
Articles

Primary Care, Self-rated Health, and Reductions in Social Disparities in Health

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Objective. To examine the extent to which good primary-care experience attenuates the adverse association of income inequality with self-reported health.

Data Sources. Data for the study were drawn from the Robert Wood Johnson Foundation sponsored 1996–1997 Community Tracking Study (CTS) Household Survey and state indicators of income inequality and primary care.

Study Design. Cross-sectional, mixed-level analysis on individuals with a primary-care physician as their usual source of care. The analyses were weighted to represent the civilian noninstitutionalized population of the continental United States.

Data Collection/Extraction Methods. Principal component factor analysis was used to explore the structure of the primary-care indicators and examine their construct validity. Income inequality for the state in which the community is located was measured by the Gini coefficient, calculated using income distribution data from the 1996 current population survey. Stratified analyses compared proportion of individuals reporting bad health and feeling depressed with those with good and bad primary-care experiences for each of the four income-inequality strata. A set of logistic regressions were performed to examine the relation between primary-care experience, income inequality, and self-rated health.

Principal Findings. Good primary-care experience, in particular enhanced accessibility and continuity, was associated with better self-reported health both generally and mentally. Good primary-care experience was able to reduce the adverse association of income inequality with general health although not with mental health, and was especially beneficial in areas with highest income inequality. Socioeconomic status attenuated, but did not eliminate, the effect of primary-care experience on health. In conclusion, good primary-care experience is associated not only with improved self-rated overall and mental health but also with reductions in disparities between more- and less-disadvantaged communities in ratings of overall health.

Key Words. Primary-care experience, income inequality, self-rated health

Numerous studies at both individual and ecological levels have established the salutary effect of primary care and shown its positive association with health outcomes (Starfield 1992, 1994, 1998; Institute of Medicine 1994; Shi 1992, 1994, 1995; Politzer et al. 1991; Bindman, Grumbach, and Osmond 1996; Roos 1979; Greenfield, Rogers, and Mangotich 1995; Green 1996; Grumbach 1996; Donaldson and Vanselow 1996). Recent studies at both U.S. state and Primary Metropolitan Statistical Area have further demonstrated that primary care attenuates the adverse impact of income inequality on population health, as measured by life expectancy, age-adjusted mortality, and leading causes of death (Shi et al. 1999; Shi and Starfield 2000, 2001). The latter studies measured primary care as the number of primary-care specialty physicians who were in active office-based patient care per ten thousand civilian population, or primary-care physician-to-population ratio. The primary-care specialties included family practice and general practice, general internal medicine, and general pediatrics. While there is no doubt that these physician specialties in the United States are primarily engaged in primary care, this measure of primary care availability does not necessarily reflect the adequate practice of primary care and cannot distinguish differences in primary-care quality among primary-care physicians. The current study measures primary care by the achievement of its functions and examines the extent to which good primary-care experience attenuates the adverse association of income inequality with self-reported health. Our underlying assumption is that actual experiences with receipt of primary care are a better measure of the contribution of primary care than the simple presence of primary-care physicians. Using measures of primary-care experiences would provide a more definitive conclusion about whether and to what extent primary care moderates the adverse association of income inequality with health.

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METHODS

Data

Data for the study were drawn from the 1996–1997 Community Tracking Study (CTS) household survey, a major initiative of the Robert Wood Johnson Foundation. The CTS is a national study of the rapidly changing health-care market and the effects of these changes on people’s care-seeking and health. The study develops an information base designed to track and analyze change. The CTS has three objectives: tracking changes in health systems, tracking changes in outcomes, and understanding the effect of health-system change on outcomes.

The CTS collected data on 60 local health-care markets (communities) in the continental United States. The 60 communities were randomly selected with probability in proportion to population to ensure representation of the U.S. population. Within each community, households were randomly selected through a combination of random-digit dialing and a field sample to represent households with no telephones or with intermittent telephone service. Information was obtained on all adults in the household and one randomly selected child within each family in the household. All families within a household were interviewed separately in English or Spanish (for respondents not fluent in English). An additional nationally representative random sample of individuals constituting about 10 percent of the total sample was obtained so that civilian, noninstitutionalized persons in the contiguous 48 states of the United States constitute the universe of CTS. Overall response rate was 65 percent. Stratification by region and systematic sampling by state ensured the full diversity of health-delivery systems across the nation, as well as diversity with respect to historical evolution and community culture, as reflected by differences across regions and states. More detailed discussions of the design and scope of CTS are published elsewhere (Kemper et al. 1996; Metcalf et al. 1996) and can also be obtained through the website of the Robert Wood Johnson Foundation (<http://www.rwjf.org/nation/jnation.htm>).

Several exclusion criteria were used to yield the analytic sample. First, the sample was restricted to people whose last visit in the past 12 months was made to their usual source of care—the “place they usually go when they are sick or need advice about their health.” This restriction was made because the primary-care experience questions were linked to the practitioner whom the individual last visited.

Second, only individuals identifying a primary-care physician as a usual source of care were included in the study sample for the following reasons. Those identifying specialists were excluded because these individuals are likely to be less healthy and therefore would bias the study outcome due to selection bias. Preliminary analysis indicates that while 11.77 percent of those with primary-care physicians as usual source of care reported bad health, 17.67 percent of those with specialists as usual source of care reported bad health ($p < .01$). Individuals with primary-care physicians as usual source of care also had significantly better SF-12 Physical Health Component Score (36.75 vs. 45.42, $p < .01$) and SF-12 Mental Health Component Score (39.28 vs. 49.56, $p < .01$) than those with specialists as usual source of care. Specialists as a whole are known to perform less well on primary-care attributes than do primary-care physicians (Starfield 1998; Weiner and Starfield 1983; Rosenblatt et al. 1998). The long-term nature of the patient–primary-care physician relationship is qualitatively different from most relationships patients have with specialists, which tend to be time-limited and less intense. While some specialists, such as obstetricians and gynecologists, are often used by women as their usual primary-care provider, the CTS dataset does not indicate the type of physician specialty once “specialist” is checked.

Third, individuals who identified hospital emergency room as usual source of care were excluded because they are less likely to have a regular provider for their needs, thus decreasing the likelihood of having continuity of care (Hatcher 1994; Farmer, Stokes, and Fisher 1991). The poorer continuity of care for primary-care visits in emergency rooms may contribute to a more aggressive practice style because of less familiarity with patients’ medical and health histories. Greater service intensity and poorer continuity of care in emergency rooms also raise the concern over the suitability of this setting as primary-care delivery sites. Those identifying community health centers ($n = 3,829$) or hospital outpatient ($n = 1,672$) as usual source of care were retained because these settings have become more popular in recent years and increasingly serve as the primary-care safety-net providers for the nation’s uninsured or underinsured (Shi et al. 2001; Forrest and Whelan 2000; Dievler and Giovannini 1998; Politzer et al. 2000).

Of the 60,446 persons in the total survey sample, 33,022 had a usual source of care and visited that provider last within the past 12 months. Among them, 26,924 had primary-care doctors as their usual source of care. Excluding 245 individuals with hospital emergency room as usual source of care, the final unweighted analytic sample was 26,679.

Measures

Primary Care. Our specification of the principal domains of primary care is consistent with the Institute of Medicine's (IOM) characterization of primary care. IOM lists the attributes of primary care as accessibility, comprehensiveness, coordination, continuity, and accountability (Institute of Medicine 1978). Its 1994 report further defines primary care as "the provision of integrated, accessible health-care services by clinicians who are accountable for addressing a large majority of personal health-care needs, developing a sustained partnership with patients (which connotes the nature of the interpersonal relationship between patients and their health-care practitioners), and practicing in the context of family and the community" (p. 1) (Institute of Medicine 1994). A number of professional committees and experts have reaffirmed these important characteristics of primary care (Starfield 1998; Safran et al. 1998; Flocke 1997).

For the purpose of this study, we identified questions within the CTS "access to care" component of the household survey that measure such principal primary-care domains as accessibility and interpersonal relationship. Measures of other primary-care domains were inadequate or unavailable from CTS and therefore not represented in the study. Specifically, we used three questions intended to address accessibility to the usual source of care: appointment time, waiting time, and travel time. For interpersonal relationship, we identified four questions reflecting patient-physician interactions (i.e., thoroughness of care, doctor's listening, doctor's explanation, and choice of doctor) and one question that reflects continuity (i.e., see the same provider). Table 1 provides the operational definitions and coding of these primary-care indicators.

Consistent with earlier studies of primary care and health (Shi 1992, 1994; Shi et al. 1999), primary-care physician-to-population ratio at the state level was also included as a contextual measure. The primary-care specialties included family practice and general practice (combined), general internal medicine, and general pediatrics. Data were obtained from the American Medical Association Physicians Master File.

Income Inequality. Income inequality was measured by the Gini coefficient, a commonly used indicator of income inequality wherein higher values indicate greater inequality in income distribution (Kaplan et al. 1996; Lynch et al. 1998). It is derived from the Lorenz curve, which is a mechanism to graphically represent the cumulative share of the total income accruing to successive income intervals. Data used to calculate it at the state level came from

Table 1: Definitions of Indicators of Primary Care (PC) Accessibility and Interpersonal Relationship Domains

<i>PC Quality Indicators</i>	<i>Question Items</i>	<i>Codings</i>
PC accessibility (Appointment time + Waiting time + Travel time)	Appointment time (Last visit appointment time in days)	5 = 0 day 4 = 1-7 days 3 = 8-15 days 2 = 16-30 days 1 = 31+ days
	Waiting time (Last visit waiting time in minutes)	5 = 0-30 minutes 4 = 31-60 minutes 3 = 61-120 minutes 2 = 121-180 minutes 1 = 181+ minutes
	Travel time (Last visit travel time in minutes)	5 = 1-30 minutes 4 = 31-60 minutes 3 = 61-120 minutes 2 = 121-180 minutes 1 = 181+ minutes
PC interpersonal relationship (Thoroughness of care + Doctor's listening + Doctor's explanation + Choice of doctor)	Thoroughness of care How would you rate the thoroughness and carefulness of care you received?	5 = excellent 4 = very good 3 = good 2 = fair 1 = poor
	Doctor's listening How would you rate how well your doctor listened to you?	5 = excellent 4 = very good 3 = good 2 = fair 1 = poor
	Doctor's explanation How would you rate how well your doctor explained things to you?	5 = excellent 4 = very good 3 = good 2 = fair 1 = poor
	Choice of doctor Are you satisfied with choice of primary care doctor?	5 = very satisfied 4 = somewhat satisfied 3 = neither satisfied nor dissatisfied 2 = somewhat dissatisfied 1 = very dissatisfied
PC continuity	Do you usually see the same provider?	1 = no 5 = yes
PC experience = PC accessibility + PC interpersonal relationship + PC continuity		

the 1996 current population survey available on the U.S. Census Bureau web site (U.S. Census Bureau 2000.) This file provides annual data on household income for 25 income intervals. Counts of the number of households that fall into each income interval along with the total aggregate income and the median household income were obtained for each state. The Gini coefficient was calculated using software developed by Eric Welniak (1988).

We applied statewide Gini coefficients to individuals based on their state residence. Recent research on determinants of health reveals the importance of contextual and ecological characteristics as well as individual ones. That is, health is heavily influenced by the characteristics of the political, physical, and social environments per se as well as their impact on the resources available to and used by individuals (Wilkinson 1996, 1997; Evans, Barer, and Marmor 1998; Starfield and Shi 1999). Because income distribution is influenced by legislation and policies at the state (as well as national) level, the state is an appropriate unit of analysis of income inequalities. Moreover, individual communities are often too socially homogeneous to provide the distribution of income sufficient to conduct the analysis of their impact.

States ($n = 48$) were divided into four categories based on the distribution of the Gini coefficient. Category 1 represents the most egalitarian states with the smallest inequality in income and included states with coefficients less than one standard deviation below the 0.43 mean coefficient for the United States in 1996, that is, < 0.40 . Category 2 included states with coefficients between one standard deviation below the mean and the mean (.40–.43). Category 3 included states with coefficients between the mean and one standard deviation above the mean (.43–.46). Category 4 included the least egalitarian states with the greatest inequality in income ($> .46$). Each individual in the CTS sample was then assigned a contextual Gini value, according to his or her state of residence. The coding of the Gini coefficient into four groups allows us to compare individuals in different income-inequality areas and is consistent with previous studies (Kennedy et al. 1998; Shi and Starfield 2000). Using Gini as a continuous measure in multivariate analyses yields similar results (available upon request).

Self-rated Health. Two measures of self-rated health were used. As a measure of overall health, respondents' self-perceived health status was used and coded as 1 for respondents reporting excellent, very good, or good health (herein referred to as good health), and 0 for those reporting fair or poor health (herein referred to as bad health). As a measure of

mental health specifically, respondents' self-perceived state of depression was used and coded as 1 for respondents reporting feeling depressed, and 0 for those reporting feeling not depressed. Self-rated health has strong predictive validity for mortality, morbidity, and mental health, independent of other physiological, behavioral, and psychosocial risk factors (Idler and Benyamini 1997; Idler and Kasl 1995; Farmer and Ferraro 1997; Stone 2000). While CTS has other measures of health status (e.g., SF-12 Physical Health Component Score and SF-12 Mental Health Component Score), these measures were restricted to adults and are highly intercorrelated with self-perceived health status (.65) and self-perceived state of depression (.75).

Sociodemographic Covariates. Because sociodemographic characteristics affect health, several measures were identified and served as covariates. They included sex, age, race/ethnicity, education, employment status and type, family income (divided into quartiles), health insurance, and smoking, all of which are associated with health status (Sen 1998; Evans, Barer, and Marmor 1998).

Analysis. The analyses were weighted to represent the civilian noninstitutionalized population of the continental United States. The SUDAAN software was used to take into account the complex CTS design, including the clustering of the sample in the 60 communities, the inclusion of multiple families within a household, the sampling of multiple adults within families, and the random selection of one child (Shah, Barnwell, and Bieler 1998). It can also be used for multilevel models using clustered data (such as for individuals within states). The estimation procedure took into account the violation of independence among individuals in the same cluster and estimated the appropriate standard errors (Kennedy et al. 1998).

Principal component factor analysis was used to explore the structure of the primary-care indicators and examine their construct validity by determining if the items fall into the hypothesized factors (domains). Factor analysis was also used for item selection and placement into scales based on the pattern of the factor loadings (Shah, Barnwell, and Bieler 1998; Fayers and Hard 1997). Factor loadings are considered significant if they are 0.40 or higher (Fayers and Hard 1997). Based on the results of the factor analysis (see Table 2), three common factors were extracted corresponding to two of the hypothesized primary-care scales: accessibility and interpersonal relationship. Since ongoing care (continuity) and the interpersonal relationship domain appeared as two distinct factors, they were analyzed separately. An overall primary-care score (referred to as primary-care

Table 2: Factor Loadings of Indicators of Primary Care Accessibility and Continuity Domains

	<i>PC Accessibility</i>	<i>PC Interpersonal Relationship</i>	<i>PC Continuity</i>
Appointment time	0.64103		
Waiting time	0.39120		
Travel time	0.71160		
Thoroughness of care		0.88370	
Doctor's listening		0.90872	
Doctor's explanation		0.88386	
Choice of doctor		0.56449	
See the same provider			0.88481

experience) was created by summing all primary-care indicators used in the study.

To examine the association between primary-care experience, income inequality, and self-rated health and depression, we conducted stratified analyses comparing proportion of individuals reporting bad health and depressed between those with good and bad primary-care experience for each of the four income-inequality strata. Chi-square was used for test of significance. Good primary-care experience is defined as those whose primary-care experience score is at or above the mean (mean = 34.58, median = 35, range = 8–40) and bad primary-care experience as below the mean. A more elaborate stratification was also used that divided individuals into quartiles: those whose primary-care experience score is in the top 25 percent (> 38), those less than 25 percent but above 50 percent (35.33–38), those between the bottom 25 and 50 percent (32.33–35.32), and those in the bottom 25 percent (< 32.33). Logistic regressions were then performed to examine the relation between income inequality and self-rated health. A second set of logistic regression models examined the same relation while adjusting for primary-care experience. A third and final set of logistic regression models examined the same relation while adjusting for both primary-care experience and the sociodemographic characteristics of individuals. Because prior studies showed a beneficial effect of primary-care physicians-to-population ratio, we included this variable in the third model.

Both the odds ratios and their 95 percent confidence intervals (CI) are presented along with a test of significance of the coefficients. An odds ratio greater than one indicates that, in comparison with the reference group, the associated group raises the probability of reporting good, very good, or excellent health (or lowers the probability of reporting fair or poor health). An

odds ratio less than one indicates that in comparison with the reference group, the associated group lowers the probability of reporting good, very good, or excellent health (or raises the probability of reporting fair or poor health). In the depression models, an odds ratio greater than one indicates that in comparison with the reference group, the associated group raises the probability of reporting feeling depressed whereas an odds ratio less than one indicates that in comparison with the reference group, the associated group lowers the probability of reporting feeling depressed. The significance of the odds ratios of primary-care indicators reflects the association of primary-care experience with self-rated health. The extent that primary-care experience attenuates the adverse association of income inequality with health is reflected in the changes in the odds ratios of income inequality when primary-care experience is included.

RESULTS

Table 3 summarizes results of stratified analyses comparing proportion of individuals reporting bad health and feeling depressed between those with good primary care and less good primary-care experience for each of the four income-inequality strata. Overall, those with good primary-care experience were significantly less likely to report bad health than those with less good primary-care experience (10.09 percent versus 15.38 percent, $p < .01$). This is true in all four income-inequality strata. As income inequality worsened, more people

Table 3: Primary Care Characteristics, Percentage Reporting Poor Health, Feeling Depressed, and Income Inequality

	<i>Poor Health (% , S.E.)</i>		<i>Feeling Depressed (% , S.E.)</i>	
	<i>Good PC</i>	<i>Less Good PC</i>	<i>Good PC</i>	<i>Less Good PC</i>
Gini	7.72**	12.27**	20.62	20.50
< .4038	(0.65)	(1.30)	(1.77)	(1.09)
.4038-.4313	10.03*	16.71*	19.53**	26.88**
	(0.52)	(0.86)	(0.71)	(0.98)
.4314-.4590	9.57**	13.94**	19.43**	24.22**
	(0.76)	(0.76)	(1.35)	(0.86)
> .4590	13.67**	17.71**	20.50**	30.27**
	(1.29)	(1.92)	(1.42)	(1.58)
Total	10.09**	15.38**	19.69**	25.76**
	(0.43)	(0.52)	(0.62)	(0.62)

* $P < 0.05$, ** $P < 0.01$, based on Chi-square tests.

#Quartile results available on request.

reported bad health (except for the second stratum). Between 4.04 and 6.68 percent fewer (depending on the income-inequality stratum) of those with good primary-care experience reported bad health than those with less good primary-care experience. Likewise, those with good primary-care experience were significantly less likely to report feeling depressed than those with less good primary-care experience (19.69 percent versus 25.76 percent, $p < .01$). This is true in all but the lowest income-inequality strata. Good primary-care experience was most effective in the highest income-inequality area. While 30.27 percent of people with less good primary-care experience in high income-inequality stratum reported feeling depressed, only 20.50 percent with good primary-care experience reported feeling depressed, a difference of 9.77 percent.

The association of primary-care experience with perceived health is even more pronounced when we compared individuals whose primary-care experience score is at the top 25 percent with those whose score is at the bottom 25 percent (results not shown but available upon request). Those with excellent primary-care experience (i.e., top 25 percent) were overwhelmingly less likely to report bad health than those with poor primary-care experience (i.e., bottom 25 percent) (9.56 percent versus 17.75 percent, $p < .01$). This is true in all four income-inequality strata and particularly the case in high income-inequality stratum where 35.28 percent of those with poor primary-care experience reported bad health as compared to 23.25 percent of those with excellent primary-care experience. Likewise, those with excellent primary-care experience were overwhelmingly less likely to report feeling depressed than those with poor primary-care experience (19.37 percent versus 29.99 percent, $p < .01$). This is particularly the case in high income-inequality stratum where 33.70 percent of those with poor primary-care experience reported feeling depressed as compared to 19.59 percent of those with excellent primary-care experience.

Table 4 presents the multivariate odds ratios for the effects of income inequality and primary-care experience on self-rated health status. The odds ratios of the Gini coefficient for income inequality showed that there was a gradient relation between income distribution and self-rated health (except for the second stratum) (see Model 1, first column of table). Compared with respondents living in states with the worst income distribution (Gini $> .4590$), those living in states with the best income distribution (Gini $< .4038$) were 1.71 times more likely to report good health ($p < .001$). Those in the next worst stratum were 1.39 times more likely to report good health ($p < .05$). In Model 2 (second column of table), the likelihood odds ratio of primary-care experience was significant and positively related to good health indicating that good

Table 4: Odds Ratios (95% Confidence Intervals) for Respondents Reporting Good Health. (TOTAL sample)

<i>Independent Variables</i>	<i>Model 1 Unadjusted Odds Ratio</i>	<i>Model 2 Odds ratio adjusted for primary care</i>	<i>Model 3 Odds ratio adjusted for primary care and sociodemographics</i>
Gini Coefficient			
< 0.4038	1.71 (1.26–2.32)**	1.59 (1.17–2.16)**	1.35 (1.12–1.62)**
0.4034 – 0.4313	1.23 (0.94–1.60)	1.15 (0.90–1.48)	1.03 (0.86–1.23)
0.4314 – 0.4590	1.39 (1.07–1.81)*	1.36 (1.08–1.73)*	1.32 (1.11–1.57)**
> 0.4590	1.00	1.00	1.00
PC Experience		1.07 (1.06–1.09)**	1.06 (1.05–1.08)**
PC MD-Pop. Ratio			1.03 (1.00–1.05)*
Sex			
Male			1.06 (0.96–1.17)
Female			1.00
Age			
≤ 17			1.00 (1.00–1.00)
18–64			0.62 (0.54–0.72)**
≥ 65			1.00
Race/ethnicity			
Black			0.49 (0.27–0.86)**
Hispanic			0.76 (0.62–0.94)**
Other			0.80 (0.69–0.93)**
White			1.00
Education (years)			
> 16			3.16 (2.49–4.00)**
13–16			2.82 (2.42–3.29)**
12			1.96 (1.69–2.27)**
0–11			1.00
Health Insurance			
Public			0.59 (0.47–0.75)**
Private			1.31 (1.08–1.59)**
Uninsured			1.00
Ever Smoke			
No			1.37 (1.24–1.51)**
Yes			
Employment			
No			0.39 (0.35–0.44)**
Yes			1.00
Employer Type			
Public			1.00 (0.81–1.23)
Self			1.00 (0.78–1.28)
Private			1.00

Table 4: *Continued*

<i>Independent Variables</i>	<i>Model 1 Unadjusted Odds Ratio</i>	<i>Model 2 Odds ratio adjusted for primary care</i>	<i>Model 3 Odds ratio adjusted for primary care and sociodemographics</i>
Family Income			
Highest Quartile			2.00 (1.72–2.33)**
2nd Quartile			1.67 (1.48–1.89)**
3rd Quartile			1.42 (1.27–1.59)**
Lowest Quartile			1.00
Usual Source of Care			
Doctor Office			0.91 (0.76–1.08)
HMO			0.99 (0.76–1.30)
Other Places			0.96 (0.76–1.21)
Hospital Outpatient			1.00

States with the smallest inequalities in income. #States with the greatest inequalities in income.

* $p < .05$; ** $p < .01$ for differences from reference group (OR = 1.00).

primary-care experience was associated with good health even after controlling for the adverse impact of income inequality on health. Comparing the odds ratios of the Gini coefficients between Model 1 (where only Gini was entered) and Model 2 (where primary-care experience was also added), it is noteworthy that good primary-care experience, particularly enhanced accessibility and interpersonal relationship (results available upon request), was associated with reduced disparities in self-rated health between the highest and the next highest income-inequality areas and the lowest income-inequality areas.

The effects of income inequality and primary-care experience were attenuated somewhat (the coefficients dropped but were within each others' CI), although remained significant, after including the sociodemographic covariates in the analysis (Model 3, third column of table). There remained increased odds (35 percent) of reporting good health for those living in states with the best income distribution when compared with those living in states with the worst income distribution. A one-unit improvement in primary-care experience (e.g., 15–30 minutes shorter waiting or driving time) was associated with a 6 percent increase in the odds of reporting good health. The contextual measure of primary-care physician-to-population ratio was also significantly and positively associated with good health. The results also affirmed the strong association of individual socioeconomic and demographic characteristics with health. The significant covariates associated with reporting good health were the elderly (relative to those 18–64), whites

(relative to minorities), those with higher education (relative to those with lower education), privately-insured (relative to uninsured or publicly insured), nonsmokers, employed (relative to unemployed), and higher income (a gradient effect of income and health is noted as those with higher family income were more likely to report good health than those with lower family income). The fact that lower social status, such as those without insurance or with public insurance, is associated with poorer health is well known. Moreover, people who receive Medicaid may receive it because of their poor health. Therefore, it is expected, and consistent with prior literature, that those on public insurance would have poorer health. Sex, employer type, and usual source of care setting had no significant effect after adjusting for other sociodemographic characteristics.

Table 5 presents the multivariate odds ratios for the effects of income inequality and primary-care experience on self-rated depression status. Both income inequality and primary-care experience were significantly associated with depression (see Models 1 and 2). Individuals living in states with the best income distribution (Gini < .4038) and the next worst income distribution (Gini .4314–.4590) were significantly less likely to feel depressed than those living in states with the worst income distribution (Gini > .4590) ($p < .01$, and $p < .05$, respectively). Better primary-care experience, specifically enhanced accessibility and interpersonal relationship, was associated with feeling not depressed overall ($p < .001$) but, based on the odds ratios, it did not narrow the disparity in self-rated depression between higher and lower income-inequality areas.

Including the sociodemographic correlates in the analysis changed the relationships with income inequality: the effects of income inequality on depression largely disappeared (only the least egalitarian area and the next high income-inequality area remained significantly different). Primary-care experience remained independently significant ($p < .001$) (Model 3). The contextual measure of primary-care physician-to-population ratio remained significantly and inversely associated with feeling depressed ($p < 0.05$). The sociodemographic covariates significantly associated with reporting feeling depressed were females (relative to males), those with lower education (relative to those with higher education), publicly insured (relative to those uninsured), smokers, unemployed (relative to those employed), with lower income (a gradient effect of income and depression is noted as those with lower family income were more likely to report depression than those with higher family income), and those 18–64 (relative to those 65 and older). No significant disparities in depression were observed across racial/ethnic groups, employer

Table 5: Odds Ratios (95% Confidence Intervals) for Respondents Reporting Feeling Depressed

<i>Independent Variables</i>	<i>Model 1 Unadjusted odds ratio</i>	<i>Model 2 Odds ratio adjusted for primary care</i>	<i>Model 3 Odds ratio adjusted for primary care and sociodemographics</i>
Gini Coefficient			
< 0.4038	0.76 (0.63–0.90)**	0.77 (0.63–0.93)**	0.84 (0.68–1.02)
0.4034–0.4313	0.88 (0.74–1.03)	0.90 (0.76–1.06)	0.94 (0.83–1.08)
0.4314–0.4590	0.82 (0.68–0.98)*	0.81 (0.68–0.96)*	0.86 (0.76–0.98)*
> 0.4590 [#]	1.00	1.00	1.00
PC Experience		0.94 (0.93–0.95)**	0.94 (0.93–0.96)**
PC MD-Pop. Ratio			0.98 (0.96–1.00)*
Sex			
Male			0.68 (0.63–0.74)**
Female			1.00
Age			
≤ 17			NA
18–64			2.22 (1.91–2.57)**
≥ 65			1.00
Race/ethnicity			
Black			0.79 (0.39–1.60)
Hispanic			1.13 (0.97–1.32)
Other			1.06 (0.93–1.22)
White			1.00
Education (years)			
> 16			0.60 (0.50–0.71)**
13–16			0.62 (0.54–0.72)**
12			0.69 (0.61–0.77)**
0–11			1.00
Health Insurance			
Public			1.54 (1.29–1.83)**
Private			0.89 (0.76–1.03)
Uninsured			1.00
Ever Smoke			
No			0.85 (0.79–0.92)**
Yes			
Employment			
No			1.33 (1.21–1.47)**
Yes			1.00
Employer Type			
Public			0.89 (0.76–1.04)
Self			1.06 (0.88–1.27)
Private			1.00
Family Income			
Highest Quartile			0.67 (0.59–0.75)**
2nd Quartile			0.76 (0.68–0.85)**
3rd Quartile			0.81 (0.73–0.89)**
Lowest Quartile			1.00

Table 5: *Continued*

<i>Independent Variables</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>
	<i>Unadjusted odds ratio</i>	<i>Odds ratio adjusted for primary care</i>	<i>Odds ratio adjusted for primary care and sociodemographics</i>
Usual Source of Care			
Doctor Office			1.04 (0.89–1.22)
HMO			1.11 (0.89–1.39)
Other Places			0.95 (0.81–1.12)
Hospital Outpatient			1.00

States with the smallest inequalities in income. #States with the greatest inequalities in income.

* $p < .05$; ** $p < .01$ for differences from reference group (OR = 1.00).

type, or site of usual source of care after adjusting for other sociodemographic characteristics.

DISCUSSION

Earlier studies have found that areas with higher primary-care physician-to-population ratio enjoy better health indicators than areas with lower primary-care physician-to-population ratio (Shi 1992, 1994; Farmer, Stokes, and Fisher 1991). Recent studies have also demonstrated that primary care was significantly associated with better health outcomes even after controlling for income inequality and other sociodemographic correlates of health (Shi et al. 1999; Shi and Starfield 2000, 2001). The current study affirmed previous research demonstrating a significant association of primary care supply and positive perceived health status (Starfield 1992, 1994, 1998; Institute of Medicine 1994; Shi 1992, 1994, 1995; Politzer et al. 1991; Bindman, Grumbach, and Osmond 1996; Roos 1979; Greenfield, Rogers, and Mangotich 1995; Green 1996; Grumbach 1996; Donaldson and Vanselow 1996). Moreover, rather than only using unidimensional proxies such as clinicians' primary-care specialties, the current study followed the IOM's definition and further operationalized primary care as multidimensional so that primary care can be captured more precisely.

The results of the study indicated a significant, deleterious association of income inequality with self-rated health and advanced earlier findings regarding the health benefits of primary care. Among individuals with a primary-care physician as their usual source of care, those experiencing better

primary care, in particular enhanced accessibility and interpersonal relationship, reported better health both generally and mentally, than those experiencing worse primary care. Stratified analyses indicate that good primary-care experience (with primary-care experience score at mean or above versus below the mean) accounted for 5.29 percent reduction in individuals reporting bad health and 6.07 percent reduction in individuals reporting feeling depressed. The best primary-care experience (with primary-care experience score at top 25 percent versus bottom 25 percent) accounted for an 8.19 percent reduction in individuals reporting bad health and a 10.62 percent reduction in individuals reporting feeling depressed.

That socioeconomic status measures attenuate, although do not eliminate, the effect of both income inequality and primary care on self-rated health suggests that both income inequality and primary care are independently related to health. The finding that primary-care experience is significantly associated with self-rated health contributes to the mounting evidence that specific aspects of health services have an independent effect in improving population health (Starfield 1998; Lantz et al. 1998; Bunker, Frazier, and Mosteller 1994), in particular, the beneficial effects of primary care.

Moreover, good primary-care experience was able to reduce the adverse impact of income inequality on health as disparities in self-rated health decreased between higher and lower income-inequality areas (e.g., the odds ratio in the most egalitarian areas relative to the least egalitarian areas dropped from 1.71 when only Gini was in the model to 1.59 when primary-care experience was added to the model). Those experiencing high quality primary care in higher income-inequality areas may be able to address many of the health concerns in a more timely and effective manner than those experiencing poor quality primary care. However, because they generally experience more health problems than individuals in more egalitarian areas, they remain less healthy than individuals experiencing good quality primary care in more egalitarian areas. Thus, good primary-care experience served as a buffer that moderates, although does not eliminate, the adverse impact of income inequality.

Although good primary care did not have a significant association with reducing differences in feeling depressed between high and low income-inequality areas, it had large and significant coefficients reflecting a strong and inverse independent association with feeling depressed. This could also be due to the strong adverse impact of income inequality on mental health. Kawachi and Kennedy (1999) suggested that one pathway linking income inequality to health is via the psychosocial effects of frustrated social comparisons (p. 48). They cited studies that demonstrate the effects of relative deprivation on levels

of frustration that have adverse health consequences. This study also indicates that the increased presence of primary-care physicians operates primarily through better primary-care services, because its effect is small when more proximate measures of primary care are included in the analysis.

In addition to primary-care experience and income inequality, socioeconomic characteristics remained critical in influencing individuals' health. In particular, both education and income had a gradient association with general health and feeling depressed. It is noteworthy that the straight progressive influence of income inequality is disrupted when these variables are added to the model. Thus, from a policy perspective, improvement in individuals' health is likely to require a multipronged approach that addresses individual socioeconomic determinants of health and social and economic policies that affect income distribution, as well as improves primary-care experience of health services to buffer the health effects of income inequality.

Caution needs to be exercised in interpreting the results of the study. The analyses presented reflect association rather than causality. Causal relationships between primary-care experience and self-rated health are difficult to identify with certainty due to the largely cross-sectional nature of the dataset. However, when primary care is assessed by these measures of primary care adequacy, they provide no basis for expecting that people's health should influence their choice of primary-care provider. Although there may be reverse effects regarding access to care (wherein sicker people might be likely to select more accessible providers), the findings indicate that the effect of primary care is consistent across the attributes that were assessed. Furthermore, the absence of effect of continuity (duration with the physician) suggests that prior health is not a major factor, as those with poorer health might be expected to stay a shorter time with a practitioner than others, because of their actual or perceived need for a more varied set of services.

In this study, we were unable to distinguish between physicians who were primary-care generalists from those who focused on a subspecialty. However, our findings indicate that it is not merely specialty that determines quality of primary-care practice but, rather, the particular primary care-oriented nature of practice that accounts for the results.

The inability of the research to assess quality of primary care using a suboptimal instrument may underestimate the magnitude of differences associated with high-quality primary care. The paucity and incompleteness of the primary-care measures in the dataset precluded us from considering all the major measures of primary-care domains, in particular, those reflecting comprehensiveness, coordination (Safran et al. 1998; Flocke 1997; Starfield

et al. 1998), or family and community focus (Institute of Medicine 1994). The measures used by the Community Tracking Study cover only two of the attributes of primary care, and even these are only approximations of the complexity of primary-care attributes. The availability of a well-validated tool of measurement is critical in exploring the quality of primary care. Fortunately, such measures are now available for administration to community and enrolled populations (Safran et al. 1998; Cassady et al. 2000; Shi, Starfield and Xu 2000). When such measures are used, better delineation of primary-care practice and exploration of differences is facilitated. For example, two previous studies using the Primary Care Assessment Tool (PCAT) instrument showed differences in achievement of many of the primary-care attributes in HMOs and fee-for-services facilities (Starfield et al. 1998; Shi et al. 2000).

Another limitation of the primary-care experience measures that were used in the dataset include their restriction to people's judgments about the primary-care attributes rather than their experiences with them. The response categories (except for the access items) required people to judge whether the attribute was poor to excellent (5 categories) or whether they were satisfied with them (5 categories). In contrast, primary-care instruments such as the PCAT elicit actual experiences rather than satisfaction with them. This may explain the lesser impact in this study (as compared with the others) of primary care and income inequality on depression, as people with depression may have different expectations of their experience than others and therefore report on them differently.

A further measurement-related limitation is the classification of usual source of care provider as primary-care doctors and specialists, which does not allow the identification and inclusion of certain specialists (such as obstetricians and gynecologists) who might provide some aspects of primary health care.

Further progress of research will be made by incorporating better measures of the primary-care domains and delineating the pathways through which good primary-care experience attenuates the adverse health effects of income inequality. Longitudinal data would be necessary to yield conclusive findings and determine the nature and direction of effects.

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