) rather than differences between the physicians who treated Asians and those who treated whites. At the same time, neither the overall nor the "between-" or "within-" differences between the Hispanic/black and the white group achieved statistical significance, suggesting that some of the racial/ethnic differences seen in the unadjusted analysis actually reflected differences along other dimensions of patient characteristics such as socioeconomic status.

Overall, we found 16-, 12-, and 6-percentage-point lower discussion rates for the less than high school, high school, and some college groups, respectively, compared with college graduates ($p<.01$ in all three comparisons). Similarly, the two low-income groups (<15k, 15k–35k) lagged behind high-income patients by 6–8 percentage points ($p<.05$ in both comparisons). The estimated "between-" versus "within-" physician differences based on the fixed effects specification provided interesting implications regarding the sources of differences by different dimensions. Although incremental probabilities associated with the different levels of education were reduced in the fixed-effects model, the "within-physician" education gradient persisted. In fact, Wald tests showed that the differences were highly significant between every pair of adjacent educational attainment ($p<.01$) except in the case of less than high school versus high school ($p=.10$). On the other hand, the "between-physician" differences by income were slightly smaller than the overall differences for the two lowest income categories and remained highly significant ($p<.01$ and $p<.05$ for the lowest and second lowest income group, respectively, when compared with the high-income group). The results also show a sizable "between-physician" difference for the group with annual household income 35k–75k compared with the highest income group (a difference of 3 percentage points, $p<.05$). In contrast, "within-physician"

differences by income were minimal and did not achieve statistical significance. To summarize, our results suggest that for physician discussion of FOBT, disparities by education primarily arose within physicians; disparities by patient income were largely a result of between-physician differences. On the other hand, the large Asian-white difference seemed to be largely a result of within-physician differences.

Discussion of Mammogram

In the base model, our analysis of mammogram discussion indicated that black female patients were 17 percentage points more likely than whites to have had a discussion ($p<.01$), a difference in the reverse direction of what is normally observed in other areas of health care. Results based on the fixed effects suggest that the black/white difference was mainly within-physician differences. The education gradient was not as marked as in the case of FOBT, but the difference between those with less than high school education and college graduates was not negligible (8 percentage points; $p<.05$). Such a difference was almost entirely due to within-physician differences. There were minimal differences by income in the rate of discussion of mammogram.

Discussion of PSA Test

Regarding discussion of a PSA test among male patients in CMC2, the base model indicated a 19 percentage point lower (overall) rate of discussion reported by Asian patients compared with whites ($p<.01$). According to the fixed effects model, the "within-physician" Asian/white difference was 18 percentage points, a slight reduction from the overall difference, and still statistically significant.

The analysis also revealed a 20 percentage point lower rate of discussion among patients with the lowest education (less than high school; $p<.01$), and a 12 percentage point lower rate of discussion among those with a high school education ($p<.05$), compared with college graduates. Almost all the difference in PSA discussion between the lowest and highest education groups seemed to be "within-physician" differences (a difference of 19 percentage points compared with 20 for the overall). The "within-" difference between the high school group and college graduates was slightly larger (14 percentage points) than the overall difference and retained statistical significance.

The discussion rates of the lower income groups (<15k and 15–35k) were 5–9 percentage points lower compared with those earning 75k plus, but these differences were not statistically significant.

Secondary Results

In the analyses of all three types of cancer screening discussion, when observed physician characteristics were added to the base model (third set of results in Appendix Tables A–C), we saw either no or little change in the differences by race/ethnicity and by SES compared with results of the base model; incremental probabilities based on this model (not shown) were slightly smaller in magnitude but all the statistically significant differences observed in the base model remained significant. Moreover, although we included a set of physician characteristics believed to be related to physician communication behaviors and preferences (including an indicator of the practice setting of our study physicians: solo versus Kaiser versus other group practice), none of these observed characteristics (with the exception of physician gender in the discussion of mammogram and physician specialty, i.e., GIM versus Family Practice or General Practice, in the discussion of PSA) were significant predictors of cancer screening discussion.

DISCUSSION

In an effort to better understand the sources of possible racial/ethnic and SES differences in physician–patient communication about cancer screening, we used baseline data from two community trials that matched multiple patients with their physicians to empirically disentangle differences between physicians from differences within physicians. For all three types of cancer screening (FOBT, mammogram and PSA), our results showed a strong education gradient in the discussion of these screening strategies where patients of lower education were less likely to have discussed the screening with their physicians. Differences in discussion rates were especially marked between the lowest educated group (less than high school) and college graduates. Our results further suggested that this difference mainly arose between patients treated by the same physicians ("within-physician" differences). Differences by the other dimension of SES, i.e., income, were less consistent across the different types of cancer screening. However, most of the significant differences by income seemed to have arisen because low-income patients are treated by different physicians than patients of higher income ("between-physician" differences).

Our findings for different dimensions of SES are noteworthy. The fact that differences by income are mainly "between-physician" differences indicates that physicians who disproportionately treat more low-income patients

are likely to have a lower rate of cancer screening discussion in their practice. This pattern could have developed because of the disparities in physician training regarding physician–patient communication, disparities in the institutional support for quality improvement and consistent performance of preventive care, and/or differences in demand for these services by patient income. Physicians treating a large number of low-income patients may develop practice styles that are characterized by low rate of cancer screening discussion as a result of these and other factors.[3] Our findings regarding disparities by income were consistent with the notion that physicians are not evenly distributed across communities with different levels of income and that, in seeking health care, geographic accessibility of providers is an important factor for low-income patients. In fact, our data show that low income patients in the CMC studies were treated by a disproportionately small group of physicians: 80 percent of the patients with annual household income less than 15k were seen by 60 percent of the study physicians.

By contrast, the education gradient in cancer screening discussion that we found mainly existed within physicians, indicating that education plays an important role in determining what happens during clinical encounters. At least three possible mechanisms are at play. First, patients with low education may have had less exposure to various health topics including cancer screening from sources other than one's health care providers and are thus less likely to initiate discussion with their physicians about cancer screening. In 2000, 56 percent of those with less than high school education were not aware that they needed colorectal cancer screening compared with 48 percent among high school graduates and 42 percent among those who achieved beyond high school (Finney Rutten, Nelson, and Meissner 2004). Studies have found that patients who asked for help with smoking cessation were much more likely to have received cessation treatment (Quinn et al. 2005). Likewise, patients who do not bring up the topic of cancer screening, all else being equal, may be less likely to receive any discussion about cancer screening from their physicians.

Second, deficits in comprehension and cognitive abilities and in health literacy in particular associated with lower education may have put these patients at a disadvantage when it comes to cancer screening (IOM 2004). The decision about cancer screening necessarily involves tradeoffs between future benefits and current costs, which is likely an important element of physician–patient discussion. The fact that making such tradeoffs is more demanding for low-education patients makes it less likely that they engage in active discussion with their physicians.

Third, physicians may hold stereotypes of low-education patients (e.g., "low-education patients are less interested in screening"), and interact with their low-education patients in a different way, forgoing opportunities of discussing cancer screening during a clinical encounter.

Two findings stood out in our adjusted results regarding racial/ethnic differences in the discussion of cancer screening: (1) the Asian/white disparity in the discussion of FOBT and PSA, and (2) the higher rate of discussion about mammogram among black female patients compared with white females. The first finding suggests that although Asian patients may not select to see a small group of providers who practice differently (this is especially true for Asian patients in our sample since patients had to speak either English or Spanish to be eligible for the study), the cultural distance between physicians and their older Asian patients may have led to the low rate of discussion of FOBT, a type of cancer screening that has not been mass-promoted as mammogram. The black/white difference in the discussion of mammogram is in contrast with the pattern of racial/ethnic disparities normally seen in health care. In discussing more with black female patients, physicians may have applied the law of conditional probabilities when faced with greater uncertainties in communicating with minority patients (Balsa and McGuire 2001, 2003). Although black women have a lower incidence rate of breast cancer compared with whites, their breast cancer-related mortality rate is much higher (Jemal et al. 2004). This is consistent with the finding that black women were less likely to be diagnosed with early stage breast cancer (Schwartz et al. 2003). In deciding whom to discuss mammogram with, physicians may have been mindful of the relatively lower screening rate among black women and delivered more discussion to their black patients. It is not clear why we do not see a similar pattern for the discussion of PSA test, given that both incidence and mortality rates are much higher among black males than white males.[4] At the same time, because of the small numbers of Asian and black patients in our sample (4–8 percent of the samples), these results should be interpreted with caution.

The language variable—whether the patient was interviewed in Spanish or English—was not a significant predictor for any of these outcomes. This finding suggests that having limited English proficiency was not a substantial barrier in cancer screening discussion or patients minimized the impact of potential language barriers by choosing to see a physician who speaks the same language.

Our study has a few limitations. First of all, our physician and patient populations are from Southern California only and physicians affiliated with large groups (but not Kaiser) were not well represented in the study. As a

result, our findings may not be generalizable to other geographical areas of the country or physicians practicing with large groups. Second, our outcomes of interest—discussion of cancer screening between the patient and his/her primary care physician—are self-reported by the patients and may not reflect what happened in a clinical encounter. However, previous studies found that patient self-reports of instrumental and affect aspects of clinical communication have substantial correlations with rated outcomes of audio and video records of the visits (DiMatteo et al. 2003). Another concern is that patient self-report may be subject to recall bias, although such bias may be mitigated by the fact that we chose to study whether they ever discussed a particular cancer screening rather than their discussion within a specified recall period. There might also be concern that certain SES or racial/ethnic groups tend to over or under report their discussion. However, it is not possible to predict how differential recall between patient groups may bias our results regarding between- versus within-physician differences.

Our results suggest that disparities in health care along the different dimensions of patient SES may have arisen because of very different mechanisms and therefore may entail different remedies. In particular, we found income disparities in cancer screening discussion mainly a result of differences between physicians who treat low-income patients and those who treat patients of higher income. Disparities by patient education, on the other hand, have developed largely because the results of clinical encounters with the same physicians differ for low-education patients compared with high-education patients.

One general implication of our findings is that socioeconomic disparities in cancer screening discussion, and possibly in other areas of health care communication as well, develop because of a multitude of factors. Therefore, no magic bullet exists and a multifactorial approach is more plausible to effectively address these disparities. For example, one important practical implication based on our findings is that physicians need to be aware of the educational disparities in the receipt of cancer screening discussion and possibly also in other areas of medical care. Increased awareness may then translate into special efforts when they interact with low-education patients. On the patients' side, informational materials on cancer screening and other health education topics need to be designed in a way that they either target patients of low health literacy or they are tailored to the needs of these patients. Community health initiatives that focus on enhancing the awareness and understanding of cancer screening among low-education population and on more effective communication with one's physician during a clinical encounter may

also be promising. Also in light of our findings, quality improvement efforts targeted at physicians practicing in low-income communities may be most effective in addressing disparities in cancer screening discussion and possibly other areas of preventive care by patient income.

ACKNOWLEDGMENTS

This research is funded by the NIH EXPORT Center at UCLA/Charles Drew University (NIH/1P20MD000148-01) (Y. B.), the National Cancer Institute (S. A. F.) and the Agency for Healthcare Research and Quality (Grant P01-HS10770) (J. J. E.). We thank Martin Shapiro, M.D., Ph.D., and Magda Shaheen, Ph.D., for their helpful comments on an earlier draft of the paper. Our thanks also go to two anonymous reviewers and the editor.

NOTES

1. Reasons why blacks have the highest mortality from all cancers are multi-fold. For breast cancer, although the incidence rate among black women was slightly lower compared with that among white women based on SEER data from 1992 to 2001 (Jemal et al. 2004), mortality rate was much higher (36.4 compared with 28.3 per 100,000), reflecting on average later stage detection of breast cancer among blacks compared with whites. On the other hand, the much higher incidence rate of prostate cancer among black men than among white men (284.6 versus 175.6 per 100,000) explains a substantial amount of the more-than-two-fold mortality difference between black and white men (74.9 versus 31.8 per 100,000).
2. In this study, individual physicians only pratice at one site. Therefore dummy indicators of physicians in our fixed effects model capture not only the idiosyncratic differences of individual physicians but differences at their practicing sites as well.
3. One of the factors might be the generally higher need for chronic conditions management (and thus little time left for preventive care) among low-income patients. However, when we added a dichotomous indicator of having any chronic conditions to the models, the indicator never significantly predicted the outcome and our findings regarding within- versus between-physician differences were not changed.
4. Because public awareness of prostate cancer and its screening is not as high as that for breast cancer, even physicians may not be fully aware of the much higher prostate cancer incidence and mortality rates among black men, and therefore did not choose to discuss with their black patients more about the PSA test. It is also possible that, because of the controversy surrounding the PSA test, there is not a compelling case to advise patients at elevated risks of developing prostate cancer to take the PSA test, hence the similar rates of discussion between white and black patients.

REFERENCES

Ashford, A., D. Gemson, S. N. Sheinfeld Gorin, S. Bloch, R. Lantigua, H. Ahsan and A. I. Neugut. 2000. "Cancer Screening and Prevention Practices of Inner-City Physicians." *American Journal of Preventive Medicine* 19 (1): 59–62.

Bach, P. B., H. H. Pham, D. Schrag, R. C. Tate, and J. L. Hargraves. 2004. "Primary Care Physicians Who Treat Blacks and Whites." *New England Journal of Medicine* 351 (6): 575–84.

Balsa, A. I., and T. G. McGuire. 2001. "Statistical Discrimination in Health Care." *Journal of Health Economics* 20 (6): 881–907.

———. 2003. "Prejudice, Clinical Uncertainty and Stereotyping as Sources of Health Disparities." *Journal of Health Economics* 22: 89–116.

Bellochs, C., and A. B. Carter. 1990. *Building Primary Health Care in New York City's Low-Income Communities.* New York: Community Health Service Society of New York.

Bradley, C. J., J. Gardiner, C. W. Given, and C. Roberts. 2005. "Cancer, Medicaid Enrollment, and Survival Disparities." *Cancer* 103 (8): 1712–8.

DiMatteo, M. R., J. D. Robinson, J. Heritage, M. Tabbarah, and S. A. Fox. 2003. "Correspondence among Patients' Self-Reports, Chart Records, and Audio/Videotapes of Medical Visits." *Health Communication* 15 (4): 393–413.

DHHS. 2004. *National Healthcare Disparities Report. AHRQ Publication No. 05-0014.* Rockville, MD: U.S. Department of Health and Human Services, Agency for Healthcare Research and Quality.

Efron, B., and R. Tibshirani. 1993. *An Introduction to Bootstrap.* New York: Chapman & Hall.

Finney Rutten, L. J., D. E. Nelson, and H. I. Meissner. 2004. "Examination of Population-Wide Trends in Barriers to Cancer Screening from a Diffusion of Innovation Perspective (1987–2000)." *Preventive Medicine* 38 (3): 258–68.

Fosset, J. W., J. D. Peroff, J. A. Peterson, and P. R. Kletke. 1990. "Medicaid in the Inner City: The Case of Maternity Care in Chicago." *Milbank Quarterly* 68: 111–41.

Institute of Medicine. 2002. *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care.* Washington, DC: National Academy Press.

———. 2004. *Health Literacy: A Prescription to End Confusion.* Washington, DC: National Academy Press.

Jemal, A., L. X. Clegg, E. Ward, L. A. G. Ries, X. Wu, P. M. Jamison, P. A. Wingo, H. L. Howe, R. N. Anderson, and B. K. Edwards. 2004. "Annual Report to the Nation on the Status of Cancer, 1975–2001, with a Special Feature Regarding Survival." *Cancer* 101: 3–27.

Jemal, A., T. Murray, E. Ward, A. Samuels, R. C. Tiwari, A. Ghafoor, E. J. Fever, and M. J. Thun. 2005. "Cancer Statistics." *Cancer Journal for Clinicians* 55: 10–30.

McDavid, K., T. C. Tucker, A. Sloggett, and M. P. Coleman. 2003. "Cancer Survival in Kentucky and Health Insurance Coverage." *Archives of Internal Medicine* 163: 2135–44.

McMahon, L. F., R. A. Wolfe, S. Huang, P. Tedeschi, W. Manning Jr., and M. J. Edlund. 1999. "Racial and Gender Variation in Use of Diagnostic Colonic Procedures in the Michigan Medicare Population." *Medical Care* 37 (7): 712–7.

Mitchell, J. B. 1991. "Physician Participation in Medicaid Revisited." *Medical Care* 29: 645–53.

Mitchell, J. B., and J. Cromwell. 1980. "Large Medicaid Practices and Medicaid Mills." *Journal of the American Medical Association* 244: 2433–7.

National Center for Health Statistics. 2004. *Health, United States, 2004.* National Center for Health Statistics, Hyattsville, MD.

Perloff, J. D., P. R. Kletke, and K. M. Neckerman. 1986. "Recent Trends in Pediatrician Participation in Medicaid." *Medical Care* 24: 749–60.

Ponce, N. A., S. H. Babey, D. A. Etzioni, B. A. Spencer, E. R. Brown, and N. Chawla. 2003. *Cancer Screening in California: Findings from the 2001 California Health Interview Survey.* Los Angeles, CA: UCLA Center for Health Policy Research.

Quinn, V. P., V. J. Stevens, J. F. Hollis, N. A. Rigotti, L. I. Solberg, N. Gordon, D. Ritzwoller, K. S. Smith, W. Hu, and J. Zapka. 2005. "Tobacco-Cessation Services and Patient Satisfaction in Nine Nonprofit HMOs." *American Journal of Preventive Medicine* 29 (2): 77–84.

Roetzheim, R. G., N. Pal, C. Tennant, L. Voti, J. Z. Ayanian, A. Schwabe, and J. P. Krischer. 1999. "Effects of Health Insurance and Race on Early Detection of Cancer." *Journal of the National Cancer Institute* 91 (16): 1409–15.

Schwartz, K. L., H. Crossley-May, F. D. Vigneau, K. Brown, and M. Banerjee. 2003. "Race, Socioeconomic Status and Stage at Diagnosis for Five Common Malignancies." *Cancer Causes and Control* 14: 761–6.

Singh, G. K., B. A. Miller, B. F. Hankey, and B. K. Edwards. 2003. *Area Socioeconomic Variations in U.S. Cancer Incidence, Mortality, Stage, Treatment and Survival, 1975–1999. NCI Cancer Surveillance Monograph Series, Number 4, NIH Publication No. 03-5417.* Bethesda, MD: National Cancer Institute.

Van Ryn, M., and J. Burke. 2000. "The Effect of Patient Race and Socio-Economic Status on Physician's Perceptions of Patients." *Social Science and Medicine* 50: 813–28.

Ward, E., A. Jemal, V. Cokkinides, G. K. Singh, C. Gardinez, A. Ghafoor, and M. Thun. 2004. "Cancer Disparities by Race/Ethnicity and Socioeconomic Status." *Cancer Journal for Clinicians* 54: 78–93.