

- J Clin Epidemiol.* 1993;46:379–393.
28. Parkerson GR Jr., Hammond WE, Yarnall KSH. Feasibility and potential clinical usefulness of a computerized severity of illness measure. *Arch Fam Med.* 1994;3:968–973.
 29. Software Update Release Notes, The Johns Hopkins University ACG Case-Mix Adjustment System, Version 4.0. Baltimore, MD: The Johns Hopkins University; 1997.
 30. Cox DR. Regression models and life-tables (with discussion). *J Royal Stat Soc B.* 1972;34:187–220.
 31. Newhouse JP. Patients at risk: health reform and risk adjustment. *Health Affairs.* 1994;13:132–146.
 32. Kassirer JP, Angell M. Editorial: risk adjustment or risk avoidance? *N Engl J Med.* 1998;339:1925–1926.
 33. Iezzoni LI, Ayanian JZ, Bates DW, et al. Editorial: Paying more fairly for Medicare capitated care. *N Engl J Med.* 1998;339:1933–1938.
 34. Kuttner R. Editorial: the risk-adjustment debate. *N Engl J Med.* 1998;339:1952–1956.
 35. Parkerson GR Jr., Bell HS, Albright JB, et al. A telephone needs assessment for potential high utilizers. *Fam Med.* 2001;33:466–472.

Vulnerability and the Receipt of Recommended Preventive Services: *The Influence of Multiple Risk Factors*

Leiyu Shi, DrPH, MBA,* and Gregory D. Stevens, PhD†

Context: Previous studies have confirmed the independent associations of race/ethnicity, socioeconomic status, and potential access with the receipt of preventive care. More pragmatic models of vulnerability are needed to examine the concomitant influence of multiple risk factors.

Objective: To operationalize vulnerability as risk profiles of predisposing (race/ethnicity and education) and enabling (eg, income, health insurance, and having a regular source of care) factors, and their association with the receipt of preventive care.

Study Design: Cross-sectional data on 14,983 adults from the Household Component of the 1996 Medical Expenditure Panel Survey.

Main Outcome Measures: Receipt of recommended preventive care: blood pressure and cholesterol screening, flu shot, Papanicolaou test, mammogram, and dental visit.

Results: Controlling for other factors, analyses of risk profiles revealed a clear dose–response relationship with the receipt of preventive care regardless of race/ethnicity. In the total sample, having more risk factors was associated with a lower prevalence of, for example, receiving a cholesterol screening: 1 risk (PR = 0.77; CI, 0.71–0.84), 2 risks (PR = 0.56; CI, 0.49–0.64), and 3+ risks (PR = 0.34; CI, 0.25–0.43).

Conclusion: Sizeable disparities in the receipt of recommended preventive services were found in relation to increasing vulnerability risk profiles. Without attention to such co-occurring risks, it is unlikely that substantial gains will be made in reducing disparities in the incidence of and mortality from the most common preventable diseases in the United States.

Key Words: race/ethnicity, socioeconomic status, vulnerability, preventive care, disparities

From the *Johns Hopkins University Bloomberg School of Public Health, Department of Health Policy and Management, Baltimore, Maryland; and the †University of Southern California Keck School of Medicine,

Division of Community Health, Los Angeles, California.

Reprints: Gregory D. Stevens, PhD, USC Keck School of Medicine, Division of Community Health, 3716 South Hope St., Room 257, Los Angeles, CA 90007. E-mail: gregorydstevens@yahoo.com.

The United States has adopted a national priority of reducing and eliminating disparities in health and health care by 2010.¹ Most strategies to reduce health disparities have focused on improving the delivery of primary and preventive services to vulnerable populations. Previous studies have demonstrated disparities in preventive care among racial/ethnic minorities,^{2–7} low socioeconomic status (SES) populations,^{8–13} and those lacking potential access to care.^{14–20} Although research examines the contributions of individual risk factors for poor access on primary and preventive services, few have adopted models of vulnerability that account for the clustering of multiple risk factors.

This study operationalizes the concept of vulnerability using profiles that account for multiple risk factors and examines these profiles in relation to the receipt of 6 US Preventive Services Task Force (USPSTF)-recommended preventive services. The risk factors that are included in this study include low income, low education, lack of health insurance, and not having a regular source of care that are associated with access to care. Profiles are examined by race/ethnicity so that differences in the influences of risk factors across racial/ethnic groups can be readily detected.

Methods

Study Design and Sampling

Data on 14,983 adults are from the Household Component of the 1996 Medical Expenditure Panel Survey (MEPS). Detailed information about the design of MEPS is available elsewhere.²¹ Analyses included individuals 18 years and older who completed the first 2 rounds of the survey.

Conceptual Framework

Risk factors for poor access and quality of preventive care in this study include those that have been most consistently correlated with the receipt of preventive services: low income, low education, no health insurance, and not having a regular source of care. The selection of these factors was based on the access to care models of Andersen,²² reflecting both the predisposing (eg, education) and enabling risk factors (eg, income, health insurance, and having a regular source of care) for poor access that are amenable to policy changes.

Measures

The study independent variables are (1) household income less than 200% of the federal poverty line, (2) having less than a high school education, (3) being unin-

TABLE 1. Weighted Characteristics of the Population by Race/Ethnicity

Study Variables	Asian (n = 411)	Black (n = 1864)	Hispanic (n = 2748)	White (n = 9960)
Demographics, %				
Age 18–64 years (versus 65+ years)	88.5 [†]	88.3 [‡]	92.0 [‡]	81.3
Female gender	50.6	55.6 [‡]	49.9 [‡]	52.1
Poor health status (versus good health)	9.0	18.6 [‡]	16.0 [‡]	11.8
Married (versus not married)	66.2	35.6 [‡]	55.1 [‡]	60.8
Living in MSA (versus not in MSA)	94.5 [‡]	84.8 [‡]	91.1 [‡]	77.9
Socioeconomic status, %				
Low income** (versus high: ≥ 200% FPL)	26.9	49.0 [‡]	53.6 [‡]	24.4
Education	‡	‡	‡	
Less than high school**	14.2	23.5	42.8	14.1
High school	39.5	58.0	43.4	54.0
College degree or higher	46.3	18.5	13.9	32.0
Health system factors				
Insurance coverage	†	‡	‡	
Private	68.1	59.6	50.5	81.5
Medicare	11.4	16.6	16.1	4.4
Medicaid	2.8	4.7	2.4	4.7
Uninsured**	17.8	19.1	31.1	9.4
No regular source of care** (versus yes)	24.9*	24.2 [‡]	38.2 [‡]	18.3
Managed care	*	‡	‡	
Have managed care	40.9	34.6	30.7	33.0
No managed care	51.6	57.9	60.3	62.6
Inapplicable	7.6	7.6	9.0	4.4
Vulnerability profile ^{††}	*	‡	‡	
0 risk factors	47.1	31.6	22.3	54.7
1 risk factor	29.7	34.4	26.3	29.1
2 risk factors	17.2	23.0	25.4	12.6
3 risk factors	4.7	9.3	17.2	3.3
4 risk factors	1.3	1.6	8.9	0.4
Preventive services in past year				
Dental checkup [¶]	30.0	21.8	22.4	38.8
Flu shot	50.9	46.0	61.0	67.7
Blood pressure screening	64.7	73.8	64.7	79.0
Cholesterol screening [§]	46.8	55.4	44.0	48.1
Papanicolaou test [¶]	47.7	59.5	52.5	55.8
Mammogram [§]	50.5	54.0	55.1	58.3

Dental checkup was assessed for ages 18+ years; flu shot, ages 65+ years; blood pressure screening, 18+ years; cholesterol screening men, 35 to 64 years; cholesterol screening women, 45 to 64 years; Papanicolaou test, women 18+ years; and mammogram, women 50 to 69 years.

* $P < 0.05$, [†] $P < 0.01$, [‡] $P < 0.001$ for χ^2 of the racial/ethnic group compared with whites.

[§] $P < 0.05$, [¶] $P < 0.01$, ^{||} $P < 0.001$ for χ^2 across all racial/ethnic groups.

**The category of the variable considered “vulnerability”, and included in the vulnerability profile.

^{††}Number of vulnerabilities (low income, less than high school education, uninsured, or no regular source of care).

sured, and (4) not having a regular source of care. These risks are combined into vulnerability risk profiles that reflect the number of risks that a person has. Profiles are examined in different combinations, and as a count of the total risk factors a person has (eg, 0 risks, 1 risk, 2 risks,

etc). Analyses are presented by race and ethnicity (eg, white, black, Asian, and Hispanic).

Study dependent variables are 6 preventive services recommended by the USPSTF that respondents reported they received in the past 12 months: blood pressure screening, cho-

lesterol screening, flu shot, Papanicolaou test, mammogram, and dental checkup. For each service, appropriate age and gender subgroups were analyzed based on detailed recommendations of the USPSTF from 1996 (to match recommendations that physicians were following at that time).²³ Study covariates are respondent age, gender, health status, marital status, metropolitan statistical area, and managed care.

Analysis

Analyses were performed using SUDAAN to account for the multistage, stratified cluster sampling of the MEPS. Analyses adjusted for the design effect, and all estimates are weighted to be nationally representative. The association of risk profiles with the receipt of preventive services is analyzed by race/ethnicity using multivariate logistic regression. Because of small sample sizes for some racial/ethnic groups at higher risk levels, 3 and 4 risk factors are combined into 1 analytic group called “3+ risk factors.” Prevalence ratios (ie, relative risks) are presented.²⁴ Third, to examine whether certain risk combinations have a stronger influence on receipt of preventive services, the association of 16 unique risk

profiles with blood pressure screening is presented for the total sample.

Results

Table 1 shows that about half of both Hispanics (53.6%) and blacks (49.0%) were low income, compared with only about one quarter of Asians and whites. Hispanics and blacks were also more likely to have less than a high school education (42.8% and 23.5%) compared with about 14% of Asians and whites. Hispanics were most likely to be uninsured (31.1%) and not have a regular source of care (38.2%). Although 54.7% of whites and 47.1% of Asians had no risk factors, about 1 of every 4 Hispanics (26.1%) and more than 1 of every 10 blacks (10.9%) had 3 or more risk factors. Blacks were most likely to have a cholesterol screening (55.4%) and Papanicolaou test (59.5%); Asians were least likely to have a Papanicolaou test (47.7%).

Table 2 shows that, controlling for other factors, each additional risk factor (that was found to be individually associated with the receipt of preventive care in analyses that are not presented here) was associated with a lower likelihood

TABLE 2. Vulnerability Profiles by Race/Ethnicity Predicting Preventive Services, Multivariate Logistic Regressions, Prevalence Ratios (CIs)

Variable	Dental Checkup	Flu Shot	Blood Pressure Screening	Cholesterol Screening	Papanicolaou Test	Mammogram
Total (ref: zero)	n = 14,862	n = 2394	n = 14,047	n = 5872	n = 7955	n = 1893
1 risk factor	0.62 (0.57, 0.67)	0.82 (0.73, 0.91)	0.85 (0.81, 0.89)	0.77 (0.71, 0.84)	0.89 (0.83, 0.94)	0.83 (0.72, 0.93)
2 risk factors	0.33 (0.29, 0.38)	0.70 (0.59, 0.80)	0.76 (0.71, 0.81)	0.56 (0.49, 0.64)	0.81 (0.74, 0.89)	0.54 (0.45, 0.66)
3+ risk factors	0.14 (0.12, 0.18)	0.29 (0.15, 0.48)	0.47 (0.42, 0.52)	0.34 (0.25, 0.43)	0.56 (0.45, 0.66)	0.45 (0.29, 0.66)
White (ref: zero)						
1 risk factor	0.67 (0.61, 0.73)	0.85 (0.75, 0.95)	0.87 (0.84, 0.91)	0.72 (0.38, 0.88)	0.89 (0.82, 0.96)	0.80 (0.67, 0.93)
2 risk factors	0.34 (0.29, 0.40)	0.76 (0.65, 0.86)	0.80 (0.74, 0.84)	0.61 (0.38, 0.78)	0.79 (0.69, 0.88)	0.53 (0.40, 0.67)
3+ risk factors	0.15 (0.11, 0.22)	0.35 (0.17, 0.61)	0.57 (0.49, 0.66)	0.34 (0.22, 0.50)	0.61 (0.47, 0.78)	0.46 (0.23, 0.77)
Black (ref: zero)						
1 risk factor	0.54 (0.41, 0.71)	1.25 (0.85, 1.62)	0.85 (0.74, 0.95)	0.92 (0.73, 1.10)	0.93 (0.80, 1.05)	0.96 (0.59, 1.32)
2 risk factors	0.35 (0.24, 0.51)	0.94 (0.54, 1.37)	0.73 (0.59, 0.88)	0.72 (0.50, 0.97)	0.87 (0.68, 1.05)	0.54 (0.28, 0.89)
3+ risk factors	0.15 (0.18, 0.36)	0.52 (0.11, 1.42)	0.46 (0.32, 0.63)	0.27 (0.14, 0.45)	0.45 (0.22, 0.79)	0.37 (0.12, 0.86)
Hispanic (ref: zero)						
1 risk factor	0.60 (0.46, 0.78)	0.84 (0.46, 1.20)	0.82 (0.69, 0.95)	0.92 (0.68, 1.18)	0.77 (0.60, 0.96)	1.07 (0.69, 1.39)
2 risk factors	0.42 (0.30, 0.56)	0.62 (0.26, 1.07)	0.74 (0.60, 0.87)	0.73 (0.51, 0.99)	0.73 (0.54, 0.93)	0.83 (0.46, 1.21)
3+ risk factors	0.16 (0.10, 0.24)	0.16 (0.02, 0.68)	0.35 (0.26, 0.46)	0.39 (0.23, 0.60)	0.44 (0.29, 0.65)	0.73 (0.37, 1.15)
Asian (ref: zero)						
1 risk factor	0.53 (0.30, 0.87)	0.34 (0.02, 1.50)	0.75 (0.54, 0.96)	0.90 (0.51, 1.34)	0.88 (0.50, 1.32)	0.23 (0.04, 1.00)
2 risk factors	0.38 (0.18, 0.74)	0.50 (0.06, 1.59)	0.86 (0.58, 1.12)	0.73 (0.25, 1.43)	1.16 (0.57, 1.69)	0.04 (0.01, 0.45)
3+ risk factors	0.16 (0.04, 0.56)	—*	0.50 (0.21, 0.91)	0.43 (0.07, 1.34)	0.30 (0.06, 0.98)	—*

Dental checkup was assessed for ages 18+ years; flu shot, ages 65+ years; blood pressure screening, 18+ years; cholesterol screening men, 35 to 64 years; cholesterol screening women, 45 to 64 years; Papanicolaou test, women 18+ years; mammogram women, 50 to 69 years.

Models are adjusted for age and gender (when appropriate), health status, marital status, MSA, and managed care enrollment.

*Not stable due to very small sample size and thus not reported.

of receiving each preventive service. For example, in the total sample, the prevalence of having a blood pressure screening was 15% lower among those with 1 risk factor compared with no risk factors (PR = 0.85; CI, 0.81–0.89), 24% lower among those with 2 risk factors (PR = 0.76; CI, 0.71–0.81), and 53% lower for those with 3 or more risks compared with no risk factors (PR = 0.47; CI, 0.42–0.52). This pattern held for each racial/ethnic group with the exception of flu shots and mammograms for blacks and Hispanics, and for several of the analyses with Asians due to small sample sizes.

Figure 1 shows that there is a general declining pattern across sets of profiles delineated by the number of risk factors. There is some variation within each set, suggesting that certain combinations of risk factors have larger effects than others on the receipt of a blood pressure screening. For example, the proportion with a blood pressure screening among those with a 2-risk factor profile of low income and less than a high school education (86%) was much higher compared with those with 2-risk factor profiles of either low education and no regular source of care (60%) or being uninsured and no regular source of care (54%). Similar differences were detected among 3-risk factor profiles.

Discussion

This study demonstrates that vulnerability can be operationalized as a profile of multiple risk factors. This study further demonstrates that a substantial proportion of

US adults (about 1 in 5) has multiple risk factors, and that these risk factors were associated with greater than 2-fold differences in the proportion of those receiving preventive care between the highest and lowest risk profiles, regardless of race/ethnicity. A particularly important finding is that Hispanics are more vulnerable (ie, have a greater prevalence of multiple risk factors) than other groups; a finding made more relevant when we consider that Hispanics are now the largest “minority” group in the United States.²⁵ Most striking is that Hispanic adults are 4 times, and blacks are 3 times, more likely than whites to have 3 or more risk factors in this study.

This suggests that addressing multiple risk factors will not only be key to meeting national prevention goals, but to reducing racial/ethnic disparities in mortality associated with associated preventable diseases. Suggestive of some improvement, however, is that despite greater risk factors, blacks and Hispanics were as or more likely than whites to have a cholesterol screening, and blacks were more likely to have a Papanicolaou test. These findings are corroborated by other research.^{26–28} In contrast, despite few risk factors, Asians were the least likely to report many preventive services, a finding corroborated by other studies.^{29–31} This finding has been attributed to low perceived risk of disease, language, and acculturation among Asians.^{32–34}

Having a regular source of care, in combination with lacking insurance, is one of the most influential risk profiles

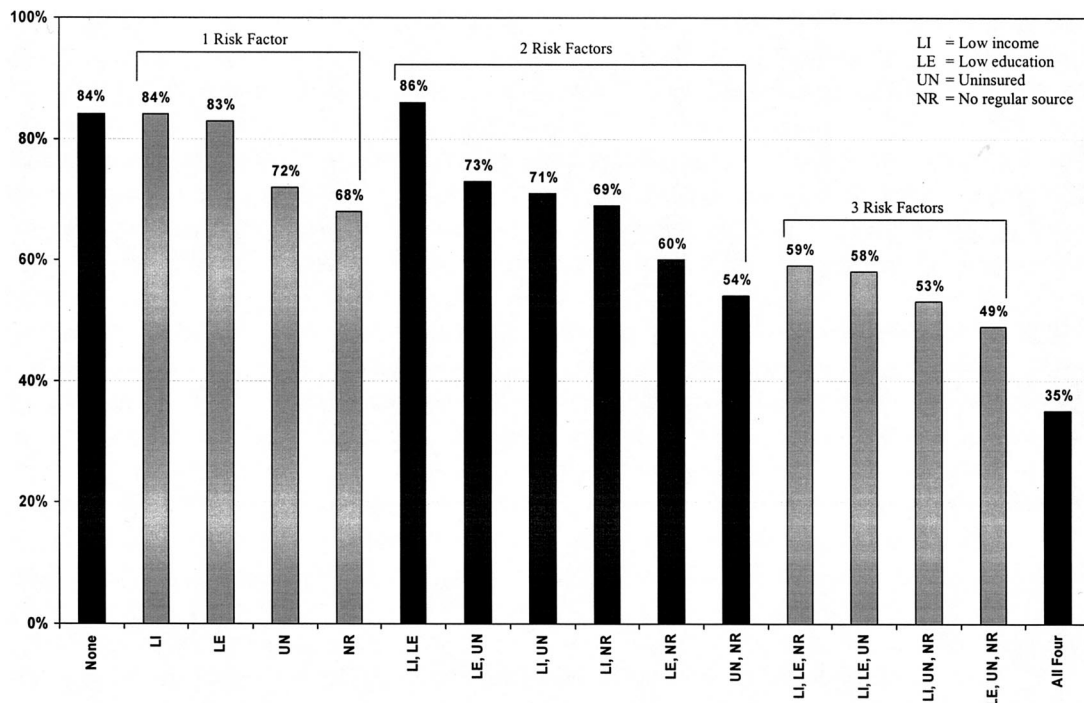


FIGURE 1. Combinations of risk factors and the percentage of individuals reporting receipt of a blood pressure screening during the past year.

associated with lower receipt of preventive care. Because these are factors that can be modified through policy, they may serve as key focal points for policy efforts to increase preventive services for the most vulnerable populations. For example, efforts can be made to increase insurance coverage and foster linkages of patients with geographically accessible providers, to provide translation services, and to reduce care-seeking restrictions that impede the development of patient-provider relationships.^{35,36}

There are several limitations to this study. First, the risk factors included are not exhaustive; other combinations of risk factors (eg, language, marital status) may produce different results. Second, this study was not able to examine the periodicity of preventive services in accord with USPSTF recommendations. MEPS did allow for analyzing ever having received each preventive service, and the results were similar (not shown). Third, adults, and particularly Hispanics, may overreport the receipt of preventive services.³⁷⁻⁴⁰ This may explain why Hispanics are as likely as whites to report a cholesterol screening.

In conclusion, improving the receipt of recommended preventive services for vulnerable populations will require multifaceted clinical and policy interventions. Risk profiles in this study revealed a clear dose-response relationship between the number of risk factors and the receipt of preventive services. Strategies to reduce disparities among vulnerable populations should address these co-occurring risks, rather than continue the fragmented approach of targeting single risks. Barring a more comprehensive approach, it is unlikely that large gains will be made in reducing the incidence and mortality associated with the most common preventable diseases for US adults.

REFERENCES

1. US Department of Health and Human Services. *Healthy People 2010: Understanding and Improving Health*. 2nd ed. Washington, DC: US Government Printing Office; 2000.
2. Doty HE, Weech-Maldonado R. Racial/ethnic disparities in adult preventive dental care use. *J Health Care Poor Underserved*. 2003;14:516-534.
3. Stewart SH, Silverstein MD. Racial and ethnic disparity in blood pressure and cholesterol measurement. *J Gen Intern Med*. 2002;17:405-411.
4. Williams RL, Flocke SA, Stange KC. Race and preventive services delivery among black patients and white patients seen in primary care. *Med Care*. 2001;39:1260-1267.
5. Hegarty V, Burchett BM, Gold DT, et al. Racial differences in use of cancer prevention services among older Americans. *J Am Geriatr Soc*. 2000;48:735-740.
6. Naumburg EH, Franks P, Bell B, et al. Racial differentials in the identification of hypercholesterolemia. *J Fam Pract*. 1993;36:425-430.
7. Racial/ethnic disparities in influenza and pneumococcal vaccination levels among persons aged > or =65 years—United States, 1989-2001. *MMWR Morb Mortal Wkly Rep*. 2003;52:958-962.
8. Selvin E, Brett K. Breast and cervical cancer screening: sociodemographic predictors among white, black, and Hispanic women. *Am J Public Health*. 2003;93:618-623.
9. Franks P, Fiscella K. Effect of patient socioeconomic status on physician profiles for prevention, disease management, and diagnostic testing

- costs. *Med Care*. 2002;40:717-724.
10. Fiscella K, Goodwin MA, Stange KC. Does patient educational level affect office visits to family physicians? *J Natl Med Assoc*. 2002;94:157-165.
11. Janes GR, Blackman DK, Bolen JC, et al. Surveillance for use of preventive health-care services by older adults, 1995-1997. *MMWR CDC Surveill Summ*. 1999;48:51-88.
12. Solberg LI, Brekke ML, Kottke TE. Are physicians less likely to recommend preventive services to low-SES patients? *Prev Med*. 1997;26:350-357.
13. Schur CL, Albers LA. Language, sociodemographics, and health care use of Hispanic adults. *J Health Care Poor Underserved*. 1996;7:140-158.
14. DeVoe JE, Fryer GE, Phillips R, et al. Receipt of preventive care among adults: insurance status and usual source of care. *Am J Public Health*. 2003;93:786-791.
15. Xu KT. Usual source of care in preventive service use: a regular doctor versus a regular site. *Health Serv Res*. 2002;37:1509-1529.
16. Corbie-Smith G, Flagg EW, Doyle JP, et al. Influence of usual source of care on differences by race/ethnicity in receipt of preventive services. *J Gen Intern Med*. 2002;17:458-464.
17. Hueston WJ, Hubbard ET. Preventive services for rural and urban African American adults. *Arch Fam Med*. 2000;9:263-266.
18. Lambrew JM, DeFries GH, Carey TS, et al. The effects of having a regular doctor on access to primary care. *Med Care*. 1996;34:138-151.
19. Ettner SL. The timing of preventive services for women and children: the effect of having a usual source of care. *Am J Public Health*. 1996;86:1748-1754.
20. Sox CM, Swartz K, Burstin HR, et al. Insurance or a regular physician: which is the most powerful predictor of health care? *Am J Public Health*. 1998;88:364-370.
21. Cohen J. *Sample Design of the Medical Expenditure Panel Survey Household Component*. AHCPR publication no. 97-0027. Rockville, MD: Agency for Health Care Policy and Research; 1997.
22. Andersen R. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav*. 1995;36:1-10.
23. US Preventive Services Task Force. *Guide to Clinical Preventive Services*. 2nd ed. Baltimore: Williams & Wilkins; 1996.
24. Zhang J, Yu KF. What's the relative risk? A method of correcting the odds ratio in cohort studies of common outcomes. *JAMA*. 1998;280:1690-1691.
25. National Center for Health Statistics. *Health, United States 2003*. Hyattsville, MD: Centers for Disease Control; 2003.
26. Jones AR, Caplan LS, Davis MK. Racial/ethnic differences in the self-reported use of screening mammography. *J Commun Health*. 2003;28:303-316.
27. Martin LM, Calle EE, Wingo PA, et al. Comparison of mammography and Pap test use from the 1987 and 1992 National Health Interview Surveys: are we closing the gaps? *Am J Prev Med*. 1996;12:82-90.
28. Sambamoorthi U, McAlpine DD. Racial, ethnic, socioeconomic, and access disparities in the use of preventive services among women. *Prev Med*. 2003;37:475-484.
29. Calle EE, Flanders WD, Thun MJ, et al. Demographic predictors of mammography and Pap smear screening in US women. *Am J Public Health*. 1993;83:53-60.
30. Tu SP, Taplin SH, Barlow WE, et al. Breast cancer screening by Asian-American women in a managed care environment. *Am J Prev Med*. 1999;17:55-61.
31. Goel MS, Wee CC, McCarthy EP, et al. Racial and ethnic disparities in cancer screening: the importance of foreign birth as a barrier to care. *J Gen Intern Med*. 2003;18:1028-1035.
32. Yu MY, Hong OS, Seetoo AD. Uncovering factors contributing to under-utilization of breast cancer screening by Chinese and Korean women living in the United States. *Ethnic Dis*. 2003;13:213-219.
33. Tang TS, Solomon LJ, McCracken LM. Cultural barriers to mammography, clinical breast exam, and breast self-exam among Chinese-American women 60 and older. *Prev Med*. 2000;31:575-583.
34. Han Y, Williams RD, Harrison RA. Breast cancer screening knowledge, attitudes, and practices among Korean American women. *Oncol Nurs Forum*. 2000;27:1585-1591.
35. Forrest CB, Shi L, von Schrader S, et al. Managed care, primary care, and the

- patient-practitioner relationship. *J Gen Intern Med.* 2002;17:270–277.
36. Stevens GD, Shi L. Effect of managed care on children's relationships with their primary care physicians: differences by race. *Arch Pediatr Adolesc Med.* 2002;156:369–377.
 37. Martin LM, Leff M, Calonge N, et al. Validation of self-reported chronic conditions and health services in a managed care population. *Am J Prev Med.* 2000;18:215–218.
 38. McPhee SJ, Nguyen TT, Shema SJ, et al. Validation of recall of breast and cervical cancer screening by women in an ethnically diverse population. *Prev Med.* 2002;35:463–473.
 39. Suarez L, Goldman DA, Weiss NS. Validity of Pap smear and mammogram self-reports in a low-income Hispanic population. *Am J Prev Med.* 1995;11:94–98.
 40. McKenna MT, Speers M, Mallin K, et al. Agreement between patient self-reports and medical records for Pap smear histories. *Am J Prev Med.* 1992;8:287–291.