Letters

RESEARCH LETTER

Association Between Having a Highly Educated Spouse and Physician Practice in Rural Underserved Areas

Physician undersupply in rural areas remains a problem, despite efforts to improve the workforce distribution.[1] Rural origin, age, and sex have been linked to physician choice of rural settings.[2] An additional factor may be that many physicians have highly educated spouses with independent careers, which may constrain their ability to locate in rural areas.[3] We investigated the prevalence of physicians with highly educated spouses and whether having such a spouse was associated with working in rural underserved areas.

Methods | The Dartmouth institutional review board determined that the study did not involve human participants. We studied a 1% sample of all employed physicians aged 25 to 70 years working in the United States every 10 years from 1960 to 2000 (n = 19 668) obtained from the Decennial Census, and every year from 2005 to 2011 (n = 55 381) from the American Community Survey.[4] Both surveys used comparable questions, included all household members, and had response rates of more than 95%. We identified spouses reporting 6 or more years of college (before 1990) or a master's degree or higher (1990 and later).

Comparable information on primary place of work was available for 2005 to 2011. Using the Health Resources and Services Administration's Geospatial Data Warehouse, we determined whether each rural census block was in a (geographically defined) primary care Health Professional Shortage Area (HPSA).[5] Physicians who worked in prespecified groups of census blocks with more than half the rural population in a shortage area were classified as working in a rural HPSA.

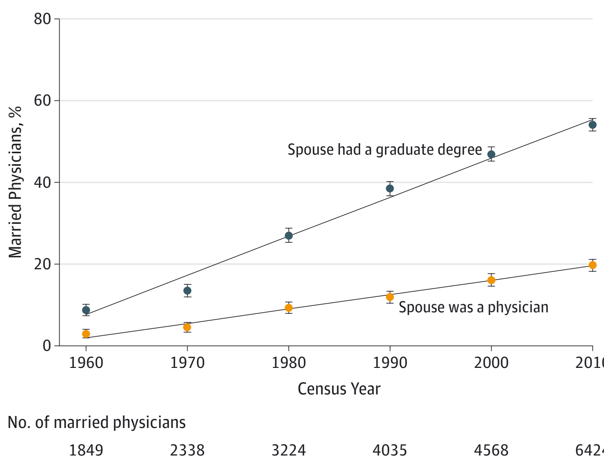
The proportion of married physicians with highly educated spouses was calculated for each year and plotted, along with a linear trend estimated by simple linear regression. Sampling weights were provided by the census.

For 2005 through 2011, we estimated logistic regression models of the likelihood of working in a rural HPSA comparing physicians married to a highly educated spouse with other married physicians (reference group) and single physicians. Odds ratios (ORs) were estimated adjusting for physician age, race/ethnicity, and sex. Tests were based on 2-tailed *t* tests using a *P* value of less than .05 for significance, and accounted for use of sampling weights and clustering of observations within households. Analyses were performed using Stata (StataCorp), version 13.1.

Results | The proportion of married physicians with highly educated spouses increased from 8.8% in 1960 (95% CI, 7.3%-10.2%) to 54.1% in 2010 (95% CI, 52.6%-55.6%; *P* for trend <.001) (**Figure**). In every year, approximately one-third of spouses with graduate degrees were also physicians. Women were an increasing fraction of married physicians (4% in 1960 and 31% in 2010) and more likely than men to be married to a spouse with a graduate degree (68% for women vs 48% for men), but even among men, the proportion of married physicians whose spouse held a graduate degree increased from 7% in 1960 to 48% in 2010.

Overall, 5.3% (95% CI, 5.0%-5.5%) of physicians worked in a rural HPSA between 2005 and 2011 (**Table**), whereas 10.88% (95% CI, 10.85%-10.91%) of the US population lived in these areas. Compared with other married physicians, physicians with a highly educated spouse were significantly less likely to work in a rural HPSA (4.2% for married physicians with highly educated spouses vs 7.2% for married physicians without highly educated spouses; difference, 2.9% [95% CI, 2.4%-3.4%]; adjusted OR, 0.62 [95% CI, 0.56-0.69]; *P* < .001). Single physicians were also less likely to work in a rural HPSA (4.1% for single physicians vs 7.2% for married physicians without highly educated spouses; difference 3.0% [95% CI, 2.4%-3.6%]; adjusted OR, 0.69 [95% CI, 0.61-0.79]; *P* < .001), as were physicians who were young, women, black, or Hispanic.

Figure. Trend in Percentage of Married Physicians Whose Spouse Had a Graduate Degree and Those Whose Spouse Was a Physician, 1960-2010



Source: Authors' calculations from Public Use Micro Sample of the US Census (1960-2000) and the American Community Survey (ACS; 2010), N = 22 438. Trend lines from linear regression (*P* value for trends <.001). Decennial estimates were weighted by sampling weights provided by the census and ACS, and 95% confidence intervals accounted for the use of sampling weights and for clustering at the household level.

Table. Logistic Regression Models of the Likelihood That a Physician Worked in a Health Professional Shortage Area (HPSA), 2005-2011

	Unweighted Sample Size, No.	Physicians Working in an HPSA, Mean (95% CI), %	Odds Ratio (95% CI)[a]	
			Unadjusted[b]	Adjusted
Marital Status of Physician				
Spouse without graduate degree	20 622	7.2 (6.7-7.6)	1 [Reference]	1 [Reference]
Spouse with graduate degree	23 158	4.2 (3.9-4.6)	0.58 (0.52-0.64)	0.62 (0.56-0.69)
Single	11 601	4.1 (3.7-4.6)	0.56 (0.49-0.64)	0.69 (0.61-0.79)
Other Demographic Controls				
Race/ethnicity[c]				
Neither black nor Hispanic	50 183	5.5 (5.2-5.7)	1 [Reference]	1 [Reference]
Black non-Hispanic	2307	3.4 (2.5-4.3)	0.60 (0.46-0.79)	0.66 (0.51-0.86)
Hispanic	2891	3.6 (2.8-4.3)	0.64 (0.51-0.80)	0.65 (0.52-0.82)
Sex				
Men	36 988	5.9 (5.6-6.2)	1 [Reference]	1 [Reference]
Women	18 393	4.0 (3.7-4.3)	0.66 (0.60-0.73)	0.81 (0.74-0.90)
Age, y				
<30	3411	1.9 (1.3-2.6)	0.27 (0.19-0.40)	0.32 (0.22-0.47)
30-39	14 427	4.1 (3.7-4.5)	0.60 (0.53-0.67)	0.68 (0.60-0.77)
40-49	15 319	5.3 (4.9-5.8)	0.78 (0.70-0.87)	0.83 (0.75-0.93)
≥50	22 224	6.7 (6.3-7.1)	1 [Reference]	1 [Reference]
Full sample	55 381	5.3 (5.0-5.5)		

[a] All regressions were weighted by sampling weights provided by the American Community Survey (ACS). The 95% confidence intervals accounted for the use of sampling weights and for clustering at the household level.

[b] Based on ACS data from 2005 through 2011 (N = 55 381).

[c] Race and ethnicity were self-reported and aggregated into broad categories to simplify the analysis.

Discussion | By 2010 more than half of married physicians had a highly educated spouse, which was associated with a reduced odds of working in rural underserved areas. However, the absolute difference between those with and without highly educated spouses was only 2.9%, and the proportion of both groups locating in rural underserved areas was small relative to the population. Limitations include the lack of information on physician specialty and possible misclassification of rural shortage areas. Incentives to encourage physicians to practice in rural areas[6] are needed, but policies that target job opportunities for spouses may not improve undersupply greatly. Other approaches, such as allowing provision of health care without requiring physicians to locate in rural areas (ie, through telemedicine), should be investigated.

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COMMENT & RESPONSE

Hip Fracture Surgery vs Elective Total Hip Replacement

To the Editor The study by Dr Le Manach and colleagues[1] compared differences in hospital mortality between patients undergoing hip fracture surgery and elective total hip replacement. A population matched for age, sex, and preoperative comorbidities to patients who underwent the 2 operations was created using a multivariable logistic model and a greedy matching algorithm with a 1:1 ratio. This matching model is useful for adjusting the patients' baseline characteristics and controlling selection biases in a retrospective study, but it carries the significant assumption of no unmeasured confounders. That is, all important known factors that can affect measured outcomes must be measured and taken into account in the matching model.

This assumption is unrealistic in this study because many preoperative and intraoperative risk factors that have been independently associated with postoperative short-term mortality of patients undergoing the 2 operations were not included in the matching model, such as American Society of Anesthesiologists physical status classification, preoperative anemia, hypoproteinemia, cardiac medications, functional status, surgical risk score, intraoperative blood loss, hemodynamic instability and transfusion, and duration of operation.[2-5] Thus, the work of Le Manach and colleagues cannot provide robust evidence for the increased hospital mortality with hip fracture surgery relative to elective total hip replacement.

Researchers need to perform a large-scale, multicenter, randomized clinical trial in which the innumerable sources of bias that may contaminate the study end points are minimized. If such studies show a consistent beneficial effect of elective total hip replacement relative to hip fracture surgery on postoperative mortality of geriatric patients, the implications for practice are immense.

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To the Editor In an observational study, Dr Le Manach and colleagues[1] used a 1:1 matching technique and found that the relative risk of in-hospital mortality was higher for patients with hip fracture than those undergoing elective total hip replacement. The authors concluded that this difference could not be adequately explained by patient characteristics and may represent "physiologic mechanisms, such as acute stress and inflammatory states resulting from the fractures."[1] However, this conclusion is difficult to justify given the large differences between the elective and trauma populations. Patients undergoing elective total hip replacement are selected for their suitability to undergo a major operation, whereas hip fractures are typically a consequence of physiological deterioration (osteoporosis and falling).

The authors acknowledged the likelihood of residual confounding and selection bias but argued that these cannot explain the large effect size following their extensive efforts to match patients. However, there are many other characteristics that are likely to vary between the groups, including patient factors (eg, frailty and functional capacity) and undiagnosed comorbidities, which are less likely in the elective total hip replacement group that will have undergone comprehensive preoperative assessment.

Most importantly, falls in the elderly are often precipitated by acute illness (eg, urinary tract infection), whereas elective total hip replacement would be postponed under such circumstances. It is not uncommon to admit hip fracture patients with concurrent urinary tract infection, dehydration, acute kidney injury, and uncontrolled atrial fibrillation.[2-4] In this study, such a patient would have been directly compared with a well counterpart selected and prepared to undergo planned elective surgery. Unfortunately, the authors reported "postoperative outcomes" without clearly distinguishing true postoperative events from acute illness present on admission. The greater risks of "postoperative" stroke, sepsis, and myocardial infarction in the hip fracture group are therefore not surprising.