

November 14, 2011

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Reva Harris

Acting Director, Division of Policy and Information Coordination

Health Resources and Services Administration

Proposed Project: BHP Performance Data Collection (OMB No. 0915-0061) Revision

Rockville, MD 20857

Attention: HRSA Desk Officer

To whom it may concern:

On behalf of the Council of Academic Family Medicine (CAFM), which represents the membership of The Society of Teachers of Family Medicine, The Association of Departments of Family Medicine, The Association of Family Medicine Residency Directors, and The North American Primary Care Research Group, and in conjunction with The American Academy of Family Physicians (AAFP), we write to comment on the Office of Management and Budget's (OMB) Comment Request published in the October 14th, 2011 Federal Register.

As organizations whose members are greatly involved in Title VII grant applications, programs, and activities, particularly in the area of primary care training, we applaud HRSA and OMB's goals of streamlining the reporting process and updating information collection efforts with the goal of allowing meaningful, consistent assessments of the programs' successes.

We also commend HRSA and OMB for seeking input on "the accuracy of the agency's estimate of the burden of the proposed collection of information," and "ways to minimize the burden of the collection of information on respondents," among other requests for feedback.

We concur with the identification of the following five key outcomes the proposed measures will focus on, but unless there are more funds provided we are concerned about HRSA and the nation's ability to provide more primary care physicians, and our ability to show success in meeting these outcomes, will be harmed:

- (1) Increasing the workforce supply of diverse well-educated practitioners;
- (2) influencing the distribution of practitioners to practice in underserved and rural areas;
- (3) enhancing the quality of education;
- (4) diversifying the pipeline for new health professionals; and,
- (5) supporting educational infrastructure to increase the capacity to train more health professionals

The data collection requirements have always been difficult. We have discussed these difficulties with staff of the Bureau of Health Professions and HRSA over the years. We have described the need to move toward more national data sets, helping relieve the individual

grantee of much of the data collection burden. We appreciate the recognition by HRSA that efforts must be made to reduce the obstacles and burden involved in such data collection efforts, but we believe more needs to be done. Programs do not need to do the onerous work of tracking graduates. HRSA and OMB would serve the program and the grantees best by developing a global, routine evaluation capacity in-house or contracting for it. Moreover, a move to a centralized, national system for tracking program outcomes is important not just to address the burden on grantees, but for validity purposes. The goal for any data collected by the grantees should be to enhance the evaluations; specifically by reporting on the contact time, actual activities, etc. so that the effects of the funded activities on outcomes can be estimated. And of course, the data to be collected must be tied back to an evaluation plan--not just collected in case they're used later. We have attached three peer-reviewed articles showing how national data sets can be used appropriately to provide such evaluations.

The Notice estimates only 9 hours for collecting data for the application, 10 hours for Program Aggregate data collection and 5 hours for Individual- level data collection. We believe that this significantly underestimates the time needed to fulfill these requirements. In particular, the trainee level data requirements are a very labor-intensive effort that requires significant staff resources to accomplish. We understand that applicants can include evaluation as part of the budget of the application, to help pay for these efforts, but since funding for these programs has been frozen and reduced in recent years, caps have been set on the applications budget. At a time when calls for increased innovation and expansion outside of normal partners for these programs are increasing, it is problematic to add additional requirements without adequate funding to accomplish them. In addition, this process, if required should be aided by HRSA's promulgation of templates and best practices for tracking and collecting such data. It is also important to provide applicants with the logic models prepared by HRSA regarding the data collection tables as they can help applicants/grantees understand the rationale behind these efforts and aid in their understanding of the need for such data.

As a corollary to the above concern, many institutions are not set up to track graduates or trainees. Grant applicants who are departments or programs within departments, as well as residencies, frequently do not have the ability to leverage institutional resources to aid in this collection. These programs have much lower "indirects" than many other grant programs offered by the Department of Health and Human Services and they are not adequate to garner institutional support for additional data collection.

We reiterate our call in our earlier response to the May 20, 2011 HRSA notice regarding this data collection for the use of a national data set. A unique identifier needs to be established so that individual trainees can be searched for in a national data bank, without the burden of individual tracking by each program. We believe this is a necessary precursor to measuring performance of these grants and longitudinal evaluations of the grants and their outcomes over time. It should not be necessary for applicants and grantees to track their trainees. HRSA, using a national data set and unique identifier should be able to do so, on behalf of the entire program(s).

One issue that needs to be addressed when one is looking at long term evaluation of the success of these programs is the benchmark and relationship between program graduates or completers and those who haven't been involved in these programs. In order to effectively measure the success of these programs one must be able to compare those funded under these programs versus those not funded – a control group, if you will. The unique identifier and national data set would facilitate and enable this effort.

Should you have any questions regarding this letter, please feel free to contact Hope R. Wittenberg, CAFM Director of Government Relations, at hwittenberg@stfm.org or 202-986-3309 or Teresa Baker, AAFP Government Relations Representative at tbaker@aafp.org or 202-232-9033.

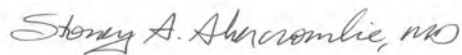
Sincerely,



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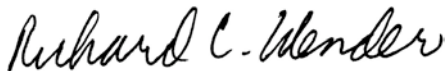
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The Association of Title VII Funding to Departments of Family Medicine With Choice of Physician Specialty and Practice Location

George E. Fryer, Jr, PhD; David S. Meyers, MD; David M. Krol, MD; Robert L. Phillips, MD, MSPH; Larry A. Green, MD; Susan M. Dovey, MPH; Thomas J. Miyoshi, MSW

Background: Title VII predoctoral and departmental grants for departments of family medicine are intended to increase the number of family and primary care physicians in the United States and increase the number of practices in rural and underserved communities. This study assessed the relationships of Title VII funding with physicians' choices of practice specialty and location. **Methods:** Non-federal direct patient care physicians who graduated from US medical schools from 1981–1993 were identified in the 2000 American Medical Association Masterfile. A grant history file was used to annotate Masterfile records with Title VII funding data for the physicians' 4-year medical school enrollment. Characteristics of the county in which they practice were taken from the Area Resource File. Title VII funding variables were then related to practice specialty and location. **Results:** Predoctoral training and departmental development funding were strongly related to attainment of each of the Title VII program objectives evaluated. **Conclusions:** Title VII has been successful in achieving its stated goals and legislative intent and has had an important role in addressing US physician workforce policy issues.

(Fam Med 2002;34(6):436-40.)

Five major commissioned reports published from 1959–1970 alerted policy makers and medical educators to the development of a physician shortage in the United States and called for immediate expansion of the physician workforce.¹⁻⁵ The US medical education system, aided by substantial public funding, responded by doubling student enrollment and creating 40 new allopathic schools of medicine during the period 1962–1982.⁶ From 1963 to 1975, Title VII of the Public Health Service Act provided financial support to medical schools to increase student enrollments. Expanding the workforce, however, did not produce adequate access to health care for everyone in the United States.^{7,8} Physician resources became maldistributed in terms of both medical specialty and practice location, leaving millions of Americans, particularly the residents of rural areas, underserved.

With the 1976 enactment of the Health Professions Educational Assistance Act, Title VII funding shifted from enhancing the aggregate supply of doctors to producing primary care physicians amenable to service in areas of greatest need.⁹ Recognizing the versatility of family practice, since 1978, the Bureau of Health Professions, via section 747 of Title VII, has provided grants to departments of family medicine for predoctoral education, departmental support, and faculty development. While family practice, general internal medicine, and general pediatrics programs have all had access to grant support for residency education and faculty development, only departments of family medicine have had access to all categories of Title VII medical education grants. Recognizing the contributions of general internists and pediatricians to America's primary care workforce, the Health Professions Education Partnership Act of 1998 reauthorized and reorganized Title VII grants to expand undergraduate funding opportunities for departments of internal medicine and pediatrics.

Because previous limited evaluations of Title VII programs have had conflicting results, the 1998 legislation also placed an increased emphasis on accountability with respect to outcomes.¹⁰⁻¹⁴ Given the program's more than 20-year history of supporting

From the Robert Graham Center for Policy Studies in Family Practice and Primary Care, Washington, DC (Dr Fryer, Phillips, and Green and Ms Dovey); the Department of Family Medicine, Georgetown University (Dr Meyers); Yale University (now with the Department of Pediatrics, Columbia University) (Dr Krol); and the Department of Family Medicine, University of Colorado (Mr Miyoshi).

departments of family medicine, we undertook a comprehensive analysis of Title VII funding on its intended outcomes—increased numbers of primary care physicians and increased practice in rural and underserved areas.

Methods

Study Population

Physicians who graduated from US medical schools from 1981–1993 were included in this study. Individual physicians were the unit of all analyses. Analyses involving practice specialty and location choices were restricted to non-federal allopathic and osteopathic physicians engaged in direct patient care in 2000. The selected time interval was chosen to ensure that Title VII funding records (1978 was the first year of records available) covered all 4 years that the physicians attended medical school and that those in subspecialties had the opportunity to complete up to 7 years of residency training.

Data Sources

The 2000 American Medical Association Physician Masterfile was used to obtain each physician's practice specialty and major professional activity. Using the doctor's preferred mailing address in the Masterfile, characteristics of practice location (whether or not a whole-county Primary Care Health Professional Shortage Area [PCHPSA]) and whether rural or urban county) were determined from the Area Resource File (ARF). The ARF is made available for analysis by the Bureau of Health Professions' National Center for Health Workforce Information and Analysis. Similarly, Masterfile items (medical school and year of graduation) were linked to grant support (dollar amount, fiscal year, and program category) from 1978–1993 in a Title VII funding history file maintained by the Health Resources and Services Administration's Bureau of Health Professions.

Study Variables

Outcomes. Practice specialty and location—Specialty choice and practice location were analyzed for non-federal physicians whose major practice activity was direct patient care. Specialty choice was divided into (1) family and general practice versus other specialties and (2) primary care (defined as family practice, general practice, general internal medicine, or general pediatrics) versus other specialties. Practice location was assessed for (1) practice in a whole-county PCHPSA versus another county and (2) practice in a rural county versus other county. Non-metropolitan statistical area (non-MSA) counties were considered rural.

Intervention. The independent variables in this analysis were three grant types made to departments of family medicine—predoctoral training, departmental sup-

port, and faculty development. The intervention, related to individual medical students, was the receipt by their medical school of one or more of the above-named Title VII grants during a particular year in which they were enrolled in medical school. The independent and combined influence of the three grant types on the choice of practice specialty and practice location was examined. Associations with the number of years of medical school with Title VII support and the total amount of Title VII support were also assessed.

Faculty development grants were included in analyses of practice specialty and location partly due to their potential to mediate outcomes through interaction with the other two grant categories; however, faculty development grants have a decidedly different objective of preparing teachers of family medicine.

Analytic Strategy

Physicians were organized into groups according to the type and duration of grant support to their medical school of graduation. Chi-square and Mann-Whitney tests were performed to characterize outcomes for physicians grouped by interventions as outlined above. Odds ratios were calculated to compare outcomes obtained from each combination of grant types versus no Title VII funding at all.

Results

The 2000 AMA Masterfile contained records for 184,057 non-federal, direct patient care physicians who graduated from one of the 142 US medical schools during the period 1981–1993 and were non-federally employed physicians whose major professional activity was direct patient care. Physician addresses were adequate to identify their county for 177,558 (96.5%) of physicians engaged in direct patient care. About two thirds of these physicians (67.4%) had been students in medical schools that received some type of Title VII funding while they were enrolled.

Between 1978 and 1993, 2,268 Title VII grants were awarded to 120 US medical schools for family practice predoctoral programs (1,074), departmental support (737), and faculty development (457). These represent 96.6% of the 2,347 grants awarded during this period. Other recipients included local departments of health, area health education centers, and large urban hospitals. Grants to departments of family medicine under these three programs totaled \$290 million over this 16-year period. The average annual grant amount per institution was \$127,500.

Specialty Choice

Students who attended schools that received no family medicine Title VII funding during their 4-year tenure (59,946) chose family practice at a rate of 10.2%. Students who attended schools that received funding of any type for 1 or more years of their enrollment

(124,363) chose family practice at a rate of 15.8% ($P<.001$). The percentage of graduates entering primary care was also significantly greater for graduates attending during periods of Title VII funding—30.9% versus 36.3% ($P<.001$).

Graduates of schools with Title VII predoctoral training and departmental development grants were significantly more likely to become family physicians and practice primary care than were graduates of schools without funding in these categories (Table 1). Title VII support for faculty development was only moderately associated with specialty choice. Most benefits that apparently accrued from faculty development grants were limited to its combination with predoctoral training and departmental development funding.

The contents of Table 2 reflect the relative association with specialty choice of Title VII funding by each of the three grant types and their interactions. On balance, receipt of two or more types of grants during a physician's tenure did not enhance the likelihood of primary care specialty choice. Predoctoral and departmental grants had significant positive independent association with specialty choice. Their combination had no additive effect. Longer duration of funding also had little association.

Practice Location

When students who attended schools that received no Title VII funding during their 4-year tenure (57,896) were compared to students who received any type of Title VII funding for 1 or more years of their tenure (119,910), the proportions of graduates practicing in a PCHPSA were 1.1% and 1.5%, respectively ($P<.001$). The percent practicing in a rural area was also greater for graduates of Title VII-funded schools (9.5% versus 12.7%) ($P<.001$).

Both predoctoral and departmental funding were significantly associated with practice in PCHPSAs and with practice in rural areas (Table 3). The effect of sustained funding on practice location was less than for specialty choice. The amount of funding received during a student's tenure was not significantly associated with practice location.

The data that appear in Table 4 reflect the relative association with practice location of Title VII funding by each of the respective categories and their interactions. Receipt of two or more types of grants during a physician's enrollment did not enhance practice site selection. Predoctoral and departmental grants had significant positive independent association with practice location. They did not, however, have an additive effect. In fact,

Table 1

Specialty Choice of Graduated Direct Patient Care Physicians, Based on Their Medical School's Receipt of Title VII Grants of Various Types

<i>Title VII Grant Type</i>	<i>Total n=184,057</i>	<i>Family Practice % (#)</i>	<i>Primary Care % (#)</i>
None	59,946	10.2 (6,144)	30.9 (18,468)
Any funding	124,363	15.8 (19,703)	36.3 (45,100)
Predoctoral	106,156	15.9 (16870)	36.3 (38,487)
Departmental	87,444	16.1(14,093)	36.6 (32,008)
Faculty	57,585	16.0 (9,208)	35.8 (20,623)
Predoctoral only	25,358	15.5 (3,931)	36.0 (9,128)
Departmental only	9,973	17.1 (1,707)	38.4 (3,829)
Faculty only	3,942	12.8 (503)	32.7 (1,288)
Combination			
Predoctoral, departmental, and faculty	39,791	16.5 (6,548)	36.3 (14,447)
Predoctoral and departmental only	32,158	15.5 (4,997)	36.5 (11,748)
Departmental and faculty only	4,040	14.7 (592)	34.8 (1,404)
Faculty and predoctoral only	8,849	15.8 (1,394)	35.8 (3,164)

students were more likely to choose a desired practice location if they were exposed to either grant type alone, rather than a combination of predoctoral and departmental funding.

Table 2

Likelihood of Choosing Family Practice or Primary Care Associated With Each Title VII Funding Arrangement, Compared With No Title VII Funding

<i>Grant Combination</i>	<i>Family Practice</i>		<i>Primary Care</i>	
	<i>Unadjusted OR</i>	<i>95% CI</i>	<i>Unadjusted OR</i>	<i>95% CI</i>
None	1.00		1.00	
Predoctoral only	1.59	1.53–1.66	1.25	1.21–1.29
Departmental only	1.80	1.69–1.90	1.39	1.33–1.45
Faculty only	1.28	1.16–1.41	1.08	1.01–1.16
Predoctoral and departmental	1.62	1.56–1.69	1.29	1.26–1.33
Predoctoral and faculty	1.64	1.54–1.75	1.24	1.19–1.30
Departmental and faculty	1.51	1.37–1.65	1.19	1.11–1.27
All three types	1.73	1.66–1.79	1.27	1.24–1.31

OR—odds ratio
CI—confidence interval

Table 3

Practice Location Choice of Graduated Physicians, Based on Their Medical School's Receipt of Title VII Grants of Various Types

<i>Title VII Grant Type</i>	<i>Total n=177,558</i>	<i>PCHPSA % (#)</i>	<i>Rural % (#)</i>
None	57,896	1.1 (646)	9.5 (5,507)
Any	119,910	1.5 (1,798)	12.7 (15,263)
Any predoctoral	102,692	1.5 (1,525)	12.8 (13,120)
Any departmental	84,099	1.4 (1,148)	12.5 (10,526)
Any faculty	55,095	1.3 (733)	12.4 (6,816)
Predoctoral only	24,680	2.0 (489)	13.8 (3,410)
Departmental only	9,649	1.9 (184)	13.8 (1,334)
Faculty only	3,861	.8 (29)	8.4 (325)
Combinations			
Predoctoral, departmental, and faculty	38,346	1.3 (490)	12.3 (4,711)
Predoctoral and departmental only	31,185	1.3 (403)	12.3 (3,851)
Departmental and faculty only	3,460	1.7 (59)	13.2 (457)
Faculty and predoctoral only	8,481	1.7 (143)	13.5 (1,148)

PCHPSA—primary care health professions shortage area

Examination for Selection Bias

There were 30 medical schools with an initial period of no Title VII support that later received a Title VII grant within the 1981–1993 study period. A separate analysis of the graduates of these schools was conducted to isolate the effects of grant support from other school characteristics to control for possible bias in the selection of schools to receive awards. This analysis, restricted to physicians from these schools, compared students who attended before the school had Title VII funding with those attending during or after initial Title VII support. This more intra-school comparison was done on large, relatively equal-sized groups and demonstrated a considerable and significant Title VII association with each of the four outcomes shown in Table 5.

Discussion

Title VII family medicine predoctoral training or departmental support grants were significantly associated with choice

of family practice and primary care and practice in whole-county PCHPSAs and rural counties. Generally, funding duration and amount had no association with these outcomes. Additionally, having attended a school with more than one type of Title VII grant versus either only a predoctoral training or departmental development grant during enrollment as a student did not increase the likelihood of the graduate's practicing in rural or underserved areas or choosing family practice or another primary care specialty. More coordination may be required to optimize the effects of all Title VII activities at schools. This analysis illustrates the capacity to monitor large-scale programs with existing data at modest cost. Such large-scale assessments are consistent with the emphasis of the Health Professions Education Partnership Act of 1998 on increased accountability for programs.

One way to assess the possible influence of these grant programs is to estimate what might have happened in the absence of Title VII funding. Had physicians who attended medical schools that received any Title VII support chosen family practice at the rate of physicians whose schools had no support during their enrollment (10.2% rather than 15.8%—see Table 1), 6,968 fewer active patient care family physicians would have been practicing in 2000, 27.0% less than the 25,816 total for the 13-year period. These and other results associated with Title VII funding should be viewed in the context of about \$290 million made available to departments of family medicine.

Our findings almost certainly underestimate Title VII's effect on primary care HPSAs. A greater proportion of graduates of schools that had received Title VII funding during their enrollment than other graduates practiced in each of the six rural county categories of the Department of Agriculture's Rural/Urban Con-

Table 4

Likelihood of Choosing to Practice in a Rural or Primary Care Shortage Area Associated With Each Title VII Funding Arrangement, Compared With No Title VII Funding

<i>Grant Combination</i>	<i>PCHPSA</i>		<i>Rural</i>	
	<i>Unadjusted OR</i>	<i>95% CI</i>	<i>Unadjusted OR</i>	<i>95% CI</i>
None	1.00		1.00	
Predoctoral only	1.84	1.63–2.07	1.54	1.47–1.61
Departmental only	1.68	1.43–1.99	1.52	1.43–1.62
Faculty only	.67	.46–.97	.88	.78–.98
Predoctoral and departmental	1.14	1.01–1.30	1.34	1.28–1.40
Predoctoral and faculty	1.52	1.26–1.82	1.49	1.39–1.60
Departmental and faculty	1.53	1.17–2.01	1.45	1.31–1.61
All three types	1.14	1.02–1.29	1.33	1.28–1.39

PCHPSA—primary care health professions shortage area

OR—odds ratio

CI—confidence interval

Table 5

Specialty and Practice Location Choices
of 1981–1993 Graduates of Medical Schools
at Which Title VII Funding Was First Received
in 1982 or a Later Year

	<i>Before</i> Title VII Funding (n=20,904)	<i>After</i> Title VII Funding (n=20,995)	<i>P Value</i>
Family practice	2,697 (12.9%)	3,939 (18.7%)	<.001
Primary care	6,942 (33.2%)	8,549 (40.9%)	.001
Rural	2,416 (11.6%)	2,834 (13.5%)	<.001
PCHPSA	272 (1.3%)	327 (1.6%)	.03

PCHPSA—primary care health provider shortage area

tinuum. That difference for the most remote, sparsely settled category of completely rural counties (counties with no places with a population of 2,500 or more), was 37% (.67% versus .49%) ($P<.001$). Thus, it appears likely that there are many rural counties that have not been designated PCHPSAs or have had that designation withdrawn due to the presence of graduates of medical schools that had Title VII support during their enrollment.

A medical school's receipt of Title VII funding during a physician's enrollment has been used as the intervention variable in this study. By using the receipt of a grant as a proximate measure of exposure to programs and activities supported by Title VII predoctoral grants, we have probably underestimated the influence of these grants. Not every student who attended a particular medical school in a given year in which a grant was received was exposed to the interventions supported by the grant. Further, these analyses attribute potential Title VII program benefits only to students who were enrolled during years for which the school received funding. However, changes to school curriculum, training sites, or other aspects of the educational program made with Title VII resources may influence career decisions of students after withdrawal of funding.

Limitations

This study had a number of limitations. The most important limitation is to note that the effects we found are associations and do not establish definite causal relationships. Another limitation is that while the AMA Masterfile is the most widely used source of data for analysis of the US physician workforce, it has shortcomings that have been demonstrated by previous study.¹⁵ Further, because the AMA Masterfile data are cross-sectional, the practice location listed in the Masterfile may be the first for most physicians who

recently completed their residency training but will not be the first for many of those with more years in practice. Finally we did not standardize funding in relation to the number of students enrolled in a school or in any other way.

Conclusions

The findings of this study suggest that Title VII grant programs are achieving their legislative intent. Title VII funding of departments of family medicine is related to expansion of the primary care physician workforce and increased physician accessibility for the residents of rural and underserved areas.

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Accounting for Graduate Medical Education Production of Primary Care Physicians and General Surgeons: Timing of Measurement Matters

Stephen Petterson, PhD, Matthew Burke, MD, Robert Phillips, MD, MSPH, and Bridget Teevan, MS

Abstract

Purpose

Legislation proposed in 2009 to expand GME set institutional primary care and general surgery production eligibility thresholds at 25% at entry into training. The authors measured institutions' production of primary care physicians and general surgeons on completion of first residency versus two to four years after graduation to inform debate and explore residency expansion and physician workforce implications.

Method

Production of primary care physicians and general surgeons was assessed by retrospective analysis of the 2009 American Medical Association Masterfile,

which includes physicians' training institution, residency specialty, and year of completion for up to six training experiences. The authors measured production rates for each institution based on physicians completing their first residency during 2005–2007 in family or internal medicine, pediatrics, or general surgery. They then reassessed rates to account for those who completed additional training. They compared these rates with proposed expansion eligibility thresholds and current workforce needs.

Results

Of 116,004 physicians completing their first residency, 54,245 (46.8%) were in primary care and general surgery. Of 683

training institutions, 586 met the 25% threshold for expansion eligibility. At two to four years out, only 29,963 physicians (25.8%) remained in primary care or general surgery, and 135 institutions lost eligibility. A 35% threshold eliminated 314 institutions collectively training 93,774 residents (80.8%).

Conclusions

Residency expansion thresholds that do not account for production at least two to four years after completion of first residency overestimate eligibility. The overall primary care production rate from GME will not sustain the current physician workforce composition.

Editor's Note: A commentary on this article appears on page 541.

The Balanced Budget Act of 1997 fixed the number of graduate medical education (GME) positions funded by Medicare, which tightly governed the growth of the physician workforce in the United States for about five years.^{1,2} Then, between 2002 and 2007, training institutions largely self-financed a nearly 8% expansion in

residency training, in which the majority of positions were for non-primary-care specialties and tightly aligned with teaching hospitals' financial interests.^{3,4} In 2007, the U.S. Council on Graduate Medical Education (COGME) called for further expansion of GME positions,¹ but in May 2009 it expressed concern to the U.S. Secretary of Health and Human Services that recent expansions had effectively reduced the production of primary care physicians and reiterated the importance of "aligning GME with future health care needs."⁵

The Resident Physician Shortage Reduction Act of 2009,⁶ introduced in both the U.S. House and Senate during debate on health care reform, proposed increasing residency slots by expanding federal funding to qualified GME teaching institutions. The bill included a 15% increase in Medicare-funded GME positions, taking the total to about 115,000. To be eligible for the additional slots, a hospital already beyond its government-funded cap would need to have (1) 10 or more resident positions above its cap and (2) at least 25% of its

full-time equivalent residents in primary care and general surgery. Going forward, the hospital would not be allowed to go below this 25% threshold for 10 years.

This language created some concern because it committed nearly half of the proposed expansion to supporting the GME growth that hospitals had already financed on their own—growth that had effectively reduced primary care and general surgery production. In addition, it set the 25% threshold for eligibility at entry into residency, meaning that residents who subsequently subspecialized would be counted. A recent COGME report⁷ recommends that setting the threshold at a point after completion of the first residency would be a better measure of production because the majority of internal medicine residents and an increasing number of pediatric and surgery residents choose to subspecialize.

Although the bill was not passed, it is likely that a version of it will be reintroduced. To inform that debate, we tested the 25% threshold for each U.S. training institution at residents' completion of initial training

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and again two to four years out to demonstrate how the difference in the timing of measurement affects hospitals' eligibility. The bill set a relatively low bar given that nearly 38% of the physician workforce consists of primary care providers or general surgeons, so we also investigated how thresholds higher than 25% would affect institutional eligibility for expansion.

Method

We assessed institutional production of primary care physicians and general surgeons in the United States between 2005 and 2007 using retrospective analysis of data from the 2009 American Medical Association Physician Masterfile.⁸ These files track residency and fellowship training for individual physicians for up to six experiences. We initially classified a resident as primary care if the specialty of his or her residency was family medicine, general internal medicine, or pediatrics.

For each institution providing GME to residents, we first identified all physicians who completed primary care or general surgery residencies during the study period. Then, for each institution, we calculated the production rate after initial training as the sum of primary care and general surgery graduates divided by the total number of graduates. Second, to calculate production rates that take into account further training, we excluded from the numerator those primary care or general surgery graduates who went on to complete another residency within the next two to four years (based on length of time from graduation date to 2009) and analyzed the data again. The rates we calculated, therefore, reflect production after initial training and for graduates two years (graduated in 2007) to four years (graduated in 2005) out from their completion of a primary care or general surgery residency training program. We then calculated the numbers of institutions with production rates above and below the 25% and 35% thresholds of primary care and general surgery graduates who did not pursue training beyond their first residency.

Results

From 2005 to 2007, 683 institutions in the United States provided GME training to 116,004 residents. Among physicians completing their first residency, 54,245

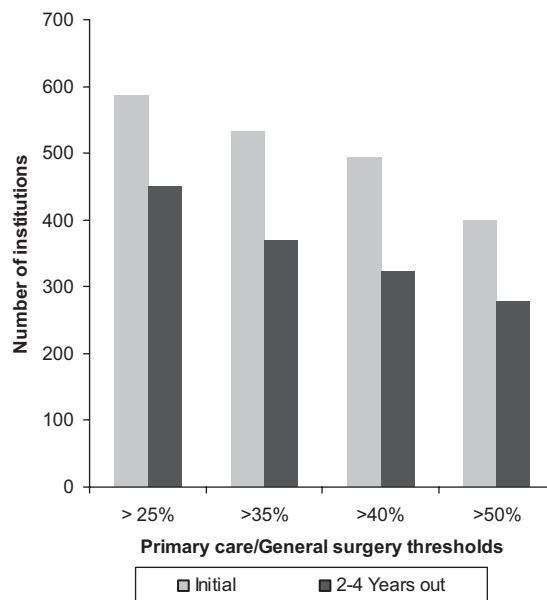


Figure 1 The number of training institutions (n = 683) that produced more than 25%, 35%, 40%, or 50% primary care physicians and general surgeons from 2005 to 2007. The number of institutions that reached each threshold was substantially larger when the threshold was applied at the completion of initial training than when measured two to four years later.

(46.8%) were trained in primary care or general surgery, and 586 (85.8%) of the training institutions met the proposed 25% threshold for expansion eligibility if it were assessed at completion of initial residency. The 97 institutions that fell below the 25% threshold trained 2,307 (2%) residents.

At two to four years out, only 29,963 (25.8%) of the physicians had not pursued training beyond an initial primary care or general surgery residency, and an additional 135 institutions training 73,466 (63.3%) of the residents fell below the 25% threshold. Moving the threshold to 35%—a rate still below that needed to sustain the current primary care and general surgery workforces—at two to four years after initial training further reduced eligibility, leaving just 369 (54.0%) of the institutions (Figure 1). This excluded 314 institutions collectively training 93,774 (80.8%) of the residents (Figure 2). Raising the threshold to 40%, a level proposed by COGME in recent draft recommendations,⁹ left only 323 (47.3%) institutions when applied two to four years out from completion of initial residency. This higher threshold excluded 360 institutions training 99,269 (85.6%) of the residents.

Discussion

We found that thresholds for GME expansion eligibility are sensitive to the point in the physician training pipeline at

which institutional production is measured. Although the Resident Physician Shortage Reduction Act of 2009 contained much language that supported purposeful expansion of primary care and general surgery, the thresholds it set and the point at which they were applied may not have produced the desired effect. As written, the bill would apply its 25% threshold at the time of entry into first residency and perpetuate the hospital-funded expansion of the past decade, which strongly favored training other than and led to reduced production of primary care and general surgery physicians. However, were the same 25% threshold to be applied two to four years after completion of first (and perhaps only) residency, 135 institutions (with nearly two-thirds of current residency positions) would be eliminated from expansion eligibility. Applying higher thresholds, which are more appropriate to maintaining the current primary care and general surgery workforces, would remove from contention the majority of institutions, which train 80% to 85% of young physicians. Our findings demonstrate that setting such higher thresholds and applying them at least two years after completion of initial training would reward institutions that train generalist physicians and be more consistent with the intent of the bill's sponsors.

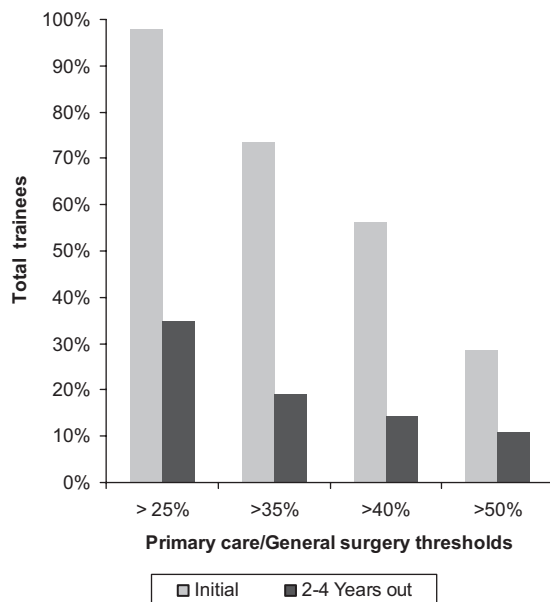


Figure 2 The percentage of trainees (all specialties) in training institutions that produced more than 25%, 35%, 40%, and 50% primary care physicians and general surgeons from 2005 to 2007 ($n = 116,004$). The percentage of trainees by institutions making each threshold shows that the institutions that train the most residents are not producing primary care and general surgery physicians in proportion to the current physician workforce.

Since 2000, primary care GME production has dropped to levels too low to sustain the current primary care physician workforce.^{3,10} More than 1,250 resident positions in adult primary care training programs have been lost because of closures, absorption into other specialty training programs, and increased opportunity for subspecialty training.⁴ In fact, fellowship positions for internal medicine increased from 7,774 in 1999 to 10,062 in 2008, which may reflect an intent to increase the number of trainees who specialize and move out of primary care.¹¹ COGME, the Medicare Payment Advisory Commission, the Josiah Macy Jr. Foundation, and others have made recent recommendations about improving primary care training and recommitting GME to the health care needs of the United States.^{1,9,12} Setting the expansion eligibility threshold at 25%—at time of entry or after completion of first residency—will not accomplish either goal. Production of at least 35% to 40% measured two to four years out from initial residency completion is required to sustain the current primary care and general surgery workforce, and, as noted above, COGME is considering a recommendation of at least 40%.¹³

The Patient Protection and Affordable Care Act of 2010 (ACA)¹⁴ is projected to

exacerbate anticipated primary care shortages by helping 30 million or more people gain access to health insurance. ACA may help mitigate this situation through the preferential redistribution of currently unfilled residency positions to primary care and general surgery programs. It also supports community-based training by providing funding for new residency positions in teaching health centers and by lifting administrative restrictions on GME funding for training in outpatient settings—both changes that will favor primary care. ACA also expands debt relief for physicians who serve in the National Health Service Corps, which also favors primary care and general surgery, specifically in underserved areas. Further, the Secretary of Health and Human Services recently announced the Primary Care Residency Expansion Program, which will provide \$168 million to fund temporary expansion of primary care residencies with an emphasis on community-based training.¹⁵ These aspects of ACA offer important opportunities to improve access to generalist services. Any further efforts to expand GME training will need similar tailoring to prevent continuation of the trends seen over the last decade and supply the workforce necessary to meet the country's health care needs.

Our study has potential limitations. By applying our proximal threshold measurement at graduation from first residency, we are underestimating likely institutional eligibility of using the entry criteria proposed in the GME expansion bill because a small proportion of residents start primary care or general surgery residencies but leave before completion of training or to enter other training. Similarly, because we only looked at data two to four years out from first residency graduation, we may be overestimating institutions' actual generalist production. Finally, we did not account for the estimated 20% of internal medicine graduates who work as hospitalists, or in other nonclinical roles in the decade after they finish their initial training, which would effectively reduce generalist production even further.¹⁶

Conclusion

The GME expansion legislation proposed in the House and Senate in 2009 would not have met legislative expectations using the proposed threshold and timing of measurement. Rather, it may have solidified the GME expansion that has reduced production of primary care physicians and general surgeons over the last decade to the point that it cannot sustain the current workforce. Applying thresholds at least two years out from completion of initial residency is a better indicator of final output, but production will not be sustained or increased unless a threshold higher than 25% is set. The workforce research community should help policy makers marry intent with evidence to produce the outcomes that many congressional advisory groups are advocating.

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Impact of Title VII Training Programs on Community Health Center Staffing and National Health Service Corps Participation

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Conflicts of interest: Drs Rittenhouse, Fryer, Phillips, Miyoshi, Goodman, and Grumbach hold academic appointments in departments that are past or current recipients of Title VII training grants.

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ABSTRACT

PURPOSE Community health centers (CHCs) are a critical component of the health care safety net. President Bush's recent effort to expand CHC capacity coincides with difficulty recruiting primary care physicians and substantial cuts in federal grant programs designed to prepare and motivate physicians to practice in underserved settings. This article examines the association between physicians' attendance in training programs funded by Health Resources and Services Administration (HRSA) Title VII Section 747 Primary Care Training Grants and 2 outcome variables: work in a CHC and participation in the National Health Service Corps Loan Repayment Program (NHSC LRP).

METHODS We linked the 2004 American Medical Association Physician Masterfile to HRSA Title VII grants files, Medicare claims data, and data from the NHSC. We then conducted retrospective analyses to compare the proportions of physicians working in CHCs among physicians who either had or had not attended Title VII-funded medical schools or residency programs and to determine the association between having attended Title VII-funded residency programs and subsequent NHSC LRP participation.

RESULTS Three percent (5,934) of physicians who had attended Title VII-funded medical schools worked in CHCs in 2001-2003, compared with 1.9% of physicians who attended medical schools without Title VII funding ($P < .001$). We found a similar association between Title VII funding during residency and subsequent work in CHCs. These associations remained significant ($P < .001$) in logistic regression models controlling for NHSC participation, public vs private medical school, residency completion date, and physician sex. A strong association was also found between attending Title VII-funded residency programs and participation in the NHSC LRP, controlling for year completed training, physician sex, and private vs public medical school.

CONCLUSIONS Continued federal support of Title VII training grant programs is consistent with federal efforts to increase participation in the NHSC and improve access to quality health care for underserved populations through expanded CHC capacity.

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INTRODUCTION

The expansion of community health centers (CHCs) is the cornerstone of recent federal efforts to expand access to the underserved.^{1,2} CHCs provide primary care services for underserved populations, including the uninsured, migrant farm workers, and the homeless. In 2005 CHCs provided more than 50 million visits to more than 15 million people, and in recent years CHCs have been a test bed for quality improvement and practice innovation experiments.³⁻⁶ Although President Bush's Community Health Center Initiative aimed to double the capacity of CHCs between 2002 and 2006, CHCs are struggling to

recruit sufficient numbers of primary care physicians and have many vacant positions.^{1,2,7}

National Health Service Corps (NHSC) physicians make up a substantial proportion of physicians staffing CHCs.⁷ The NHSC Scholarship Program awards full medical school scholarships to students in exchange for a commitment to work in an underserved area after completion of training. The first NHSC scholars began their service in 1977. In 1987 the program was augmented by the establishment of the NHSC Loan Repayment Programs (LRP), offering primary care clinicians payments to be applied against their student loans in return for working in an underserved area.⁸ After completing their NHSC obligation, a large proportion of NHSC participants remain in service to the underserved.⁹⁻¹¹ Temporary placement of NHSC physicians in rural underserved areas positively affects the long-term non-NHSC physician supply in those areas.¹² Unfortunately, the demand for NHSC physicians far exceeds the supply. In 2006 there were more than 4,200 vacant positions in underserved areas for NHSC physicians, yet there were only 1,200 NHSC physicians available to fill these slots (personal communication, Health Resources and Services Administration, NHSC Office, April 4, 2006).

Unmet demand for CHC and NHSC physicians exists in the context of substantial cuts in funding for Health Resources and Services Administration (HRSA) Title VII Section 747 Primary Care Training Grants (Title VII grants)—from \$92.4 million in fiscal year 2003 to \$48.0 million in 2008.¹³ Title VII grants are intended to strengthen the primary care educational infrastructure at medical schools and residency programs and to encourage physicians-in-training to pursue careers working with underserved populations.^{14,15} Prior research shows an association between Title VII grants to medical schools, an increased production of primary care physicians,¹⁶⁻¹⁹ and a greater likelihood that graduates will practice in underserved areas.^{19,20} The only published study to examine Title VII grants to residency programs was limited to family physicians in 9 states, which found that family physicians who attended residency programs receiving Title VII grants were more likely than other family physicians to practice in rural and low-income areas.¹⁹

No prior studies have documented whether obtaining medical training in programs with Title VII grants is associated with subsequent work in CHCs or with participation in the NHSC. We undertook this study to better understand these associations in an effort to inform the federal effort to adequately staff CHCs.

METHODS

We obtained data from the 2004 AMA Physician Masterfile (Masterfile), including Medicare Unique

Physician Identification Numbers (UPINs) for each physician. The Masterfile contains regularly updated information on all US allopathic physicians and many osteopathic physicians. Details on the Masterfile have been published elsewhere.²¹⁻²³

We also obtained data on Title VII grant awards from HRSA's Bureau of Health Professions, including the project director, the awardee institution (medical school, residency program, hospital, university, or other affiliated institution), and type and year of grant. Nine grant types were included and grouped into 3 categories: predoctoral education (predoctoral grants), department development (academic administrative unit or academic unit grants), and residency training (residency grants). Descriptions of the Title VII grant categories are available in the Supplemental Appendix at <http://www.annfammed.org/cgi/content/full/6/5/397/DC1>.



Between 1972 and 2003, 3,606 predoctoral and academic unit grants were awarded to 137 US medical schools (allopathic and osteopathic). Most grants were to departments of family medicine, because general internal medicine and pediatrics were not eligible until 1998. Using the medical school identifier and state, we linked grants to physician records in the Masterfile, allowing for identification of whether each physician's medical school was receiving Title VII funds during that physician's tenure.

Data on residency grants typically included only an institution and project director. The lack of a common identifier in the AMA Masterfile made matching these grants to programs and, therefore, to physicians, challenging. We matched each recipient institution to a primary care residency program by specialty using FREIDA Online, a database with information on more than 8,200 graduate medical education programs accredited by the Accreditation Council for Graduate Medical Education (ACGME).²⁴ Whenever necessary, we conducted hand searches of ACGME historical data and online searches of grantee program directors. Residency programs were characterized as having had a Title VII grant if one of its listed sponsoring or teaching institutions received a residency grant in the primary care specialty (eg, family medicine) of the residency program. There were a total of 6,245 residency grants to 819 residency programs between 1972 and 2003. Using the constructed institution-program link, as well as the institutional identification number in the Masterfile, allowed for identification of whether each physician's residency program was receiving Title VII funds during that physician's tenure.

For analyses, we labeled physicians as having attended a Title VII-funded medical school if their school received a predoctoral grant, an academic unit

grant, or both during at least one of the years that they attended, and as having attended Title VII–funded residency if their residency program received a residency grant at least 1 year during their tenure.

We used Medicare claims data to identify physicians working in CHCs, using the Centers for Medicaid and Medicare Services outpatient file with a 100% sample of all beneficiaries who had Medicare outpatient facility claims filed in 2001, 2002, and 2003. Data included the billing physician's UPIN number and whether the claim was for a visit to a Federally Qualified Health Center (FQHC). We used UPIN numbers to link claims files to physician records in the Masterfile. We then classified physicians as working in a CHC for any year 2001-2003 if they billed at least 2 claims from a FQHC in at least 1 of the study years. In this way, we could perform a cross-sectional analysis of physicians who worked in a CHC during the 3-year period, but we did not assess whether a physician ever worked in a CHC.

We obtained the NHSC participant database from the HRSA Bureau of Health Professions, NHSC Division, which contained information on all 13,051 NHSC physician participants between 1975 and 2003. Because a unique physician AMA Medical Education identifier is not one of the data elements in the NHSC participant database, we used a combination of 3 algorithms to match these data to the Masterfile. These algorithms combined last name and first name with (1) exact date of birth, (2) medical school, and (3) graduation year. Masterfile records matched by these protocols produced specificities of 99.9%, 98.0% and 96.0% respectively. Using this method allowed us to match 11,318 (86.7%) of all physicians in the NHSC file to physician entries in the Masterfile. Because some physicians had served in the NHSC as long as 30 years before, at least modest attrition was to be expected.

Data Analyses

Title VII and Work in CHC

The proportion of physicians who attended Title VII–funded medical schools and who worked in a CHC in 2001-2003 was compared with the proportion of physicians who attended non–Title VII–funded schools and who worked in a CHC. Predoctoral education grants, academic unit grants, or both were examined separately. Similar comparisons were made among physicians who attended Title VII–funded and non–Title VII–funded residency programs.

All analyses excluded physicians not active in direct patient care, those still in residency training, and those who completed residency before 1970 (before the inception of the Title VII grants programs). Medical school analyses excluded international and Cana-

dian medical graduates, because they could not have attended Title VII–funded medical schools. Residency analyses included international and Canadian medical graduates, but excluded general practitioners and non–primary care physicians because they could not have attended Title VII–funded residency programs, and osteopathic physicians because of the lack of sufficient residency data in the Masterfile. For both medical school and residency analyses, we examined results separately for primary care physicians only (including family physicians, general practitioners, general internists, and general pediatricians), and for family physicians only, because of their distinct funding history. Significance of differences between physicians who attended Title VII–funded, and physicians who attended non–Title VII–funded, training programs was tested using 2-tailed χ^2 analyses.

We used logistic regression analysis to examine the independent contribution of each of the 3 types of grants—predoctoral, academic unit, and residency—on working in a CHC. Additional regression models controlled for year of residency completion, public vs private medical school, participation in the NHSC, and physician sex. We hypothesized that more recent graduates were more likely to attend Title VII–funded training programs (because of more grants being awarded in later years) and more likely to work at CHCs (because of service obligations or desire for an underserved practice experience early in their career). Graduates of state-owned medical schools have been shown to be more likely to enter primary care fields.¹⁶ We controlled for NHSC participation because it is strongly associated with work in a CHC, and trainees willing to participate in the NHSC may also be attracted to training programs that receive Title VII grants to prepare physicians for subsequent work in underserved settings. Only physicians active in direct patient care who graduated from allopathic US medical schools and completed residency training in 1970 or later were included in the regression analyses.

Title VII and NHSC Participation

Similar methods were used to examine the association between attending Title VII–funded training programs and participation in the NHSC LRP. We included in these analyses all physicians in the Masterfile who completed residency in 1987 or later, based on the start date for the NHSC LRP program. International and Canadian medical graduates were excluded because they are not eligible for NHSC participation. General practitioners, non–primary care physicians, and osteopathic physicians were excluded from residency analyses for the reasons described above.

For all bivariate analyses, significance of differences

between physicians who attended Title VII–funded programs and those who attended non–Title VII–funded programs was tested using 2-tailed χ^2 analyses. We performed logistic regression analysis to examine the association between having attended Title VII–funded programs and participation in the NHSC LRP. The dependent variable was NHSC LRP participation. We hypothesized that attending Title VII–funded medical school and Title VII–funded residency programs would each be associated with NHSC LRP participation, but that the effect of Title VII funding during residency would be stronger given that it is more proximal in time to LRP participation. We therefore included separate independent variables for having attended programs with an academic unit grant, a predoctoral grant, and a residency grant.

Covariates included year completed residency, physician sex, and public vs private medical school. Prior research has shown that graduates of state-owned medical schools are more likely to enter primary care fields.¹⁶ In addition, tuition differences between public and private schools may affect student debt and thereby influence decisions to participate in the NHSC LRP. The NHSC LRP model was run for primary care physicians only and family physicians only. Inclusion and exclusion criteria for regression analyses were the same as for the bivariate NHSC analyses.

RESULTS

Descriptive statistics of physicians are displayed in Table 1. The number of physicians for each analysis varies for reasons described in the Methods.

Title VII–Funded Medical Training and Work in CHCs

As shown in Table 2, 3.0% of physicians who attended Title VII–funded medical schools worked in CHCs in 2001–2003, compared with 1.9% of physi-

cians who attended medical schools that were not Title VII funded ($P < .001$). Attending a medical school with each type of grant was associated with a greater likelihood of working in a CHC. In analyses limited by specialty, primary care physicians and family physicians/general practitioners who had attended Title VII–funded medical schools were also significantly more likely to be working in a CHC. Also shown in Table 2, 4.4% of primary care physicians who had attended

Table 1. Physicians Attending Title VII–Funded Programs, Working in CHCs and Participating in the NHSC LRP, by Specialty

Characteristic	All Specialties No. (%)	PCPs Only No. (%)	FP/GPs Only No. (%)
Analysis of CHC staffing^a			
Total N for medical school analysis ^b	412,012	138,197	58,299
Attended Title VII–funded medical school	201,186 (48.8)	78,612 (56.9)	36,326 (62.3)
Academic unit grant only	28,363 (6.9)	10,652 (7.7)	4,630 (7.9)
Predoctoral grant only	59,535 (14.4)	22,167 (16.0)	10,049 (17.2)
Both grants	113,288 (27.5)	45,793 (33.1)	21,647 (37.1)
Attended non–Title VII–funded medical school	210,826 (51.2)	59,585 (43.1)	21,973 (37.7)
Worked in CHC (2001–2003)	9,943 (2.4)	5,329 (3.9)	3,208 (5.5)
Total N for residency analysis ^c		173,656	59,354
Attended Title VII–funded residency	N/A	70,529 (40.6)	25,098 (42.3)
Attended non–Title VII–funded residency	N/A	103,127 (59.4)	32,256 (57.7)
Worked in CHC (2001–2003)	N/A	6,759 (3.9)	3,408 (5.7)
Analysis of NHSC LRP participation^d			
Total N for medical school analysis	278,975	98,390	41,275
Attended Title VII–funded medical school	192,878 (69.1)	73,405 (74.6)	32,753 (79.4)
Academic unit grant only	24,093 (8.6)	8,791 (8.9)	3,624 (8.8)
Predoctoral grant only	49,134 (17.6)	17,694 (18.0)	7,657 (18.6)
Both grants	119,651 (42.9)	46,920 (47.7)	21,472 (52.0)
Attended non–Title VII–funded medical school	86,097 (30.9)	24,985 (25.4)	8,522 (20.6)
Participated in NHSC LRP	N/A	2,017 (2.1)	1,272 (3.1)
Total N for residency analysis ^c		87,591	34,224
Attended Title VII–funded residency	N/A	40,738 (46.5)	14,400 (42.1)
Attended non–Title VII–funded residency	N/A	46,853 (53.5)	19,824 (57.9)
Participated in NHSC LRP	N/A	1,678 (1.9)	997 (2.9)

CHC = community health center; CMS = Centers for Medicare & Medicaid Services; FP = family physician; GP = general practitioner; HRSA = Health Resources and Services Administration; NHSC = National Health Services Corps; LRP = Loan Repayment Program; PCPs = primary care physicians (includes FPs, GPs, general internists, and general pediatricians).

^a Includes all US physicians who reported their major professional activity as “direct patient care” and who completed residency in 1970 or later.

^b International and Canadian medical school graduates were excluded because they could not have been exposed to Title VII funds during medical school.

^c Osteopathic physicians were excluded from residency analyses due to insufficient osteopathic residency data in the AMA Masterfile. General practitioners were excluded from residency analyses because they generally do not undergo full residency training.

^d Includes all US physicians who completed residency in 1987 or later. International and Canadian medical school graduates were excluded because they are not eligible for the NHSC.

Data source: 2004 AMA Physician Masterfile and HRSA Title VII Training Program grantee database; CMS outpatient claims file, 2001, 2002, 2003; and HRSA Bureau of the Health Professions NHSC participant database.

Title VII–funded residency programs worked in CHCs in 2001-2003 ompared with 3.5% of primary care physicians who attended non–Title VII-funded residency programs. Among family physicians attending Title VII–funded residency programs, 6.8% worked in CHCs compared with 5.0% of their counterparts who attended non–Title VII-funded programs

Table 3 shows the results of the regression models summarizing the association between physicians attending Title VII–funded programs and working in a CHC. Among all physicians, attending a pro-

gram with a Title VII predoctoral grant (odds ratio [OR]= 1.25; 95% confidence interval [CI], 1.19-1.32), an academic unit grant (OR = 1.28; 95% CI, 1.22-1.35), and a residency grant (OR= 1.16; 95% CI, 1.11-1.20) were each independently and significantly associated with working in a CHC. Not surprisingly, the odds ratios for the associations between attending a Title VII–funded residency program and working in a CHC were greater when limited to primary care physicians and family physicians, since the effect of the residency training grant exposure is diluted in analyses that

include non–primary care physicians who subspecialized after generalist training or who trained in programs that would not have been eligible for Title VII grants. In regression models that included additional covariates, attending programs with Title VII academic unit and residency grants remained significantly and positively associated with working in a CHC (Table 3). Attending medical schools with Title VII predoctoral grants was no longer significant in the all physician and primary care physician models, however, and had a significant, negative association in the model for family physicians. NHSC participation had a strong, positive association with working in a CHC.

Title VII–Funded Medical Training and NHSC LRP Participation

As shown in Table 2, the percentage of physicians participating in the LRP was 0.9% among physicians attending Title VII–funded medical schools, and 0.7% among physicians who attended non–Title VII-funded schools ($P < .001$). The proportion of family physicians and general practitioners who participated in the LRP was the same (3.1%) among those who attended Title VII–funded medical schools and those who did not, although 3.8% of family physicians and general practitioners attending a medical school with a pred-

Table 2. Number (%) of Physicians Attending Title VII–Funded Training Programs That Worked in Community Health Centers (2001-2003) or Ever Participated in the NHSC Loan Repayment Program

Characteristic	All Specialties No. (%)	PCPs Only No. (%)	FP/GPs Only No. (%)
Physicians that worked in CHCs^a			
Medical school analysis ^b			
Attended Title VII-funded medical school	5,934 (3.0) ^e	3,515 (4.5) ^e	2,258 (6.2) ^e
Academic unit grant only	847 (3.0) ^e	506 (4.8) ^e	301 (6.5) ^e
Predoctoral grant only	1,624 (2.7) ^e	914 (4.1) ^e	574 (5.7) ^e
Both grants	3,465 (3.1) ^e	2,095 (4.6) ^e	1,383 (6.4) ^e
Attended non–Title VII-funded medical school	4,007 (1.9) ^e	1,814 (3.0) ^e	950 (4.3) ^e
Residency analysis ^c			
Attended Title VII–funded residency	N/A	3,130 (4.4) ^e	1,698 (6.8) ^e
Attended non–Title VII-funded residency	N/A	3,629 (3.5) ^e	1,710 (5.0) ^e
Physicians that participated in NHSC LRP^d			
Medical school analysis			
Attended Title VII–funded medical school	1,828 (0.9) ^e	1,508 (2.1)	1,011 (3.1)
Academic unit grant only	204 (0.8)	169 (1.9)	99 (2.7)
Predoctoral grant only	494 (1.0) ^e	413 (2.3) ^f	292 (3.8) ^g
Both grants	1,130 (0.9) ^e	926 (2.0)	620 (2.9)
Attended non–Title VII-funded medical school	626 (0.7)	509 (2.0)	261 (3.1)
Residency analysis ^c			
Attended Title VII–funded residency	N/A	891(2.2) ^e	524 (3.6) ^e
Attended non–Title VII-funded residency	N/A	787(1.7)	473 (2.4)

CHC = community health center; CMS = Centers for Medicare and Medicaid Services; FP = family physician; GP = general practitioner; NHSC = National Health Service Corps; HRSA = Health Resources and Services Administration; LRP = Loan Repayment Program; PCPs = primary care physicians (includes FPs, GPs, general internists, and general pediatricians).

^a Includes all US physicians who reported their major professional activity as “direct patient care” and who completed residency in 1970 or later.

^b International and Canadian medical school graduates excluded because they could not be exposed to Title VII during medical school.

^c GPs and osteopathic physicians excluded from residency analyses because GPs generally do not undergo full residency training, and because there are insufficient osteopathic residency data in the AMA Masterfile.

^d Includes all US physicians who completed residency in 1987 or later. International and Canadian medical school graduates were excluded because they are not eligible for the NHSC LRP.

^e Significant at $P < .001$ for comparisons between physicians who attended Title VII–funded programs and physicians who attended non–Title VII-funded programs, using χ^2 tests.

^f Significant at $P < .05$ for comparisons between physicians who attended Title VII–funded programs and physicians who attended non–vTitle VII-funded programs, using χ^2 tests.

^g Significant at $P < .01$ for comparisons between physicians who attended Title VII–funded programs and physicians who attended non–Title VII-funded programs, using χ^2 tests.

Data source: 2004 AMA Physician Masterfile; HRSA Title VII Training Program grantee database; CMS outpatient claims file, 2001, 2002, 2003; and HRSA Bureau of the Health Professions NHSC participant database.

Table 3. Logistic Regression Analysis of the Effects of Physicians Attending Title VII–Funded Training Programs and Work in Community Health Centers (2001-2003)

Characteristic	All Physicians ^a OR (95% CI)	PCPs Only ^a OR (95% CI)	Family Physicians Only ^a OR (95% CI)	All Physicians ^b OR (95% CI)	PCPs Only ^b OR (95% CI)	Family Physicians Only ^b OR (95% CI)
Attended Title VII–funded training program						
Predoctoral grant	1.25 ^c (1.19-1.32)	1.15 ^c (1.08-1.24)	1.12 ^d (1.02-1.22)	1.03 (0.97-1.08)	0.94 (0.87-1.01)	0.86 ^e (0.78-0.95)
Academic unit grant	1.28 ^c (1.22-1.35)	1.28 ^c (1.20-1.37)	1.15 ^c (1.08-1.22)	1.11 ^c (1.06-1.17)	1.12 (1.04-1.20) ^e	1.07 (0.98-1.18)
Residency grant	1.16 ^c (1.11-1.20)	1.29 ^c (1.22-1.37)	1.43 ^c (1.33-1.55)	1.08 ^c (1.04- 1.13)	1.23 ^c (1.16-1.31)	1.41 ^c (1.30-1.52)
NHSC participant	–	–	–	6.99 ^c (6.51-7.50)	6.16 ^c (5.68-6.69)	5.87 ^c (5.29-6.52)
Attended private medical school	–	–	–	1.04 (1.00-1.09)	1.04 (0.97-1.11)	1.17 ^c (1.07-1.27)
Female	–	–	–	1.30 ^c (1.25-1.36)	1.20 ^c (1.13-1.28)	1.44 ^c (1.33-1.56)
Year completed residency						
1995-1999	–	–	–	1.20 ^c (1.12-1.28)	1.12 ^e (1.03-1.23)	1.01 (0.91-1.13)
1990-1994	–	–	–	0.87 ^c (0.81-0.93)	0.88 ^e (0.80-0.97)	0.78 ^c (0.69-0.89)
1985-1989	–	–	–	0.60 ^c (0.55-0.65)	0.56 ^c (0.51-0.63)	0.46 ^c (0.40-0.53)
1980-1984	–	–	–	0.56 ^c (0.51-0.61)	0.45 ^c (0.40-0.51)	0.36 ^c (0.31-0.43)
1975-1979	–	–	–	0.60 ^c (0.54-0.66)	0.48 ^c (0.41-0.56)	0.41 ^c (0.33-0.50)
1970-1974	–	–	–	0.49 ^c (0.43-0.55)	0.47 ^c (0.38-0.58)	0.28 ^c (0.20-0.39)

CI = confidence interval; CMS = Centers for Medicare and Medicaid Services; HRSA = Health Resources and Services Administration; NHSC = National Health Service Corp; OR = odds ratio; PCPs = primary care physicians (family physicians, general practitioners, general internists, and general pediatricians).

Note: Includes all US physicians who reported their major professional activity as “direct patient care” and who completed residency in 1970 or later. Osteopathic physicians excluded because of insufficient osteopathic residency data in AMA Masterfile. International and Canadian medical school graduates excluded because they could not have attended Title VII–funded medical school. General practitioners excluded because they generally do not undergo full residency training.

^a Referent group: attended non–Title VI–funded medical school and residency program.

^b Referent group: male, attended public medical school, completed residency training after 1999, NHSC nonparticipant, attended non–Title VII–funded medical school or residency program.

^c Statistically significant ($P < .001$).

^d Statistically significant ($P < .02$).

^e Statistically significant ($P < .01$).

Data source: 2004 AMA Physician Masterfile; HRSA Title VII Training Program grantee database; HRSA Bureau of Health Professions NHSC participant base; and CMS outpatient claims file, 2001, 2002, 2003.

doctoral grant subsequently participated in the NHSC LRP ($P < .01$). Among primary care physicians attending Title VII–funded residency programs, the proportion who participated in the NHSC LRP was 2.2%, compared with 1.7% among other primary care physicians ($P < .001$); 3.6% of family physicians who attended Title VII–funded residency programs were LRP participants, compared with only 2.4% who attended non–Title VII–funded programs ($P < .001$).

Table 4 displays the results of the logistic regression analysis for participation in the NHSC LRP. Among primary care physicians, attending a Title VII–funded medical school with a predoctoral grant, but not an academic unit grant, was positively associ-

ated with NHSC LRP participation. Attending a Title VII–funded residency program (OR = 1.27; 95% CI, 1.15-1.40) was also positively and significantly associated with NHSC LRP participation. The strong association between LRP participation and having attended Title VII–funded residency programs, relative to attending medical schools with predoctoral or academic unit grants, may be explained by the distance between medical school and the decision to participate in the LRP (usually during or after residency). In the family physician-only analysis, having attended a Title VII–funded residency program was strongly associated with NHSC LRP participation (OR = 1.56; 95% CI, 1.37-1.77). Attending a medical school with a Title VII

predoctoral grant had a positive, but not statistically significant, coefficient in the model. Attending a medical school with an academic unit grant was negatively associated with participation in the LRP (OR = 0.85; 95% CI, 0.73-0.98).

DISCUSSION

We found a strong association between attending Title VII-funded medical training programs and 2 important outcome variables: (1) practice in CHCs, and (2) participation in the NHSC LRP. In regression models controlling for other factors, attending Title VII-funded medical schools and residency programs were independently associated with participation in the NHSC LRP, as well as independently associated with working in a CHC, even when controlling for NHSC participation, an important pathway to practice in underserved settings. This study is the first to examine the Title VII grants program in such a comprehensive manner by using the AMA Masterfile enhanced through analytic linkages with multiple other data sources, including Medicare claims data.

Our findings are consistent with previous research on Title VII funding, specialty choice, and practice

in underserved communities.^{19,20} This study adds to the specificity of the association of these grants, both to when medical trainees are exposed and to where they wind up practicing. That the effects of attending schools with predoctoral and academic unit grants show a weaker association with outcome variables in regression models limited to primary care physicians or family physicians should be considered in the context of earlier research showing that greater proportions of students exposed to Title VII grants during medical school pursue primary care specialties, especially family medicine, and practice in rural areas.¹⁶⁻²⁰ Characterizing predoctoral grant effects as insignificant or inhibitory would be incorrect. Rather, the positive relationships between medical school grants and our outcome variables among all physicians appears to be moderated in the analyses limited to primary care physicians and/or family physicians by the choice of residency—eg, more graduates from Title VII-funded schools enter primary care and family medicine—rather than medical school grants selectively influencing practice choices among the graduates entering these specialties. Our findings suggest that once physicians have made the decision to enter into primary care and family medicine residency programs, they are

more strongly influenced in their practice decisions by exposure to Title VII residency grants.

Our study has several limitations. First, the observational nature of the study design limits the ability to make causal inferences. Although we controlled for several possible confounding variables, it is possible that attending medical schools and residency programs with Title VII funding is correlated with some unmeasured characteristics of physicians or their training environments. Moreover, it is possible that causation works in the opposite direction. For example, medical schools and residency programs with a large proportion of their graduates working in underserved settings receive additional points in the HRSA grant-review-scoring system, so these schools and programs may be more likely to receive Title VII grants as a result of having many graduates working in CHCs. We attempted to address these issues of reverse

Table 4. Logistic Regression Analysis of the Effects of Physicians Attending Title VII–Funded Training Programs on Participation in the National Health Service Corps Loan Repayment Program (1987-2003)

Characteristic	PCPs Only n = 87,558 OR (95% CI)	Family Physicians Only n = 34,212 OR (95% CI)
Attended Title VII–funded training programs		
Academic unit grant	0.96 (0.86-1.08)	0.85 (0.73-0.98) ^a
Predoctoral grant	1.15 (1.02-1.30) ^a	1.17 (0.99-1.38)
Residency grant	1.27 (1.15-1.40) ^b	1.56 (1.37-1.77) ^b
Attended private medical school	1.41 (1.27-1.57) ^b	1.60 (1.39-1.83) ^b
Female	0.91 (0.83-1.00)	0.80 (0.70-0.91) ^c
Year completed residency		
1995-1999	1.42 (1.24-1.63) ^b	1.38 (1.17-1.63) ^b
1990-1994	1.72 (1.50-1.97) ^b	1.32 (1.10-1.58) ^c
1985-1989	0.74 (0.61-0.90) ^c	0.57 (0.44-0.74) ^b

CI = confidence interval; HRSA = Health Resources and Services Administration; NHSC = National Health Service Corps; OR = odds ratio; PCPs = primary care physicians (family physicians, general practitioners, general internists, and general pediatricians).

Note: Includes all US physicians who completed residency in 1987 or later. International and Canadian medical school graduates excluded because they are not eligible for NHSC participation. Osteopathic physicians excluded because of insufficient osteopathic residency data in the AMA Masterfile. General practitioners excluded because they generally do not undergo full residency training.

Referent group: male, attended public medical school, completed residency after 1999, attended non–Title VII-funded medical school and residency program.

^a Statistically significant ($P < .03$).

^b Statistically significant ($P < .001$).

^c Statistically significant ($P < .01$).

Data source: 2004 AMA Physician Masterfile; HRSA Title VII Training Program grantee database; and HRSA Bureau of the Health Professions NHSC participant database.

causality by using only current practice at a CHC as the outcome variable, for example, and retrospectively measuring whether individual physicians had attended Title VII–funded medical schools and residency programs. Including NHSC scholarship participation in the NHSC control variable in the regression models predicting CHC participation may also serve as a proxy for measuring physicians' underlying predisposition to work at a CHC, insofar as NHSC scholarship participants have committed to this career pathway at medical school matriculation and before exposure to Title VII–supported activities. Also, the Title VII grant-funding history for most institutions allows for a form of pre-post analysis at the institution level, as once an institution received a Title VII grant it was unlikely to lose the funding in subsequent years. The great majority of physicians in our group attending non-Title VII-funded medical training programs therefore attended a medical school or residency program that either never received a Title VII grant or had not yet received a Title VII grant.

Another limitation is the use of Medicare claims data to identify physicians working in CHCs. Although accurate, this method may be susceptible to false-negative bias, because some physicians working in CHCs (eg, pediatricians) may not be identified using Medicare claims. Undercounting physicians working in CHCs should not bias the association between attending Title VII–funded programs and subsequent CHC practice.

Our findings represent conservative estimates of the number of physicians staffing CHCs and similar safety net clinics. We measured physician practice at a CHC during only a 3-year period and focused on federally designated CHCs; other types of safety net clinics (state- and county-sponsored clinics, free clinics, etc), were not considered. Previous studies suggest that including service at CHCs in earlier years and counting physicians working in non-CHC safety net clinics would produce higher overall estimates of Title VII exposure and safety net clinic practice.^{19,20} Similarly, our NHSC LRP participation outcome variable does not consider participation in the large number of state-run loan-forgiveness and related programs that provide financial support in exchange for physicians' service in defined underserved areas. We would expect training in Title VII–funded schools and residency programs to be similarly associated with participation in these state-run programs.

In summary, our findings provide evidence that the Title VII Section 747 grant program supports the training of physicians who are more likely to staff CHCs and participate in the NHSC LRP. These findings have important implications for federal policy decisions, including the recent major reduction in

Title VII Section 747 funding. Reductions in Title VII destabilize institutions that disproportionately serve as the pipeline for producing physicians who participate in the NHSC and/or work at CHCs, potentially undermining the federal effort to improve access for the underserved through CHC expansion. Ongoing federal investment in the medical education pipeline to prepare and motivate physicians to participate in the NHSC and to work in CHCs should be considered an integral component of efforts to improve access to care for the underserved.

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Key words: Title VII training programs; community health centers; National Health Service Corps; medically underserved area/manpower; education, medical; health policy research; primary health care

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