Is Large Really Beautiful? Physician Practice in Small versus Large Scale Communities

Working Paper Series

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September 2005

Working Paper #56

This research was made possible by the generous support of the Robert Wood Johnson Foundation's Investigator Awards in Health Policy Research. The authors are also grateful for the assistance of the Center for Studying Health System Change for sharing the geographic cost of living index used in this paper. Tyler Ross, doctoral candidate in Economics, University of Washington, was a research assistant who efficiently and with insight undertook the SAS and SUDAAN programming.

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EXECUTIVE SUMMARY

This paper examines the effect of community size on how physicians view their practices as reported by respondents to two waves (1996-97 and 1998-1999) of a national sample survey conducted as part of the Community Tracking Study (CTS). We look beyond simple rural-urban dichotomies, by using the survey's geographic identifiers to examine the effects of a range of community population size. Our underlying assumption is that population size is a proxy for the complexity of both the formal and informal health system in which physicians practice. The larger the community population size, the more likely its physicians have ready access to local referral specialists and technology but also face increasingly complex systems of care. We hypothesize that physicians in both very large and very small settings report lower perceived quality and professional satisfaction.

We estimated logistic and OLS multivariate models of eleven outcomes that control for a wide range of personal and practice characteristics. In most cases all rural settings score higher than the largest metropolitan MSAs, but there is an evident inverted U-shaped relationship with the best evaluations for rural centers in counties with towns over 7,500 and small MSAs under 500,000 population. The multivariate models exhibit this curvilinear relationship on five major characteristics with evidence that mid- to large size rural and small urban centers combined access to key technology and specialists without the disadvantages of negotiating poor communications in a large unwieldy system.

Our results suggest that bigger is not necessarily better when it comes to physicians perceptions of their practice. A key challenge is whether larger urban-based practices can be decomposed into smaller clinical microsystems that can benefit from the strengths of physician practices in small city or rural settings yet retain the presumed benefits of larger scale organizations.

BACKGROUND

There is a long-established literature on the scale effects of individual components of health care systems such as economies of scale and scope of community hospitals or the volume effects of physician practice. Yet the size and complexity of local health systems in which all actors relate have received little attention. Shortell (2004) has pointed out that the value of health care to society can be measured in terms of access, cost and quality and that value is generated at four levels: the *individual provider*, the *group* that coordinates their efforts, the *organization* in which groups and institutions interact, and finally the surrounding legal and financing *environment.* Previous research has tended to examine specific outcomes for specific levels or provider types (e.g. hospital quality; access to primary care). Yet what might be true for the intersection of specific levels and components of social value may be a poor guide to the larger system's performance.

Our research examines a layer between Shortell's organization and environment levels -- the interorganizational network comprising a local health system. By "local health system", we mean the network that includes both contractual linkages among providers in a formal "health system" and the more diffuse informal web of providers that patients see for different aspects of care. From a primary care physician's perspective we can think of the local health care system as the constellation of services to which patients can be directed from a coordinating "medical home" (American Academy of Pediatrics, 2004). Thus the local system can be broader or narrower than formal integrated delivery systems or networks. Physician practices can belong to more than one or no network, refer patients to a wide-flung personal roster of specialists, and have privileges in more than one or no hospital.

Larger metropolitan areas are more likely to host large-scale complex local systems that feature a high degree of specialization, a larger number of physicians and organizations through which patients flow, more massive hospitals, larger physician groups, and more complicated tasks of managing patient care. In contrast, rural health care is unique because of both geographic isolation and its small-scale of organization (Ricketts, 1999).

The challenges of rural health care are well known. Looking first at cost and efficiency, research on cost functions has long reported real disadvantages of scale to very small hospitals (Rosko and Broyles, 1988). More recent work suggests that hospital economies of scale have been underestimated and are increasing over time (Wilson and Carrey, 2004; Li and Rosenman, 2001; Yafchak, 2000). Similar economic disadvantages are reported for small nursing homes, solo practices, small clinics, and small HMOs (Chen, 2004; Christensen, 2004; Pope and Burge, 1996; Sinay, 2001; Defelice and Bradford, 1997; Wholey et al., 1996; Given, 1996). Other challenges, including professional recruitment and retention and lack of capital for technology, accentuate the inherent cost and efficiency disadvantages of small-scale rural providers (Institute of Medicine, 2005; Ricketts, 1999).

There is, however, reason to believe that large systems involving large institutions typically in major metropolitan areas also face significant disadvantages of scale. The same research findings on the cost disadvantages of small facilities often report an inverted U-shaped relationship to scale with either few advantages or net diseconomies of scale and scope in large hospitals and nursing homes, although evidence on the issue continues to be mixed (Hallagan, 1996). Even administrative overhead tends not to fall in large facilities (Dranove, 1998). Limited research suggests that multispecialty groups with over 10 physicians appear to face similar efficiency disadvantages (Weil, 2002; Hough, 2002). Indeed, few health administrators cited cost or efficiency advantages as a benefit of large medical groups (Casalino et al., 2003).

In addition, the evidence of efficiency advantages to large-scale mergers and networks is mixed at best. The wave of mergers in the 1990s among hospitals, integrated delivery systems, and HMOs have in some highly public cases failed either because the cost advantages failed to materialize or the costs of integrating complex organizations with disparate cultures were underestimated (Sidorov, 2003; Christianson, Feldman and Wholey, 1997). Hospital mergers appear to generate no consistent cost reductions (Dranove, 1998; Dranove and Lindrooth, 2003). Hospital membership in multihospital systems appears to have little influence on patterns of care (Madison, 2004). Prepaid group practices have not expanded in part because their advantages in care integration do not balance their complexity and cost (Schoenbaum, 2004).

Physicians in medical groups report that key aspects of their practice (e.g. collegiality, emphasis on quality, cohesiveness) deteriorate as clinic size increases – a negative relationship exacerbated in multispecialty groups under system ownership (Curoe, Kralewski, and Kaissi, 2003). Complicating an understanding of the effect of large scale organizations is their generally elevated share of managed care. Physicians in practices dominated by managed care contracts have reported less satisfaction, perceive their clinical autonomy as limited, and feel pressure to minimize costs, particularly in organizations with a perceived business-first "culture" (Kerr et al., 2000; Hadley et al., 1999).

There is a separate literature on the effect of scale on quality since the "practice-makes-perfect" hypothesis of physician and hospital volume can be viewed as another version of economies of scale (Gandjour and Lauterbach, 2003). But empirical research on quality in rural settings is limited (IOM, 2005). While the problems with low volume providers for specific procedures have been demonstrated, it may be that smaller scale has an advantage for care of chronic conditions (Rosenblatt et al., 2002). At the other end of the spectrum, small area variation research has demonstrated that the greater the density of specialists and hospital beds, the greater the risk of reduced quality and elevated expenditures from over-treatment (Dartmouth, 1999; Fisher et al., 2003a; 2003b). Indeed, quality measures such as receipt of preventive services, patient satisfaction, or change in functional status were uncorrelated with more intensive inpatient and specialist-oriented patterns of care. High-cost care is not necessarily a function of local health system size and complexity. Nor is system complexity necessarily related just to the scale of providers. Nevertheless, the existing literature provides no clear evidence that moving from small-scale systems typical of rural settings to larger-scale urban size and complexity systematically generates more efficient, higher quality health care.

RESEARCH QUESTIONS AND HYPOTHESES

This paper examines one aspect of the effect of scale on health care – the conditions of physician practice. Our basic assumption is that community size is a proxy indicator of system size and complexity. Physicians in rural centers of 20,000 are more likely than their colleagues in small towns of 4,000 to work with a larger hospital, more specialists and a larger referral network, and more readily available ancillary services. In contrast, the larger the metropolitan area, the larger and more complex systems are likely to be. While we know this is generally true of the size of specific organizations (e.g. hospitals and medical groups) we have little evidence to support the assertion of system complexity. Indeed, ratio measures such as specialists per primary care physician do not follow simple correlations with population size (Dartmouth, 1999).

Our analysis starts with a central hypothesis that smaller-scale health care systems typical of rural America offer, from physicians' perspective, superior health care and practice conditions. Two phenomena account for this result. First, the *Competitive Advantage of Rural Centers Hypothesis* posits an inverted U-shaped relationship such that physicians in rural centers and small MSAs enjoy better practice conditions than those in either very small towns or very large cities. They have an advantage of highly concentrated market power in bargaining for contracts and/or fees with third parties. In contrast, very small and isolated providers lack an attractive patient base or the business resources to negotiate effectively. At the other extreme, physicians in large cities often find highly competitive conditions and concentrated power of health plans (American Medical Association, 2002). We thus expect better income and practice conditions in small centers.

Second, the *Diseconomies of Scale Hypothesis* posits that practices in smaller communities have both distinct advantages and disadvantages compared to large-city practices. Communication between physicians and within hospitals is smoother and problems easier to identify and solve in smaller scale settings (Wholey et al., 2004). Moreover, patients are easier to follow and continuity of care more readily achieved. On the other hand, the lack of proximate medical technology, lack of specialists, low patient volumes, and the threat of clinical isolation impose distinct disadvantages on small-town practice. As a result, the advantage should flow to a mid-point system that is large enough to support key local ancillary services and specialists but is still small enough to act as an effective local system with less administrative clutter and superior communication with patients and among providers.

The paper uses physician surveys with geographic identifiers to investigate the evidence for or against these hypotheses by addressing two core questions:

1. *Conditions of Physician Practice:* To what degree do physicians' self-reported practice conditions systematically shift with the population size of their communities?

2. *Quality of Care*: How much do physicians' subjective assessments of the quality of care available to patients differ by the population size of their communities?

METHODOLOGY

Data Sources

The effect of population size on system size and complexity and consequently on physician practice has not received much attention beyond simple rural-urban differentials. A key reason is that most national surveys, either by sampling design or by confidentiality requirements, have not supported analyses of how provider experience differs according to the community environment in which they practice (Schur, Good and Berki, 1997). The variety of environments across rural America has been ignored, and our understanding of the effect of system scale on physician practice potentially masked by misplaced aggregation into simple MSA/non-MSA categories.

This study seeks to overcome this limitation by using the 1996-97 and 1998-99 physician surveys conducted as part of the Community Tracking Study. For each survey, telephone interviews were completed with approximately 12,500 respondents. Twelve "high intensity" MSAs had approximately 540 respondents per site and smaller samples from 39 other MSAs, and nine non-MSA county clusters averaged 125 respondents (Kemper et al., 1996, Metcalf et al., 1996). The nine rural sites cover a diversity of settings: West Central Alabama, Central Arkansas, Northern Georgia, North East Illinois, North East Indiana, Eastern Maine, Eastern North Carolina, Northern Utah, and North West Washington. They were selected at random from the non-MSA portions of the Department of Commerce's Basic Economic Areas. All told they comprise 148 non-MSA counties. However, the rural Alabama cluster was excluded from point estimates because it had only 42 respondents and no specialists over two survey waves.

We analyze these two waves as a pooled cross-section since they use the same clusters, sampling structure, and have comparable questionnaires. Combining the two waves increases the total rural site sample to 1,500 respondents. While doubling the observations from low-intensity sites improves the stability of site-specific estimates, it introduces a complexity with a panel cohort consisting of 57.6 percent of the second round sample, who were drawn by design from the first round respondents. Estimating relationships in SUDAAN both adjusts standard errors for the complex survey design and the repeated measures character of the subsample. The total sample is 24,832 physicians of which there is a disproportionate sample of 10,751 primary care physicians.

County and MSA-level data on population and income as well as total supply of physicians and hospital beds were extracted from the Area Resource File. Since survey respondents are geographically located only by county, we classified non-MSA counties according to the population of the largest town. Three rural county types were defined: largest town >20,000 (11 counties and 421 respondents); largest town between 7,500 and 20,000 population (30 counties and 598 respondents), and largest town less than 7,500 (107 counties with 538 respondents). Counties in MSAs were classified by the total population size of the metropolitan area (less than 500,000, 500,000 to 1 million, more than 1 million to 2 million, more than 2 million).

Physician income was adjusted for geographic price differences. Since there is no official comparative cost-of-living index across different market areas, we used a version of a commercially available index that was adjusted by regression and imputed by the Center for

Studying Health System Change for small metropolitan CTS sites and all nine-rural sample clusters (Reschovsky and Staiti, 2005; see Appendix A).

Outcome Measures

We define six dimensions of physician practice conditions for which 11 indicator measures were selected from the CTS surveys: income, work stress, career satisfaction, professional communications, perceived quality of care, and clinical decision-making autonomy (Table 1). Since net practice income is top coded at $250,000, the artificial compression requires a Tobit model to correctly estimate standard errors. Reported incomes are standardized for geographic price differences. Note that for "professional communications," the question about referring PCP is asked of specialists only and the question about specialists is asked of referring PCPs only.

Given the tendency of survey respondents to rate practice conditions highly, we have followed the suggestion of previous analysts and restricted the comparisons to the highest versus all other lower scores on five-point scales (Lake, 1999). While the similar mean scores across some of the outcome measures in Table 1 suggests that physicians reported highly consistent subjective assessments of different aspects of practice, from 30 to 40 percent of respondents' replies were not consistent across pairs of outcome measures.

Physician-level explanatory variables are described in Table 2. Hours worked are used as a control variable and not as an outcome measure because physicians' view of longer hours are possibly correlated with their type of employment. For example, those on a purely fixed salary might find disutility in more hours while those who are self-employed will positively view more hours over some range. By including hours as an explanatory variable, we are valuing compensation per hour of patient care rather than total net income.

Table 1

Physician-Level Outcome Variables
(national weighted averages)

Category	Variable	Mean*	Standard Error of Sample Mean*
Income	Net practice income adjusted for geographic cost of living	$167,384	$2,477.17
Satisfaction	Career satisfaction – % high	41.4	0.62
Hassle	Adequate time for patient care – % strongly agree	33.5	0.42
Autonomy	Freedom for clinical decisions – % strongly agree	45.6	0.52
	Decisions without negative financial incentives – % strongly agree	45.3	0.56
Relationships	Good communications with specialists – % of PCPs who strongly agree	85.2	0.53
	Good communications with PCP – % of specialists who strongly agree	75.6	0.65
Quality	Possibility of providing high quality care to all patients – % strongly agree	44.0	0.43
	Continuing relationships with patients possible – % strongly agree	35.6	0.54
	High quality diagnostic imaging available – % who strongly agree	35.5	0.60
	Referrals to high quality specialists possible – % strongly agree	30.4	0.57

*Means and standard errors calculated in SUDAAN correcting for sample design effects.
Source: Center for Studying Health System Change; CTS Physician Surveys 1996-1997 and 1998-1999. n=24,832.
Note: PCP is primary care physicians including the specialties of general internal medicine, family medicine and general pediatrics.

Table 2

Physician-Level Explanatory Variables
(national average weights)

Category	Variable	Mean*	Standard Error of Sample Mean*
Personal	Sex (% Female)	19.5	0.38
	International Medical (% IMG Grad)	20.4	1.36
	Years in Practice	16.0	0.11
	DO/MD (% DO)	6.8	0.45
Specialty	General Internal Medicine (%)	13.1	0.35
	Family Practice (%)	17.2	0.44
	Pediatrics (%)	8.4	0.19
	Medical Specialties (%)	26.1	0.38
	Surgical Specialties (%)	21.5	0.49
	Other (includes Psychiatry/Radiology) (%)	7.2	0.25
	ObGyn (%)	6.5	0.26
	Board Certified in Specialty (% = No)	18.8	0.72
Practice Setting	Solo (%)	31.3	0.76
	Partnership (%)	7.7	0.26
	Group Practice (%)	27.7	0.87
	Average # Physicians in Group (%)	8.6	0.86
	HMO (%)	5.0	0.36
	Medical School (%)	7.5	0.47
	Hospital (%)	10.7	0.52
	Local Government or Public Clinic (%)	5.8	0.25
	Commercial Entities (%)	2.7	0.15
	Other (%)	1.6	0.10
Practice Finances	% Practice Revenue from Managed Care	41.5	0.54
	% Practice Revenue Capitated	16.7	0.49
	Paid on Salary (%)	50.1	0.65
	Salary Adjusted for Productivity (%)	68.3	0.59
	Productivity Affects Compensation (%)	79.4	0.42
	% Income from Bonuses	5.8	0.20
Hours	Hours per Week in Direct Patient Care	44.7	0.17

*Means and standard errors calculated in SUDAAN correcting for sample design effects.
Source: Center for Studying Health System Change; CTS Physician Surveys 1996-1997 and 1998-1999. n=24,832.

RESULTS

Regression Model

To compare geographic differences among physicians we estimate OLS regressions for income and logit models for all other measures. SUDAAN is used both because of its ability to correctly adjust for the complex sampling design in estimating standard errors and because it adjusts for the multi-level nature of the data whereby physicians are clustered within the 60 sampled communities. By way of illustration of the estimating model, which is applied to all dependent variables, the full results for income are displayed in Table 3. The model fits well with an R-square of .348 based on 20,648 observations. Interestingly, when the model standardizes for both hours worked in the previous week and practice setting, there are no statistically significant differences in net income among the three primary care specialties. The differentials of $41,031 between general internists and medical specialties and of $77,894 for surgical specialties are only half that reported in the AMA surveys. (For example, $142,500 for family and general practitioners compared to an unadjusted mean of $268,200 for surgical specialties or a difference of $125,700; AMA, 2000, Table 32). This is possibly due to the top coding of incomes in the version of the surveys available to us as well as our adjustments for cost of living and other physician characteristics.

International medical graduates earn only slightly less, and there are no significant differences between DOs and MDs. Women physicians, even controlling for hours worked, earn $32,954 less than their male colleagues. There is no simple linear return to years in practice. Practice setting makes a difference. Physicians in partnerships average almost $15,800 more than solo practitioners, and those in groups earn $31,800 more. Those in hospital settings or integrated delivery systems earn approximately $15,200 less and medical school faculty $29,300

Table 3

OLS Regression Model for Physician Income (COL Adjusted)

Variables	Beta Coeff	SE Beta	T-Test	P Value
Intercept	117,766	3,434	34.30	0.0000
Specialty				
Gen Internal Medicine (reference category)				
Family Medicine	2,231	2,329	1.00	0.3191
Pediatrics	-1,926	1,825	-1.06	0.2912
Medical Specialties	41,031	1,965	20.88	0.0000
Surgical Specialties	77,894	2,478	31.43	0.0000
Other (includes Psych)	12,996	3,068	4.24	0.0000
ObGyn	60,812	5,509	12.02	0.0000
Personal Characteristics				
IMG	-3,127	1,876	-1.67	0.0957
Physician Type (DO = 1)	-1,200	3,251	-0.37	0.7121
Sex (Female =1)	-32,954	1,705	-19.33	0.0000
Years in Practice	40	77	0.52	0.6035
Board Certified	16,027	1,710	-9.37	0.0000
Surveyed in Round 1 (96-97)	-1,263	1,402	-0.90	0.3676
Practice Setting				
Solo Practice (reference category)				
Partnership	15,791	4,000	3.95	0.0001
Group Practice	31,828	2,772	11.48	0.0000
# Physicians in Group	-32	12	-2.79	0.0052
HMO (Group or Staff Model)	24,706	3,518	7.02	0.0000
Private Hospital/Independent Contractor	16,635	2,945	5.65	0.0000
Health System (IDS, PPO, PPM)	17,067	3,655	4.67	0.0000
Public Hospital/Clinic (includes CHCs)	10,530	3,976	2.65	0.0081
Medical School/University	2,515	785	3.20	0.0014
Other (Insurer, MSO, Other)	26,525	8,091	3.28	0.0011
Practice Finances				
% Revenue from Managed Care	-174	32	-5.52	0.0000
Compensation Methods				
Salaried Physician	-14,345	2,003	-7.16	0.0000
Salary Performance Adjusted	4,349	2,023	2.15	0.0317
Productivity Affects Compensation	3,642	1,477	2.47	0.0137
% Income from Bonuses	778	75	10.40	0.0000

Table 3 (continued)

Variables	Beta Coeff	SE Beta	T-Test	P Value
Hours in Direct Patient Care Last Week				
11-19 Hours	-57,901	4,360	-13.28	0.0000
20-29 Hours	-30,650	2,426	-12.63	0.0000
30-39 Hours	-12,745	1,549	-8.23	0.0000
40-49 Hours (reference category)				
50-59 Hours	14,824	1,731	8.56	0.0000
60-69 Hours	16,139	2,523	6.40	0.0000
70-79 Hours	27,218	3,780	7.20	0.0000
80-89 Hours	28,171	6,334	4.45	0.0000
Community Size				
Small Rural (<7.5 k pop)	19,211	11,558	1.66	0.0966
Medium Rural (7.5 – 20 k pop)	21,608	15,791	1.37	0.1713
Large Rural (>20 k pop)	31,795	10,029	3.17	0.0015
Small MSA (<.5 mil pop)	29,439	3,048	9.66	0.0000
MSA .5-1 million	27,042	3,938	6.87	0.0000
MSA 1-2 million	7,130	3,413	2.09	0.0368
MSA >2 million (reference category)				

$R^2 = .348$
n = 20,648

less than physicians in group practice. Salaried physicians earn $14,000 less although the income penalty of salaried physicians disappears if compensation is determined, at least partially, by productivity. The percent of revenue from capitated managed care contracts has a negative relationship with physician income. As expected, hours worked are strongly correlated with income, but the relationship is non-linear. The large incremental changes in income correlated with low hours of patient care generally diminish as hours increase. These results for individual physician characteristics from the estimating model are treated as covariates in the remainder of the paper devoted to systematic geographic differences.

Conditions of Physician Practice by Community Size

Our goal is to move the analysis of community scale beyond simple rural-urban dichotomies and look at whether practice conditions consistently increase or decrease as we move from small rural towns to large MSAs. Table 4 reports on the market-level differences in practice conditions estimated by regressions standardizing for physician-level covariates. The information differs from Table 4 in that we expand the range of practice attributes considered and add a seven-level typology of county population described earlier in which urban physicians are classified by the size of their MSA and rural physicians according to the population of the largest town in their county. Thus in Table 4, "Rural > 20" is a non-MSA county where the largest town has over 20,000 inhabitants, and counted as a rural center.

The results in Table 4 are remarkably strong and consistent. The overall advantages reported by surveyed physicians lies largely in either rural centers or small MSAs. There is in fact a distinct inverted U-shaped relationship for the majority of the 11 aspects of physician practice. Physicians in smaller scale settings almost universally report better practice conditions than those in large MSAs.

Table 4

Incremental Effects of Market Size on Physician Practice – Regression Standardized (All Specialties; n = 22,949)

				Referral Communications		Perceived Quality (odds ratios)				Professional Autonomy (odds ratios)	
Community Size	Income (COL Adjusted)	Career Satisfaction (odds radio)	Adequate Time (odds ratio)	Communicate with PCP (odds ratio)	Communicate with Specialist (odds ratio)	Overall Ability to Provide Quality	Continuing Patient Relations	High Quality Imaging	High Quality Specialists	Freedom for Clinical Decisions	Without Negative Financial Incentives
MSA >2 million	$ 0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MSA 1-2 million	7,130*	1.14$^{\#}$	1.02	1.14	1.14	1.01	1.08	1.09	1.03	1.01	1.03
MSA .5-1 million	27,043**	1.30**	1.13*	1.23*	1.84**	1.09	1.17$^{\#}$	1.18**	1.09	1.02	1.06
MSA <.5 million	29,438**	1.34**	1.07	1.42**	1.45**	1.32**	1.58**	1.56**	1.54**	1.21**	1.25**
Rural >20k	31,796**	1.19	0.95	1.98**	2.24**	1.16	1.68**	1.28**	1.19	1.22$^{\#}$	1.50**
Rural 7.5-20k	21,608	1.46**	1.02	2.23**	2.47**	1.11	1.73**	1.28$^{\#}$	1.37$^{\#}$	1.53**	1.52**
Rural <7.5k	19,211$^{\#}$	1.29**	0.94	2.15**	1.63**	0.94	2.06**	1.01	1.09	1.43**	1.39**

Significance Levels: ** = 1%; * = 5%; $^{\#}$ = 10%
Source: CTS Physician Surveys 1996-97 and 1998-99 adjusted by regression model in Table 3.
Reference Variables: For community sizes, reference category is MSAs over 2 million.

Particularly notable is the strong gradient of increments to net practice income as market size decreases. Controlling for relevant covariates such as type of practice, specialty, compensation method, and work effort, all smaller scale settings generated higher real earnings for physicians than those in MSAs over one million (Figure 1). Net incomes peak for those in non-MSA counties with towns over 20,000 and then fall as town size decreases. A similar finding of overall higher rural practice incomes has recently been reported using the CTS physician surveys and geographic price deflator used here (Reschovsky and Staiti, 2005). The inverted U-shaped gradient in Table 4 is largely due to the geographic cost of living index described in Appendix A. Projection of lower costs of living in small cities and towns raises their real income relative to their colleagues in large MSAs. The results also reflect adjustment for the longer hours worked by rural physicians.

A similar pattern occurs for overall career satisfaction which peaks for physicians in rural counties with towns of between 7,500 and 20,000 inhabitants. What is interesting is the higher career satisfaction score for physicians in rural centers of 20,000 or more and rural communities with less than 7,500 are relative to the largest MSAs with more than 2 million residents (Figure 2). This result holds despite the finding that physicians in rural centers of 20,000 or more and in small rural communities with less than 7,500 residents are less likely to report adequate time for patient visits (result is not statistically significant). The above results are surprising since previous research has shown time pressure to be a key determinant of professional satisfaction (Landon, Reschovsky and Blumenthal, 2003; Wetterneck et al., 2003).

Figure 1
Incremental Effect of Community Size on Adjusted Physician Net Income
(Compared to MSAs >2 million)

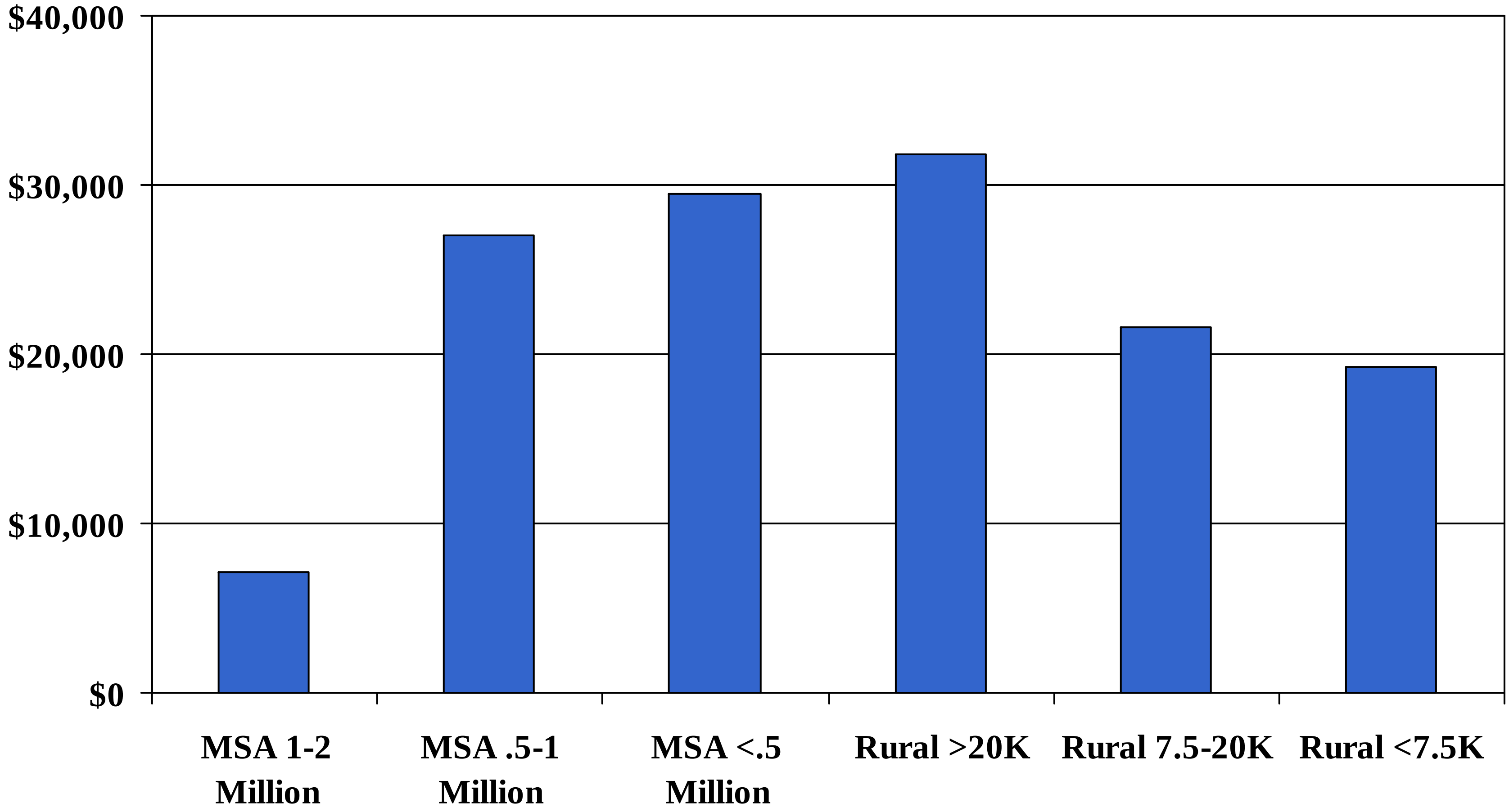
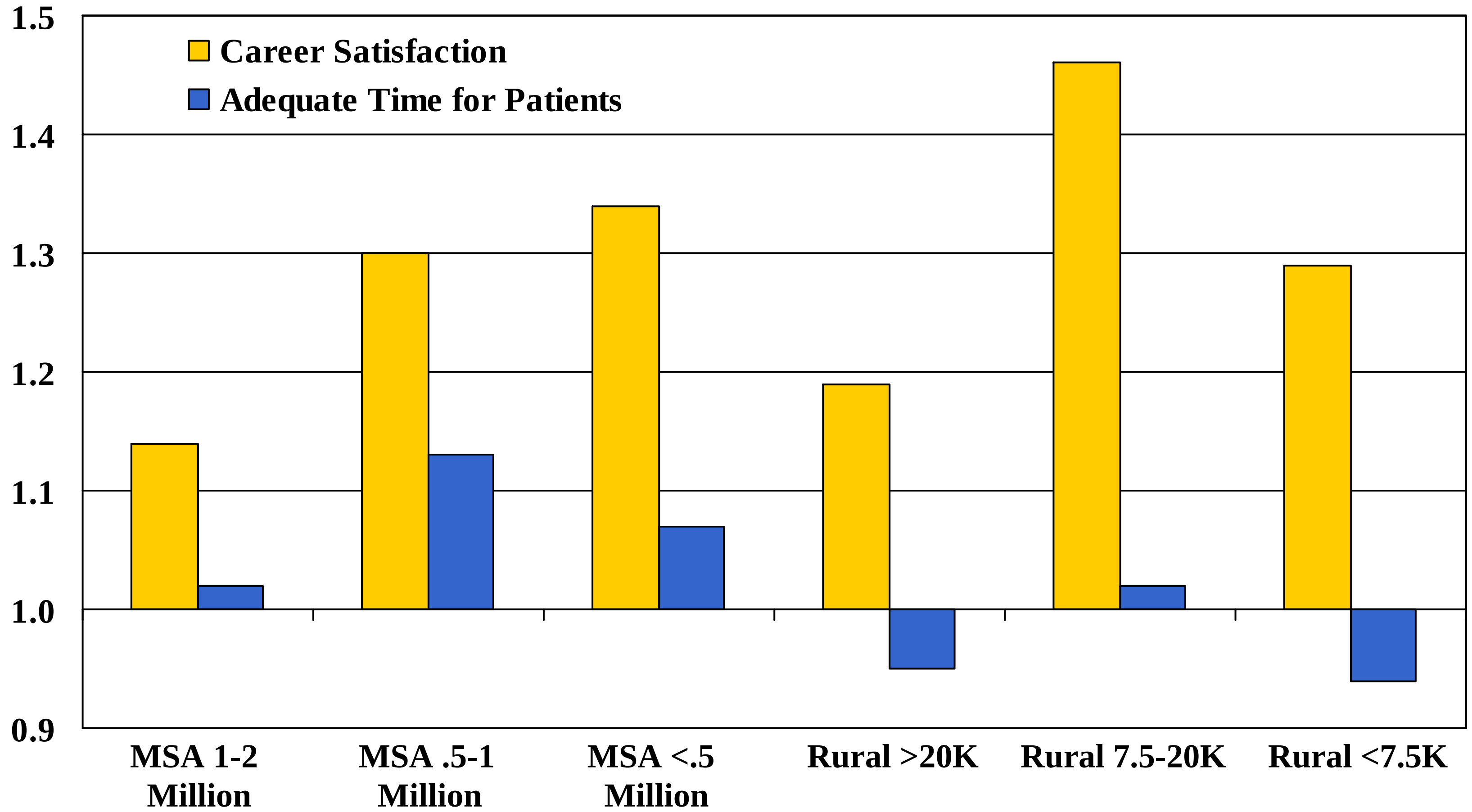


Figure 2
Incremental Effect of Community Size on Physician Satisfaction
(Odds ratios compared to MSAs > 2 million)



Assessments of Quality of Care

The remaining measures in Table 4 examine different aspects of the quality of services physicians' believe their patients receive. Availability of quality services for their patients is illustrated in Figure 3 and measured by continuity of patient relationships, availability of appropriate imaging services and a summary measure of overall quality availability to patients. High ratings of continuing patient relationships are strongly and inversely related to market size. Complementing this advantage of small size settings is the quality of specialists and imaging services. Ratings for the quality of referral specialists follow a similar pattern (see Table 4). Note that both are inverted U-shaped with comparative disadvantages associated with small towns of less than 7,500. But strikingly there is no advantage accorded to large metropolitan areas. In the global measure of ability to provide quality care to all their patients, advantage was again reported by physicians in small MSAs and rural centers of over 7,500.

A more structural aspect of quality is communication between specialists and referring primary care physicians (PCPs). As illustrated in Figure 4, PCPs in small communities all reported better communications with specialists than those in large MSAs over two million. The curvilinear pattern is evident in the falling assessment of PCPs in smaller rural towns. The opinion of specialists about communication with referring PCPs also shows a large dichotomy between small and large communities.

Finally, physicians in smaller communities clearly experience greater professional autonomy and are less likely to report financial disincentives affecting clinical decision making. As illustrated in Figure 5, the effect is significant and curvilinear but all smaller settings have the advantage over large city practice.

Figure 3
Incremental Effect of Community Size on Physician Assessment of Quality
(Odds ratios compared to MSAs > 2 million)

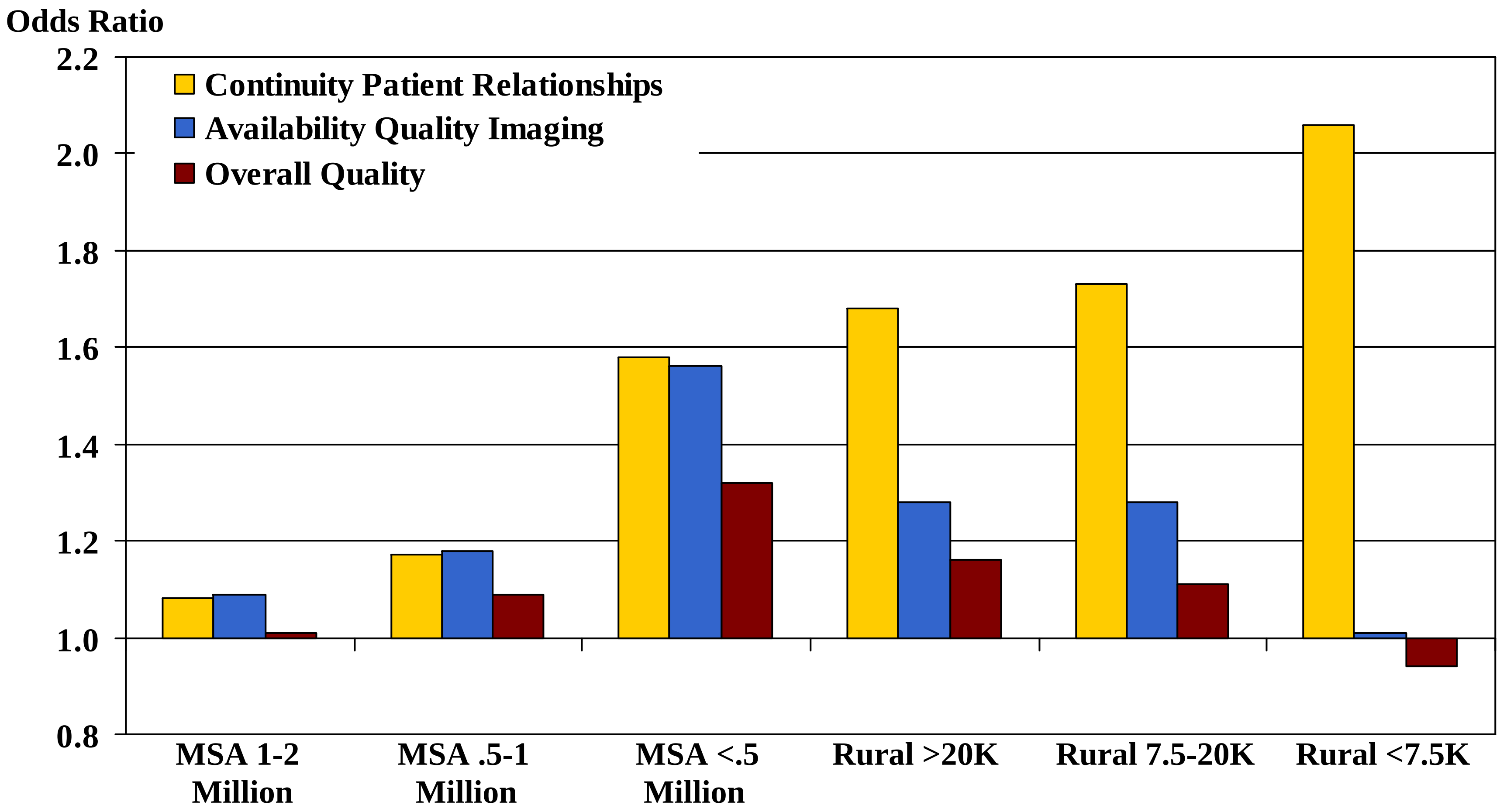


Figure 4
Incremental Effect of Community Size on Physician Assessment of Communication with Peers
(Odds ratios compared to MSAs > 2 million)

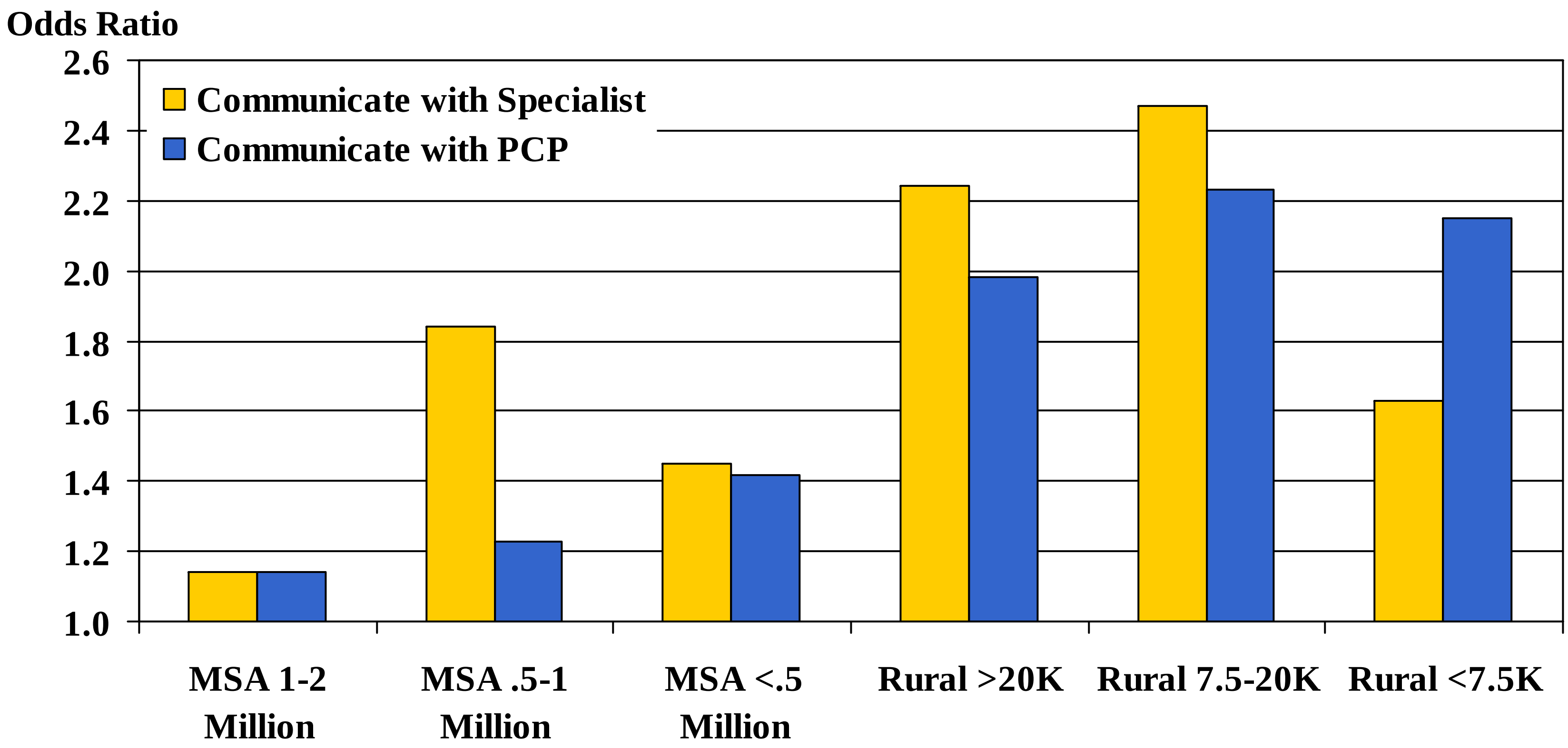
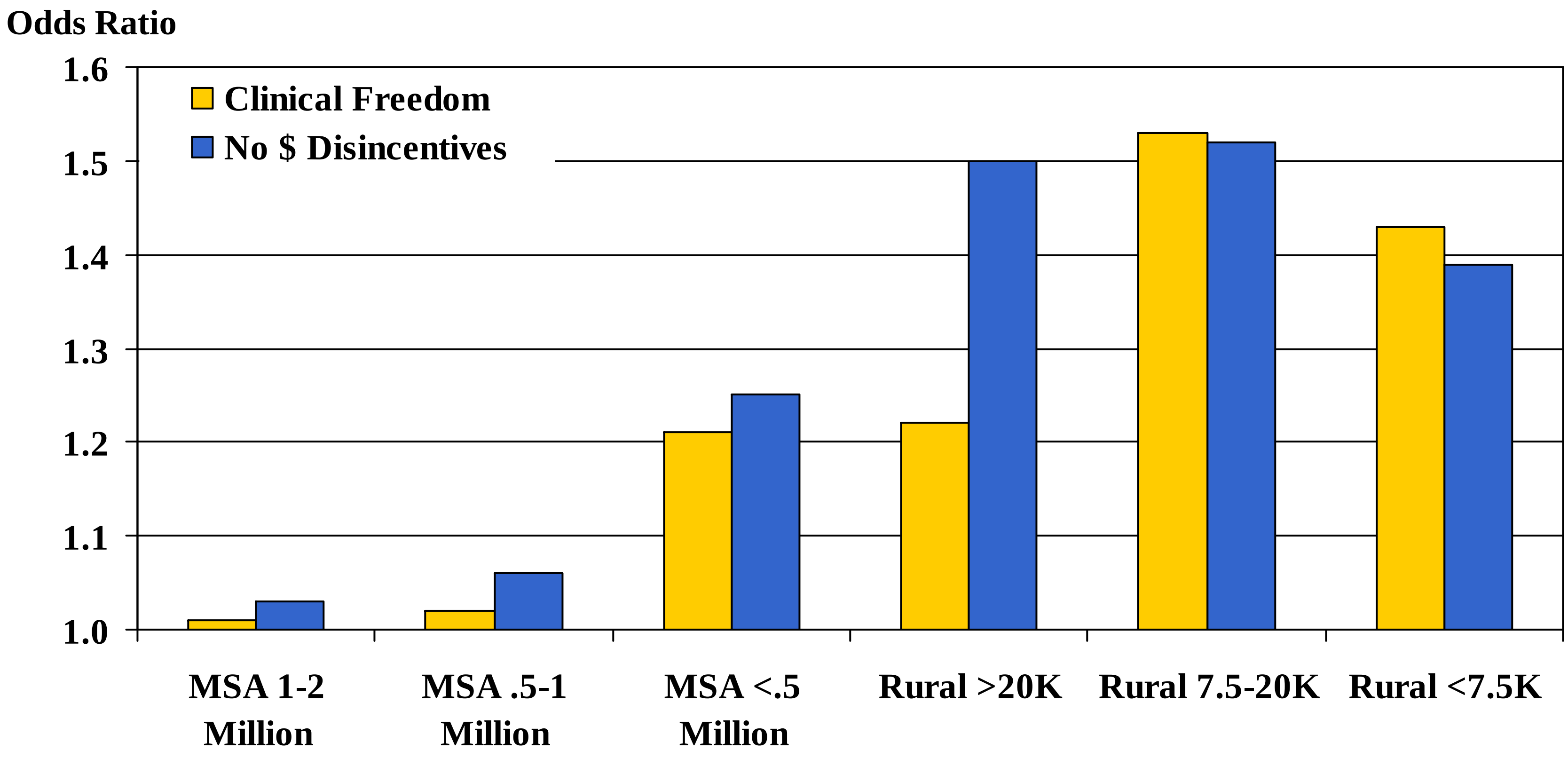


Figure 5
Incremental Effect of Community Size on Physician Assessment of Professional Autonomy
(Odds ratios compared to MSAs > 2 million)



CONCLUSIONS

This study used a pooled sample of 24,832 respondents to two waves of CTS physician surveys to examine the relationship between community size and physicians' self-reported conditions of practice. We hypothesized an inverted U-shaped relationship between community size and conditions of practice suggested by the diseconomies of scale and scope of providers in small communities and the diseconomies of large scale and complex systems more typical of metropolitan settings. In short, we tested the hypothesis that from a physician's perspective the best health care takes place in smaller scale settings not often found in large metropolitan areas.

Discussion of Results

The results clearly indicate an advantage of practice in rural centers in counties with towns over 7,500 and small MSAs under 500,000. These settings appear to combine the best of both large and small health care systems. Continuity of physician-patient relationships continuously improved as the size of the market decreased. Physicians in small rural towns were more than twice as likely to rate such relationships highly as those in large MSAs over one million. This is perhaps not surprising but does point to a potential quality advantage in areas such as management of chronic disease where personal relationships matter, a supposition consistent with findings that the best ambulatory diabetic care is provided in larger rural towns (Rosenblatt et al., 2001).

Not so obvious was the finding that specialists and primary care physicians alike rated access to imaging and the quality of specialists available to their patients higher in rural centers than in large MSAs. Not unexpectedly, physicians in small rural communities with under 7,500 were less sanguine about these indicators of access to high technology medicine. However, the probability of an excellent rating in these small towns never statistically significantly differed from large MSAs. This curvilinear pattern characterized other aspects of physician practice including clinical autonomy, lack of negative financial incentives, and communications upon patient referral. Consequently, professional satisfaction follows a similar pattern.

A less expected result is that physician income (adjusted for cost of living differences) also follows the curvilinear pattern. Since this estimate adjusts for involvement with managed care, it may reflect the fact that other than Medicare, third parties tend to specify the same payment rates regardless of location. As a result, lower-cost small settings generate higher real physician incomes. However, unadjusted incomes are sharply lower for small-town physicians, a pattern consistent with current concern over their financial viability (Future of Family Medicine Project Leadership Committee, 2004).

The above relationships are markedly consistent and notable in that smaller, rural and particularly mid-size settings are rated better than large urban settings. Methodologically, the results illustrate the benefit of disaggregating dichotomous MSA versus non-MSA analysis. More important is the suggestion that small-scale rural systems may provide a contrasting model to the ever larger health systems that increasingly dominate the urban landscape. The current frustration of many physicians may be at least partially a feature of these large systems that may need to carefully examine how smaller systems effectively organize care.

Limitations

Although drawn from a national probability sample, the number of communities represented in the geographic clustered survey design limits the generalizability of our results. Moreover, our contention that population size is a proxy measure for expected health system size is not tested. We offer an ecological correlation that does directly measure local health system scale. There are other correlates of community-level differences, including small area variations in practice patterns that could not be appropriately controlled for. For example, are the results due to system scale rather than the competitive position of physicians in small cities/large towns or unmeasured characteristics of physicians who chose to practice in different settings? Indeed market size itself is only approximated since counties are an imperfect (although common) unit of analysis. Among MSA counties there was notably little variation by size and little additional precision gained by classifying counties into core and suburban areas. Finally, in the specific estimates of real income, the Appendix A underlines the uncertainties involved.

Despite the limitations, the findings are significant because they are not confined to case studies of a single integrated system or community, but are drawn from a random, representative sample of America's communities. The consistency of results argues for the utility of identifiable community-level surveys such as the CTS physician surveys. It also highlights the need for additional research on the efficiency, costliness, and outcomes of care provided by physician practices of different scale to see if simple urban/rural dichotomies miss the non-linear scale effects identified in this study.

Policy Implications

Our results suggest that bigger is not necessarily better when it comes to physicians' perceptions of their practice quality, professional autonomy, referral communications, career satisfaction and income. Physician practices in mid- to large size rural settings and smaller urban settings consistently were rated higher than counterpart practices in larger urban settings. This has important implications for the design of strategies to transform the physician practice of the future.

Physician practices in larger metropolitan settings appear to have much to learn from the practices of their colleagues in smaller settings. What characteristics (e.g. greater reliance on primary care physicians, enhanced sense of control, increased focus on patient-centeredness, structure of linkages with external resources, better teamwork of clinicians and managers) of these smaller scale settings can be emulated in larger scale practices? A more detailed look at exemplary physician practices in larger rural and smaller urban scale settings will improve our understanding of their sources of strength and their potential applicability to larger urban-based practices.

The burgeoning work in the design of clinical microsystems – small groups of people who work together in a defined setting on a regular basis to provide care to discrete subpopulations of patients – is predicated on the assumption that: 1) the broader health system is comprised of smaller clinical microsystems that produce quality and cost at the front line of care and 2) health systems outcomes can be no better than the outcomes of its clinical microsystems (Nelson et al., 2001). It remains to be seen whether larger urban-based practices can be decomposed into smaller clinical microsystems that can benefit from the strengths exhibited by physician practices in smaller rural scale settings yet retain the presumed benefits (e.g. economic efficiencies, information technology infrastructure) of larger scale settings.

The IOM report (2003), *Health Professions Education: A Bridge to Quality*, identified a set of core competencies (i.e. patient-centered care, interdisciplinary teams, evidence-based practice, quality improvement, informatics) that all health professionals should master. Our results suggest that physician practices in mid- to large size rural settings and smaller urban settings should be used as sites for appropriately training the health workforce of the future.

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APPENDIX A

Geographic Cost of Living Adjustment

The estimates of geographic variation in physician income depend on cost-of-living adjustments. The table below compares the results from two published commercial sources, the ACCRA mean costs and Economic Research Institute (1998) for high income families. The Center for Studying Health System Change has analyzed these data and provided both the values and their regression imputations of the ACCRA cost of living figures for small metropolitan CTS sites and all nine-rural sample clusters. Alternative estimates published annually by the Economic Research Institute (1998) are generally less variable than the ACCRA geographic cost of living index. We opted for the more conservative ERI index, but applied the relative values imputed from the ACCRA data for small market areas.

Market Size	Number of CTS Sites	ACCRA with CTS Imputation	Geographic Reference Report
MSA > 3 Million	10	129.2	115.5
MSA 2-3 Million	11	112.4	107.0
MSA 1-2 Million	13	116.6	107.7
MSA .5-1 Million	7	110.8	98.8
MSA < .5 Million	10	98.9	99.9
Rural Clusters	9	87.6	87.6
Total	60	110.0	103.5