



**Growth in Physicians and Advanced-Practice Nurses in Counties Targeted
by the Robert Wood Johnson Foundation's Southern Rural Access Program:
2002 and 2003**

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Background

In 1997 the Robert Wood Johnson Foundation solicited proposals from health care leaders in southeast states for a new initiative, the Southern Rural Access Program (SRAP). The Foundation subsequently awarded grants through this program to leadership consortia in eight states—Alabama, Arkansas, Georgia, Louisiana, Mississippi, South Carolina, Texas and West Virginia—to support programs to “increase the supply of primary care providers in underserved areas” and strengthen the health care infrastructure of states and communities and their capacity to address their health needs. Through initial funding and subsequent renewal grants, the program has provided over \$30 million for four types of initiatives intended to (1) recruit and retain primary health care practitioners, (2) develop a cadre of health professions students committed to careers as leaders in primary care in underserved areas (“pipeline” initiatives), (3) develop collaborative networks of rural health providers to foster joint planning and programs, and (4) create revolving loan programs to give rural providers access to affordable capital needed to expand facilities and services.¹ The Rural Health Policy Center at Penn State University has served as the SRAP’s National Program Office² providing coordination, oversight and technical assistance to the program’s grantees (<http://www.srap.org/>).

In early 1999 rural health researchers at the Cecil G. Sheps Center for Health Services Research at the University of North Carolina at Chapel Hill were awarded a one-year planning grant to prepare a proposal for an evaluation of the first four years of the SRAP. An evaluation proposal, “Implementation of the Evaluation of the Southern Rural Access Program”, was developed after site visits to SRAP grantees and negotiations with Foundation staff, and was submitted in March 2000. The proposal was funded the following month for a project to run from May 1, 2000 through April 30, 2004, subsequently extended to October 31, 2004.

One of SRAP’s central goals was to recruit and retain primary care physicians and advanced-practice nurses—nurse practitioners and nurse midwives—into the South’s rural underserved communities. **Accordingly, one of the three principal activities of the funded evaluation was to assess whether the SRAP grantees’ initiatives were measurably improving the availability of primary health care professionals in the program’s targeted counties and parishes. The findings of this aspect of the evaluation are presented in this report.** (The other principal activities of the evaluation were to assess whether population survey indicators of access to health care showed access was improving in SRAP-targeted communities and to document grantees’ success in implementing their planned initiatives through analyses of their progress report data.³)

¹ Beachler M, Holloman C, Herman J. Southern Rural Access Program: An Overview. *The Journal of Rural Health*. 2003;19:301-307.

² Hughes RG. National Programs: Understanding the Robert Wood Johnson Foundation Approach to Grantmaking. In: *To Improve Health and Health Care, Volume VIII*. Stephen L. Isaacs and Knickman JR, eds. San Francisco: Jossey-Bass, 2005; pp-177-197.

³ Pathman DE, Thaker S, Ricketts, TC, Albright JB. Use of Program Logic Models in the Southern Rural Access Program Evaluation. *The Journal of Rural Health*. 2003;19 (supplement):308-313.

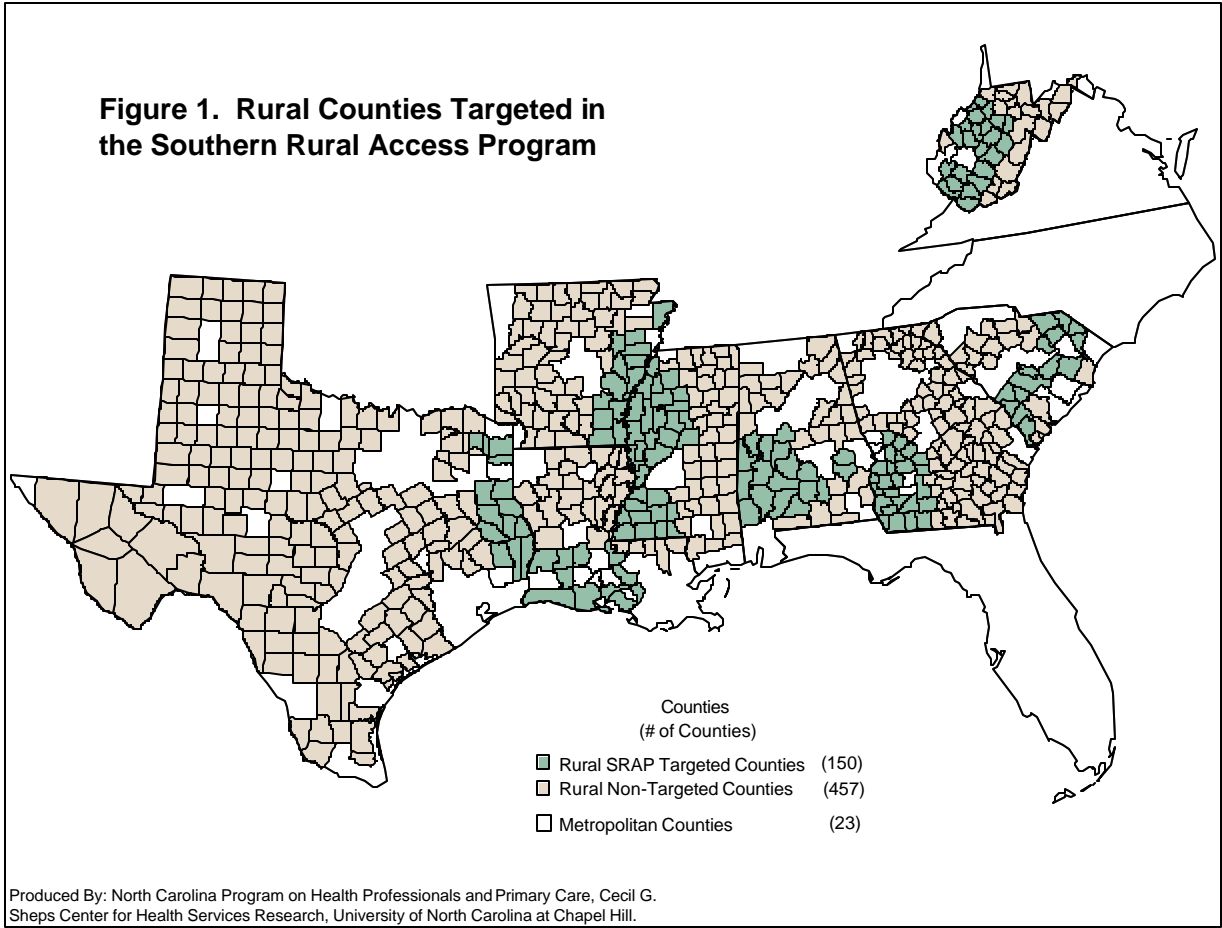
From the beginning, the evaluation team, Foundation staff and grantees understood that it would be difficult for SRAP initiatives to affect the measured availability of primary health care practitioners within the four-year span of the initially funded evaluation. While some of grantees' initiatives might yield immediate growth in practitioner numbers, such as hiring regional practitioner recruitment staff and providing practice management consultations, the effects of other types of initiatives were not expected to be seen for seven to ten years or more. For example, college students currently participating in SRAP pipeline initiatives preparing to become rural physician leaders will not appear on rosters of rural practitioners until after they have completed college, four years of medical school and at least three years of residency training. The measured effect of the SRAP on the availability of primary care practitioners at this point in the program's history, therefore, may or may not accurately reflect the program's ultimate impact on rural practitioner availability. These data provide, nevertheless, an assessment of the SRAP's effect on the growth of primary care practitioners in SRAP-targeted counties after the first four years of program efforts. A current follow-up evaluation (grant #044706) will enable these analyses to be extended for another two years, through December 2005.

Overview of the Analyses

The evaluation's study design is principally an "untreated control group design with pretest and posttest".⁴ Grantees focused their SRAP initiatives on specific clusters of rural counties (called parishes in Louisiana) in their second round of funding, which began in March 2002. We assessed growth in health care practitioner numbers from December 2001 to December 2003, the first two years of focused interventions, in the SRAP's rural targeted counties and compared this to the growth over the same period in participating states' other (non-targeted) rural counties (**Figure 1**). Growth in numbers of primary care practitioners, rather than practitioners of all specialties combined, was the main focus of the evaluation since they were the intended focus in the Foundation's original design of the SRAP. Grantees' initiatives also emphasized these practitioners. This evaluation report focuses on physicians because they generally received more attention than other practitioners in grantees' initiatives and there were better and more complete data available to evaluate physicians.

We used physician data from the American Medical Association's (AMA) Physician Masterfile, acquired through its vendor, Medical Marketing Service, Inc. of Chicago (<http://www.mmslists.com/main.asp>). The Masterfile contains location data on all U.S. allopathic physicians (including both members and non-members of the AMA) and the vast majority of osteopathic physicians, including virtually all younger osteopathic physicians. We explored the use of state physician licensing data, but the AMA data proved preferable for our analyses because of their consistency across states and because we had comparable 1996 AMA data on-hand permitting us to assess the pre-intervention growth rate in physicians in both intervention and control group counties (an "untreated control group design with pretest measures at more than one time interval").

⁴ Cook TD, Campbell DT. *Quasi-Experimentation*. Boston: Houghton Mifflin, 1979.



We used data from states' nursing licensing authorities⁵ to assess changes in numbers of nurse practitioners and certified nurse midwives in SRAP and non-SRAP rural counties. We were able to obtain both baseline (ranging between November 2001 to February 2002 across states) and post-intervention (February to May 2004) nursing data from only four of the SRAP's eight states (Mississippi, South Carolina, Texas and West Virginia); consequently, our analyses of nursing data are limited to these states.

Findings are presented as the specific numeric figures we calculated for SRAP counties and non-SRAP counties, and any differences between the two groups are accepted as "real" in the sense that they are the actual group differences: inferential statistics are not needed to assess whether "p-values" for the differences are statistically significant. If figures for the two groups differ, then the groups differ, although the differences could be small and of little real world importance or quite large and important.

This report presents data on the following: (1) baseline demographic differences between the 150 SRAP rural counties and 457 non-SRAP rural counties, (2) primary care physician growth from 1996 to 2001 and from 2001 to 2003 in SRAP and non-SRAP rural counties, (3) specialist physician growth from 1996 to 2001 and from 2001 to 2003 in SRAP and non-SRAP rural counties, (4) state-by-state primary care physician growth from 1996 to 2001 and from 2001 to 2003 in SRAP and non-SRAP counties, (5) primary care physician growth in the poorest (>18% poverty) of SRAP and non-SRAP counties, (6) numerical breakdown of in-migration and out-migration/retirement rates of primary care physicians from practice in SRAP and non-SRAP rural counties for 2001 to 2003, and (7) growth in nurse practitioners and certified nurse midwives in SRAP and non-SRAP rural counties from 2001 to 2003.

Interpreting Program Effects from These Data

In these analyses we looked for patterns of practitioner-to-population ratio changes that support a positive (or negative) impact of the SRAP's interventions. The fundamental pattern we stipulated in advance as evidence of a positive program effect was a greater growth in practitioner-to-population ratios in SRAP than non-SRAP rural counties during the years of targeted SRAP initiatives, 2002 and 2003. For physicians, the availability of 1996 data permitted additional pre-intervention growth rate calculations, which allowed us to also look for changes from pre-intervention to intervention growth rates in physician-to-population ratios in SRAP and non-SRAP counties.

Growth in the supply of primary care physicians was the principal program outcome we assessed, as these practitioners were the focus of the SRAP's initiatives. Growth of primary care advanced practice nurses—nurse practitioners and certified nurse midwives—was a secondary outcome. As another secondary outcome we also assessed changes in the growth of specialist physicians

⁵ Mississippi Board of Nursing; Office of Research & Statistics, South Carolina State Budget & Control Board; Board of Nurse Examiners for the State of Texas; West Virginia Board of Examiners for Registered Professional Nurses

because some of the SRAP's initiatives principally targeted at primary care physicians may have benefited these practitioners well.

Evaluation Limitations

The limitations of this type of evaluation are many. The fact that this analysis occurs only four years into states' SRAP initiatives and just two years after they focused their initiatives on specific rural counties was its greatest limitation. The analysis will be too early to observe changes in practitioner numbers that may still occur over the next three to ten years or more.

Data limitations are also a concern. The AMA physician and state nursing boards' data do not perfectly capture the practitioners working in the counties of interest. Medical Marketing Services (MMS) provided us better address information than is typically available from the Masterfile, allowing us to identify and correct most instances where physicians' preferred mailing addresses—the usual address one obtains from the Masterfile—were homes rather than offices. In this report we refer to this as the “Max Office” address, the name MMS uses for this refined address data. We excluded those listed as not in active practice, e.g., those retired, not practicing, or engaged solely in non-clinical work (administration, research, etc.). All data inaccuracies are expected to affect both SRAP and non-SRAP counties and the pre-intervention (1996), baseline (2001) and post-intervention (2003) periods, and therefore should not create systematic biases in the analyses. The non-systematic (random) inaccuracies, however, will add background “noise” to the findings, which may obscure program effects.

Additionally, the patterns of change in primary care practitioner supply that we accept as evidence of the effect of the SRAP's interventions may be due in part or entirely to other programs, forces and trends in the study and/or comparison counties. During the study years, for example, rapidly rising malpractice insurance costs created financial disincentives for physicians to practice in some states. Conversely, since 2001 the community health resource development efforts of the federal Delta States Rural Development Network Initiative (<http://ruralhealth.hrsa.gov/funding/Delta.htm>) occurring in some of the SRAP and non-SRAP counties may have indirectly drawn practitioners into these areas. **Consequently, the findings of this evaluation can only provide evidence for or against the SRAP's initiatives having an effect on health personnel availability in SRAP counties, but they cannot prove that any observed changes are due to the SRAP's efforts.**

Overview of Findings

County Group Demographics

1. As a whole, SRAP-targeted rural counties were substantially more socio-economically stressed than the other rural, comparison counties of the eight states, and they saw less population growth over the study period.

Primary Care Physicians

2. At the 2001 baseline primary care physician-to-population ratios were slightly lower in SRAP counties than non-SRAP counties (58.5 vs. 61.7 physicians per 100,000 population) and had been growing more slowly since at least 1996. During the years of SRAP support from December 2001 to December 2003, primary care physician-to-population ratios grew faster in SRAP than non-SRAP counties (1.37 vs. 0.80 physicians per 100,000 population annually), even after adjusting for the greater population growth rate in non-SRAP counties. This suggests that the SRAP's initiatives had a positive effect on primary care physician growth in targeted counties, yielding an estimated 39 more physicians in SRAP counties from December 2001 to December 2003 than would otherwise have been expected.

Specialist Physicians

3. Specialist physician-per-100,000 population ratios were significantly lower in SRAP counties than in non-SRAP counties at the 2001 baseline point (41.5 vs. 52.0) and had been growing more slowly from 1996 to 2001. From 2001 through 2003 during the years of SRAP support, specialist growth continued to be significantly slower in SRAP than in non-SRAP counties. The SRAP's initiatives, therefore, did not demonstrate a measurable effect on the growth of specialist physicians in SRAP counties from 2001 to 2003.

State-by-State Growth in Primary Care Physicians

4. Observed patterns of physician supply changes provide evidence that SRAP initiatives *positively* affected primary care physician-to-population growth rates in SRAP-targeted counties and parishes in three states (Alabama, Louisiana and West Virginia) and *negatively* affected the growth rate in one state (Georgia). In the remaining four states, patterns of change in SRAP and non-SRAP counties during the pre-intervention and intervention periods did not provide clear evidence for either a positive or negative effect on primary care physician-to-population growth.

Primary Care Physicians in High Poverty Rate Counties

5. Nearly 83% of SRAP counties had more than 18% of individuals living in poverty, whereas 44% of non-SRAP counties did. Within these high-poverty counties, primary care physician-to-population ratios in SRAP and non-SRAP areas were similar at

baseline (2001) but had been growing faster in non-SRAP counties from 1996 to 2001. From December 2001 to December 2003 during the years of SRAP support, ratios of primary care physicians-to-population grew by 0.59 physicians per 100,000 population in SRAP counties but *shrank* by 0.08 physicians per 100,000 population in non-SRAP counties. Growth patterns suggest that the effects of SRAP interventions within poor counties were positive in four states (Alabama, Louisiana, Texas and West Virginia) and negative in two states (Georgia and Mississippi).

In-Migration and Out-Migration of Primary Care Physicians

6. The slightly greater growth of primary care physician numbers in SRAP than non-SRAP counties of the combined eight states from December 2001 to December 2003 resulted from a greater in-migration rate of physicians into SRAP counties than into non-SRAP counties, which more than compensated for the modestly greater out-migration/retirement rate from SRAP than non-SRAP counties.

Nurse Practitioners and Certified Nurse Midwives

7. From 2001 to 2003 nurse practitioners and certified nurse midwives per 100,000 population ratios grew modestly in both SRAP and non-SRAP counties in the combined four states for which we have data. The numbers and changes were small and growth patterns varied across states, with nurse numbers increasing in two states and decreasing in two states. Taken together these data suggest that in 2002 and 2003 the SRAP did not have a significant effect on the expansion of the primary care advanced practice nursing workforce in its targeted counties of the four states for which we have data.

Conclusions

At this point in the Southern Rural Access Program's history, analyses of practitioner data in SRAP-targeted and comparison rural counties and parishes suggest that from 2001 to 2003 the program enhanced the growth of primary care physicians in the combined targeted counties of the SRAP's eight states. An estimated 39 more primary care physicians were practicing in SRAP counties in 2003 due to SRAP initiatives. Patterns of primary care physician growth most clearly suggest positive program effects in Alabama, Louisiana and West Virginia. Data suggest that the program enhanced primary care physician availability in the poorest of rural counties—those with more than 18% of their population below federal poverty levels—in Alabama, Louisiana, Texas and West Virginia. Data on nurse practitioners, nurse midwives and non-primary care specialist physicians do not show patterns of change that suggest that the program has had an effect on their availability.

The evaluation's planned analyses of practitioner data at future points in time will assess whether growth patterns supporting program effects persist, increase or diminish with time as the SRAP's initiatives evolve and have more time for their impact to be reflected in changing practitioner populations.

Detailed Findings

County Group Demographics

- 1. As a whole, SRAP-targeted rural counties were substantially more socio-economically stressed than the other rural counties of the eight participating states, and they saw less population growth over the study period.**
 - The 150 rural counties targeted in the SRAP had a combined population of over 3.4 million in the 2001 baseline year. In the same year, the 457 non-targeted rural counties of these eight states, which serve as the comparison counties and populations for this report, had a combined population of 10.1 million.
 - In the 1996 to 2001 pre-intervention period, non-SRAP rural counties experienced greater population growth than SRAP rural counties. During the 2001 to 2003 intervention period, population growth slowed from the previous rate in non-SRAP counties as a group and the population in SRAP counties actually shrank in size.
 - Population characteristics of grantees' SRAP rural counties differed substantially from their states' non-SRAP rural counties. SRAP counties overall had larger populations but had higher levels of poverty, higher unemployment rates, greater racial-ethnic minority compositions, and higher infant mortality rates (**Table 1**). These differences between SRAP and non-SRAP counties held within all states with a few exceptions: (1) Louisiana's SRAP parishes demonstrated less socio-economic need than its other rural parishes on all four measures, (2) West Virginia had few racial-ethnic minorities in both its SRAP and non-SRAP rural counties (about 3%), and (3) poverty rates were slightly higher in Texas' and West Virginia's non-SRAP than SRAP counties, but SRAP counties had greater socioeconomic need by the other three measures.

Table 1. Demographic characteristics of the SRAP and non-SRAP rural counties of the eight participating states

	SRAP Counties (n=150)	Non-SRAP Counties (n=457)
Total population		
1996	3,387,021	9,562,973
2001	3,438,904	10,146,434
Average annual % change from 1996 to 2001	0.30%	1.15%
2003	3,422,017	10,266,517
Average annual % change from 2001 to 2003	-.025%	0.59%
Median county population (2001)	20,339	16,714
Mean county percent individuals below poverty (1999)	21.8%	17.9%
Mean county percent unemployed (2001)	8.2%	5.7%
Mean percent county racial/ethnic minority population (2000)	40.5%	22.6%
Mean county infant mortality per 1000 live births (1996-2000)	10.3%	8.2%

Primary Care Physicians

2. **At the 2001 baseline primary care physician-to-population ratios were slightly lower in SRAP counties than non-SRAP counties (58.5 vs. 61.7 physicians per 100,000 population) and had been growing more slowly since at least 1996. During the years of SRAP support from December 2001 to December 2003, primary care physician-to-population ratios grew faster in SRAP than non-SRAP counties (1.37 vs. 0.80 physicians per 100,000 population annually), even after adjusting for the greater population growth rate in non-SRAP counties. This suggests that the SRAP's initiatives had a positive effect on primary care physician growth in targeted counties, yielding an estimated 39 more physicians in SRAP counties from December 2001 to December 2003 than would otherwise have been expected.**

Primary care physicians (PCPs)—family physicians, general internists, general pediatricians and obstetrician/gynecologists—are the specialties principally targeted in states' SRAP initiatives. We posited that the changes in primary care physician-to-population ratios in SRAP counties, relative to changes for non-SRAP counties, was the best single indicator of the effect of states' physician recruitment and retention efforts. In these analyses we find the following, based on the data of **Tables 2 and 3** and **Figures 2 and 3**.

- Using Max Office address data—the AMA's best physician location data—we find that at the 2001 baseline point primary care physician-to-population ratios were just slightly lower in SRAP than non-SRAP counties (58.5 vs. 61.7 primary care physicians per 100,000 population).
- The average annual growth in primary care physician-to-population ratios was nearly 50% greater in SRAP counties than non-SRAP counties from 2001 to 2003, the years they received SRAP support (annual growth rates of 1.37 vs. 0.80 physicians per 100,000 population, respectively).
- Greater growth in primary care physician to population ratios in SRAP counties than non-SRAP counties was due both to a greater percentage increase in numbers of primary care physicians (2.1% vs. 1.9%) and less growth in population ratio denominators (-.025% vs. 0.59% annual growth).

If annual population growth in SRAP counties between 2001 and 2003 had been the same 0.59% seen in non-SRAP counties, the average annual change in primary care physician to population ratios in SRAP counties would have been 0.86, just slightly greater than the 0.80 rate seen in non-SRAP counties. But since population growth is a key factor in attracting new physicians and the growth of physician numbers, even a slightly greater growth rate in primary care physicians in SRAP counties is significant in the face of their declining populations.

- We estimate that the faster growth rate in primary care physician per 100,000 population ratios in SRAP than non-SRAP counties yielded an extra 39 primary care physicians in

SRAP counties from 2001 than 2003 than there would have been if the growth rate in SRAP counties had been the same as that of non-SRAP counties over this period.

- SRAP and non-SRAP counties that gained at least one physician from December 2001 to December 2003 are shown in **Figure 3**.

Table 2. Primary care physician (PCP) counts, ratios to population and changes in SRAP and non-SRAP rural counties, December 2001 and December 2003

	SRAP Counties		Non-SRAP Counties	
	2001	2003	2001	2003
Total number of PCPs	2,013	2,097	6,257	6,495
Average annual change in PCPs from 2001 to 2003	---	42 (2.1%)	---	119 (1.9%)
Number (%) of counties with increase in PCPs from 2001 to 2003	---	66 (44.9%)	---	179 (41.4%)
PCPs per 100,000 population	58.5	61.3	61.7	63.3
Average annual change in PCPs per 100,000 population from 2001 to 2003	---	1.37	---	0.80
Average % annual change in PCPs per 100,000 population from 2001 to 2003	---	2.3%	---	1.3%

Data: AMA Masterfile “Max Office” addresses

To understand whether the faster rate of growth in primary care physician-to-population ratios in SRAP compared to non-SRAP counties from 2001 to 2003 was simply a continuation of a rate difference from previous years rather than an effect of the SRAP’s interventions, we compared the growth rates in the two groups of counties from 1996 to 2001 prior to the SRAP’s geographically targeted initiatives. AMA Masterfile Max Office addresses were not available for 1996, consequently for these analyses we used Masterfile standard addresses, which are physicians’ preferred mailing addresses. We find the following based on the data in **Table 3** and **Figure 2**:

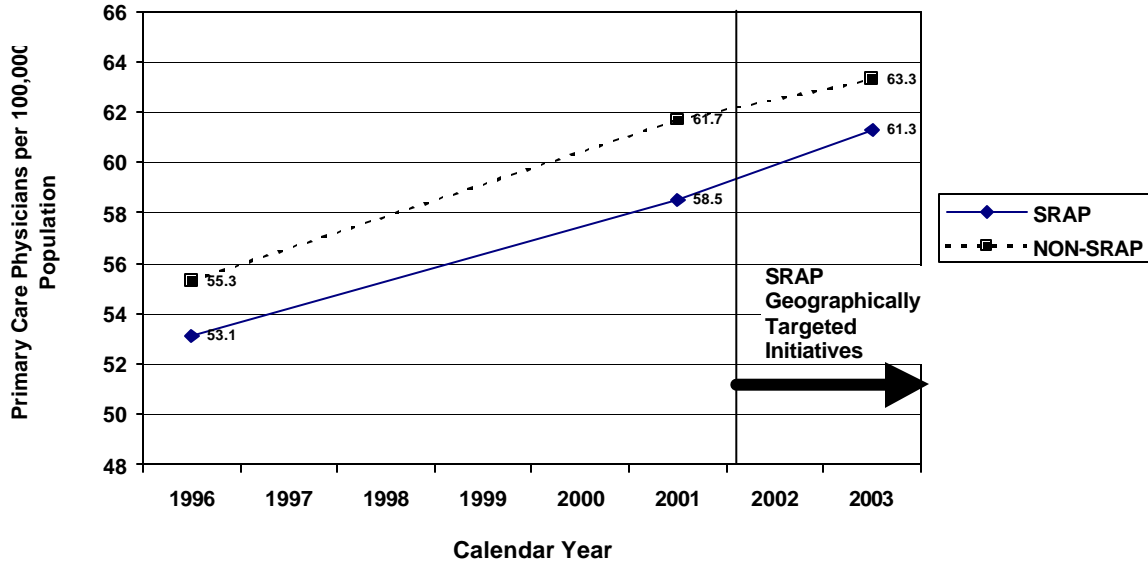
- Using AMA Masterfile standard address data, 2001 primary care physician-to-population ratios for the SRAP and non-SRAP county groups looked very similar to the ratios based on Max Office data, again with ratios found to be slightly lower in SRAP counties than non-SRAP counties (58.1 vs. 61.5).
- During the 1996-2001 baseline years, the average annual rate of growth in primary care physicians per 100,000 population was slightly less in SRAP-supported counties than non-SRAP counties (1.01 vs. 1.24 per 100,000).
- Based on these findings, we conclude that the greater growth in primary care physician-to-population ratios of SRAP counties compared to non-SRAP counties from 2001 to 2003 observed with Max Office addresses for the eight states combined was not simply a continuation of growth patterns of previous years. The absence of a baseline growth rate advantage in SRAP counties strengthens the evidence that the greater primary care physician-to-population growth in SRAP than non-SRAP counties from 2001 to 2003 was due to the initiatives of the SRAP.

Table 3. Primary care physician counts, ratios to population and percent change in SRAP and non-SRAP rural counties, December 1996, 2001 and 2003

	SRAP Counties (n=150)			Non-SRAP Counties (n=457)		
	1996	2001	2003	1996	2001	2003
Total number of PCPs	1,797	1,998	2,047	5,291	6,245	6,503
Primary Care Physicians per 100,000 population	53.1	58.1	59.8	55.3	61.5	63.3
Average annual change in PCPs per 100,000 population from 1996 to 2001 & 2001 to 2003	---	1.01	0.86	---	1.24	0.90
Average annual % change in PCPs per 100,000 population from 1996 to 2001 & 2001 to 2003	---	1.9%	1.5%	---	2.2%	1.5%

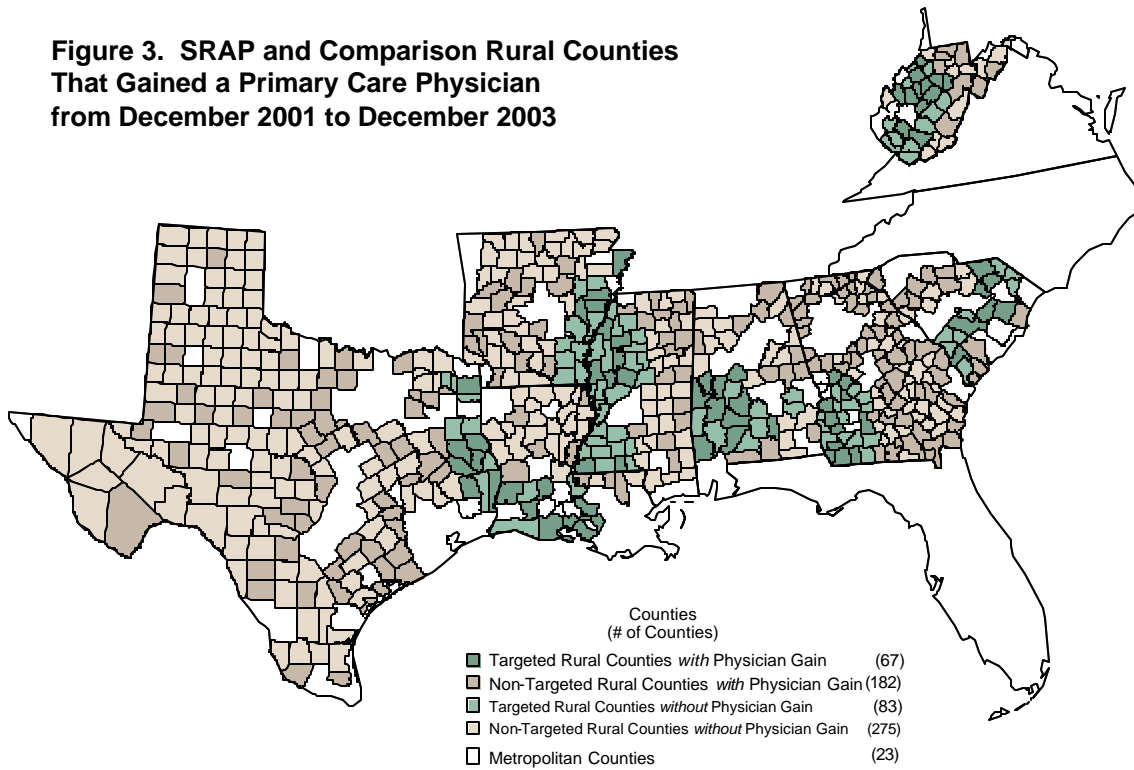
Data: AMA Masterfile standard addresses

Figure 2. Primary care physicians per 100,000 population in SRAP and non-SRAP counties: December 1996, 2001 and 2003



Data: AMA Masterfile standard addresses for 1996
Max Office addresses for 2001 and 2003

Figure 3. SRAP and Comparison Rural Counties That Gained a Primary Care Physician from December 2001 to December 2003



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Specialist Physicians

- 3. Specialist physician-per-100,000 population ratios were significantly lower in SRAP counties than in non-SRAP counties at the 2001 baseline point (41.5 vs. 52.0) and had been growing more slowly from 1996 to 2001. From 2001 through 2003 during the years of SRAP support, specialist growth continued to be significantly slower in SRAP than in non-SRAP counties. The SRAP's initiatives, therefore, did not demonstrate a measurable effect on the growth of specialist physicians in SRAP counties from 2001 to 2003.**

Specialist physicians, which we defined as physicians practicing in specialties other than family practice, general internal medicine, general pediatrics and obstetrics/gynecology, were not the principal focus of the SRAP's initiatives. However, in a number of states specialists were eligible for support through some SRAP initiatives—revolving loan funds, network participation, recruitment programs—and their numbers might have been affected. Based on the data of **Table 4** we conclude the following about specialist physician growth:

- Using the Max Office address data we find at the 2001 baseline that specialist availability was significantly less in SRAP counties than in non-SRAP counties (41.5 vs. 52.0 specialists per 100,000 population, respectively).
- During years of SRAP support, December 2001 to 2003, the average annual growth in specialist physicians-per-100,000 population in SRAP counties was only half that in non-SRAP counties (0.44 vs. 1.08 specialist physicians per 100,000 population). Fewer SRAP than non-SRAP counties saw growth in their specialist physician-to-population ratios (27.5% vs. 34.2%).

Table 4. Specialist physician (SP) counts and percent change in SRAP and non-SRAP rural counties, December 2001 and December 2003

	SRAP Counties		Non-SRAP Counties	
	2001	2003	2001	2003
Total number of SPs	1,428	1,451	5,273	5,557
Average annual change in SPs from 2001 to 2003	---	12 (0.8%)	---	142 (2.7%)
Number (%) of counties with increase in SPs from 2001 to 2003	---	36 (27.5%)	---	132 (34.2%)
SPs per 100,000 population	41.5	42.4	52.0	54.1
Average annual change in SPs per 100,000 pop from 2001 to 2003	---	0.44	---	1.08
Average annual % change in SPs per 100,000 pop from 2001 to 2003	---	1.06%	---	2.08%

Data: AMA Masterfile “Max Office” addresses

We also assessed specialist physician growth from 1996 to 2001 during the pre-SRAP period. Baseline growth in specialist physicians was assessed with Masterfile standard address data, since Max Office address data were not available for 1996. We found the following:

- Specialist physician-to-population ratios in 2001 according to Masterfile standard address field data looked quite similar to that seen with Max Office address data, with substantially lower ratios in SRAP than in non-SRAP counties (41.2 vs. 52.1 specialist physicians per 100,000 population). (**Table 5**)
- Average annual growth in specialist physician-to-population ratios was modestly lower from 1996 to 2001 in counties that were later supported through SRAP initiatives than non-SRAP counties (1.3% vs. 1.5%). (**Table 5** and **Figure 4**)

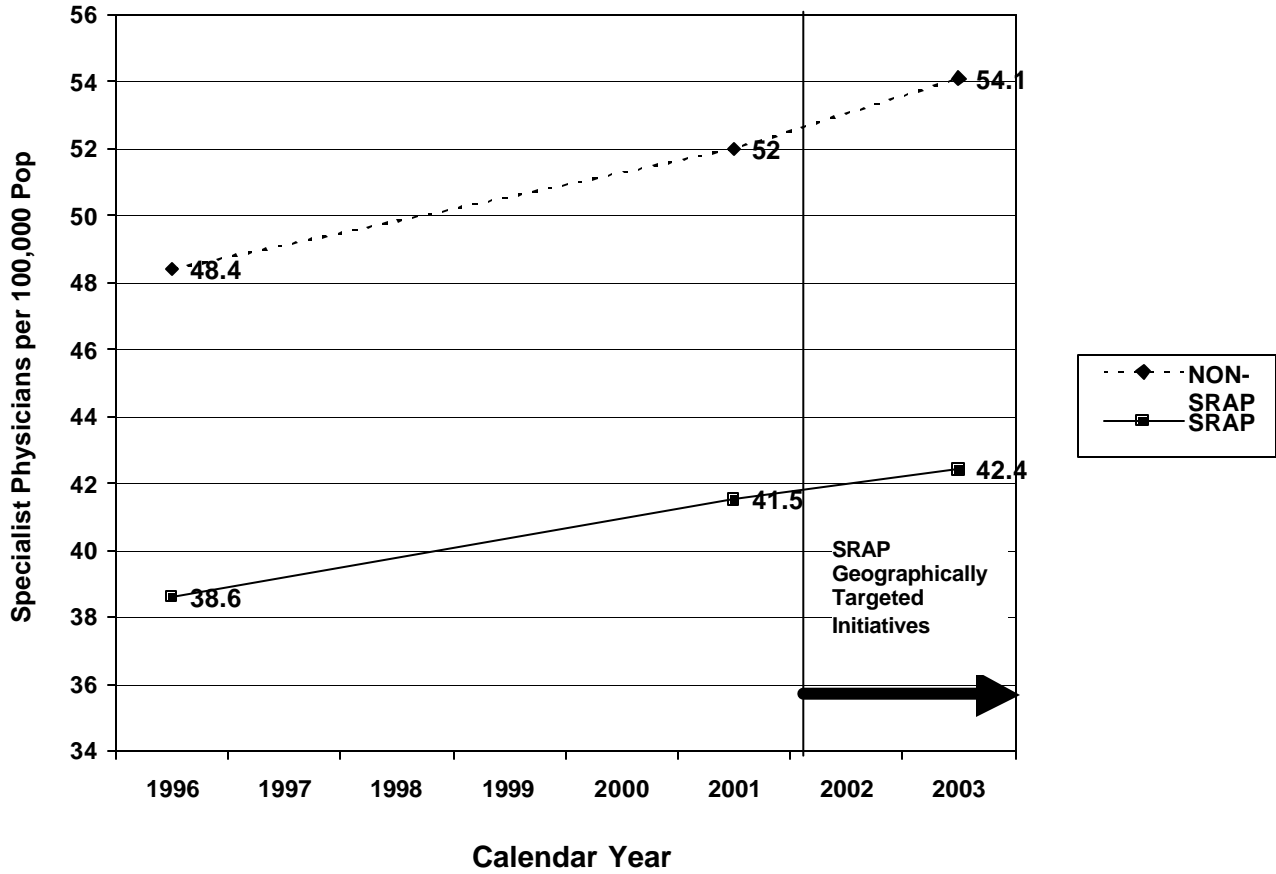
- These data suggest that the SRAP initiatives did not influence the growth of specialist physicians in SRAP counties from December 2001 to December 2003.

Table 5. Specialist physician counts and percent change in SRAP and non-SRAP rural counties: 1996, 2001 and 2003

	SRAP Counties (n=150)			Non-SRAP Counties (n=457)		
	1996	2001	2003	1996	2001	2003
Total number of SPs	1,309	1,417	1,418	4,633	5,291	5,464
SP per 100,000 population	38.6	41.2	41.4	48.4	52.1	53.2
Average annual change in SPs per 100,000 population from 1996 to 2001 & 2001 to 2003	---	0.51	0.12	---	0.74	0.54
Average annual % change in SPs per 100,000 population from 1996 to 2001 & 2001 to 2003	---	1.3%	0.3%	---	1.5%	1.0%

Data: AMA Masterfile standard addresses

Figure 4. Specialist physicians per 100,000 population in SRAP- and non-SRAP counties: December 1996, 2001 and 2003



Data: AMA Masterfile standard addresses for 1996
Max Office addresses for 2001 and 2003

State-by-State Growth in Primary Care Physicians

- 4. Observed patterns of physician supply changes provide evidence that SRAP initiatives positively affected primary care physician-to-population growth rates in SRAP-targeted counties and parishes in three states (Alabama, Louisiana and West Virginia) and negatively affected the growth rate in one state (Georgia). In the remaining four states, patterns of change in SRAP and non-SRAP counties during the pre-intervention and intervention periods did not provide clear evidence for either a positive or negative effect on primary care physician-to-population growth.**

Primary care physician-to-population ratios and changes in ratios over time may have differed across the SRAP's eight states, differences that would not have been evident in the findings presented earlier for all states combined. We examined how primary care physician-to-population ratios changed in the SRAP versus non-SRAP rural counties and parishes for each of the eight states. We used Masterfile standard address field data for all time periods for consistency in these state-specific analyses, which involve fewer physicians and thus would be more susceptible to location data inconsistencies involving even a few physicians if we used different data sources for the various time periods. We accept as evidence for an effect of SRAP initiatives within each state greater growth in primary care physician-to-population ratios from 2001 to 2003 in SRAP than non-SRAP counties, especially when this growth advantage was not seen in the 1996 to 2001 pre-intervention period. From the data of **Table 6** and **Figure 5** below, we conclude the following:

- Baseline (2001) primary care physician per 100,000 population ratios varied significantly across states' SRAP county groups, from 49.2 to 64.7; baseline ratios varied even more across states' non-SRAP counties, ranging from 49.4 to 117.4. From December 2001 to December 2003 ratios increased in the SRAP counties of six states and dropped in two. Similarly, rates increased in the non-SRAP counties of six states and dropped in two.
- Ratio changes suggesting *positive* effects of SRAP initiatives on primary care physician growth were seen in Alabama, Louisiana and West Virginia. In each of these states pre-intervention growth (1996 to 2001) in primary care physician-to-population ratios was substantially greater in non-SRAP than SRAP counties and parishes. From 2001 to 2003, the period of SRAP support, substantially greater growth occurred in SRAP than non-SRAP counties.
- Data from the state of Georgia were consistent with a *negative* effect of SRAP-initiatives on primary care physician growth. Growth was greater in SRAP counties than non-SRAP counties during the pre-intervention period (1996 to 2001); growth was then slightly greater in non-SRAP counties from 2001-2003 during the years of SRAP support.

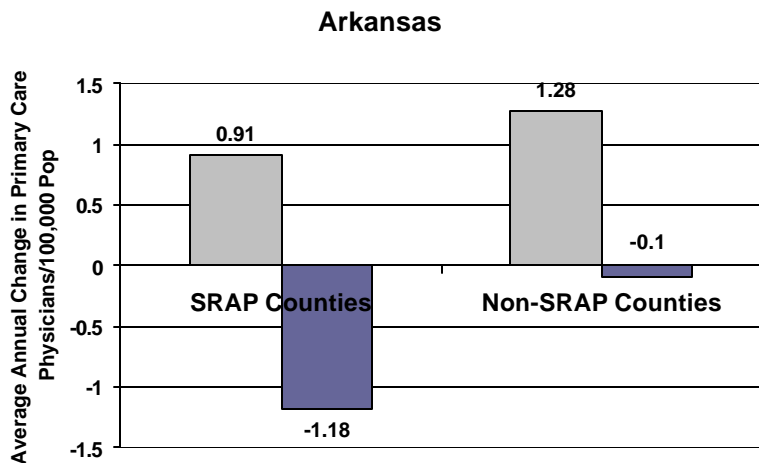
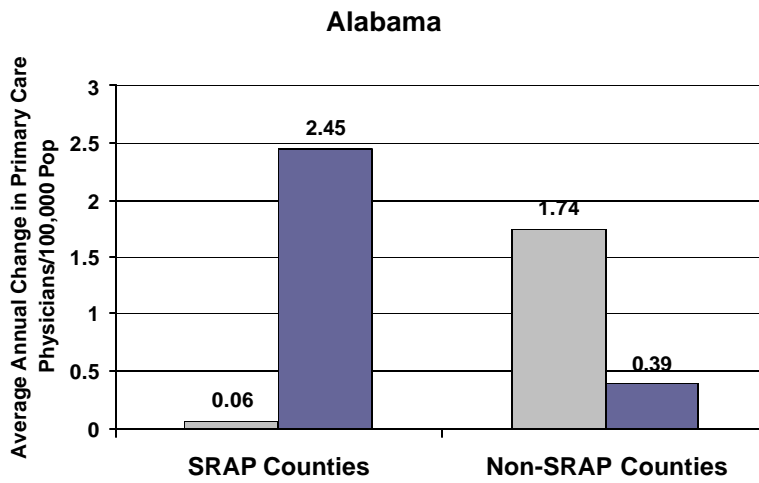
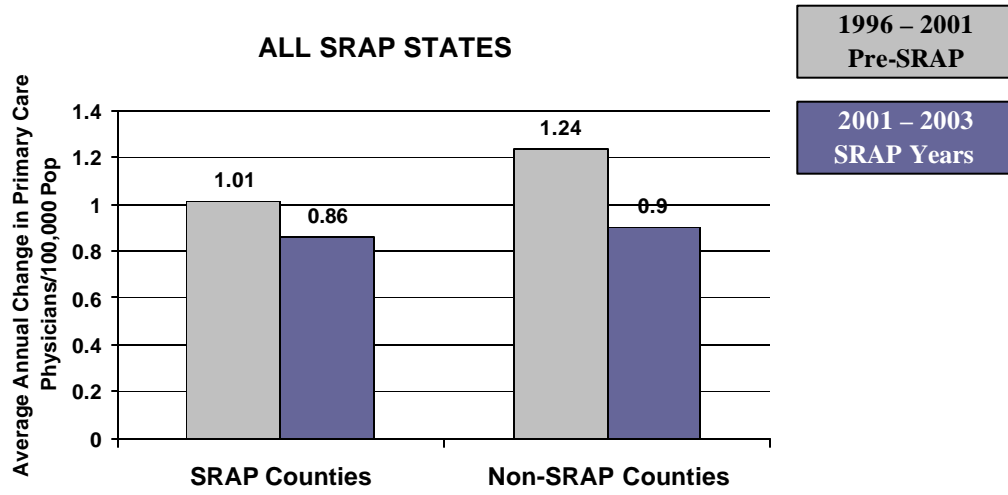
- In the remaining four states, pre-post and intervention-comparison group comparisons yielded mixed or inconclusive evidence of the effects of the SRAP initiatives on primary care physician to population growth. In Arkansas and Mississippi, growth rates were greater during the 1996-2001 pre-intervention period in SRAP than non-SRAP counties and remained greater with SRAP interventions. In South Carolina, ratio growth rates remained the same in SRAP counties from the baseline to intervention period, but growth increased substantially within non-SRAP counties from the pre-intervention to the intervention periods. In Texas growth was modest and comparable in both SRAP and non-SRAP counties in both the pre-intervention and intervention periods.

Table 6. Average annual change in primary care physicians per 100,000 population in SRAP and non-SRAP rural counties and parishes from end of years 1996 to 2001 and 2001 to 2003, by state

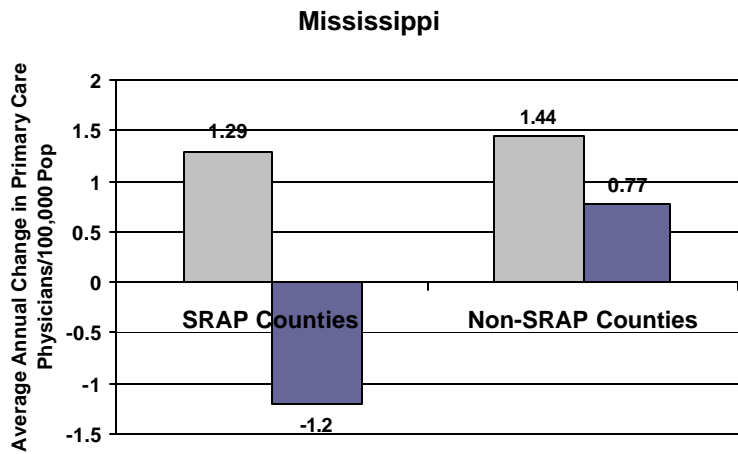
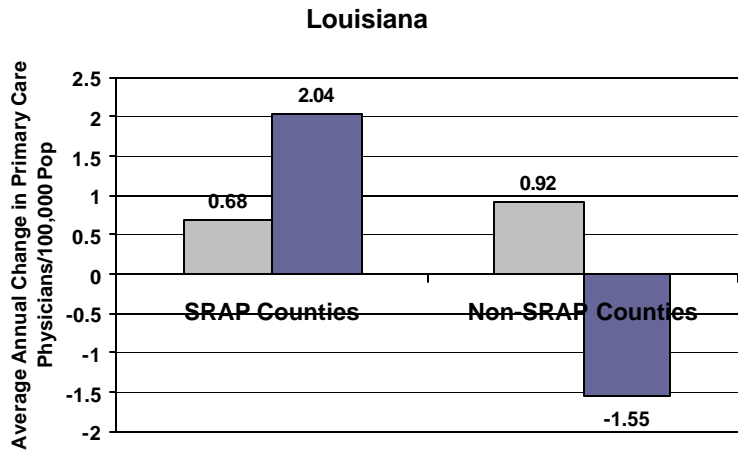
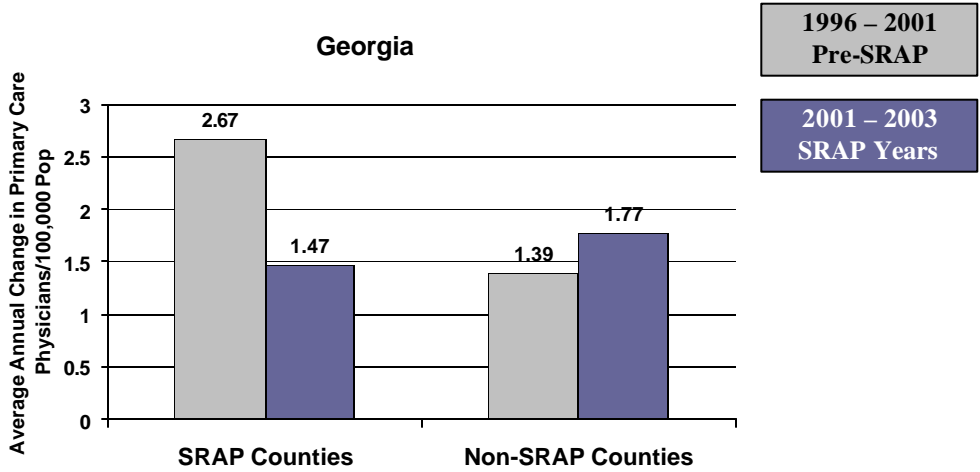
	SRAP Counties					Non-SRAP Counties				
	1996	2001		2003		1996	2001		2003	
	PCPs per 100,000 pop	PCPs per 100,000 pop	Average annual change in PCPs per 100,000 pop, 1996 to 2001	PCPs per 100,000 pop	Average annual change in PCPs per 100,000 pop, 2001 to 2003	PCPs per 100,000 pop	PCPs per 100,000 pop	Average annual change in PCPs per 100,000 pop, 1996 to 2001	PCPs per 100,000 pop	Average annual change in PCPs per 100,000 pop, 2001 to 2003
ALL SRAP STATES	53.1	58.1	1.01	59.8	0.86	55.3	61.5	1.24	63.3	0.90
Alabama	48.9	49.2	0.06	54.1	2.45	46.8	55.4	1.74	56.2	0.39
Arkansas	49.4	54.0	0.91	51.6	(1.18)	57.9	64.3	1.28	64.1	(0.10)
Georgia	51.4	64.7	2.67	67.7	1.47	56.7	63.7	1.39	67.2	1.77
Louisiana	52.6	56.0	0.68	60.1	2.04	44.8	49.4	0.92	46.3	(1.55)
Mississippi	53.4	59.8	1.29	57.4	(1.20)	50.7	57.9	1.44	59.4	0.77
South Carolina	47.1	54.1	1.40	57.1	1.48	65.3	76.0	2.15	83.8	3.89
Texas	54.8	58.3	0.70	60.1	0.92	47.1	50.8	0.74	52.2	0.71
West Virginia	62.8	64.7	0.37	67.8	1.56	110.5	117.4	1.39	118.3	0.43

Data: AMA Masterfile standard addresses

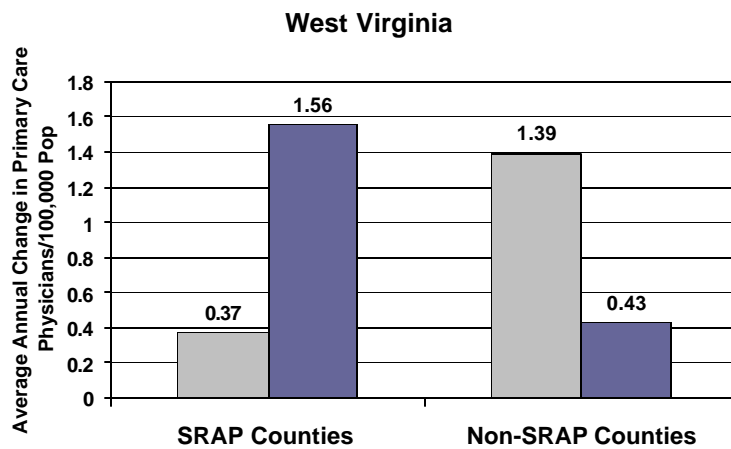
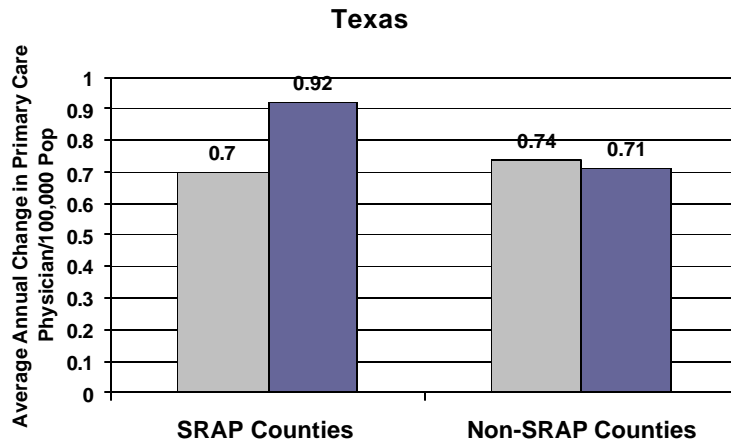
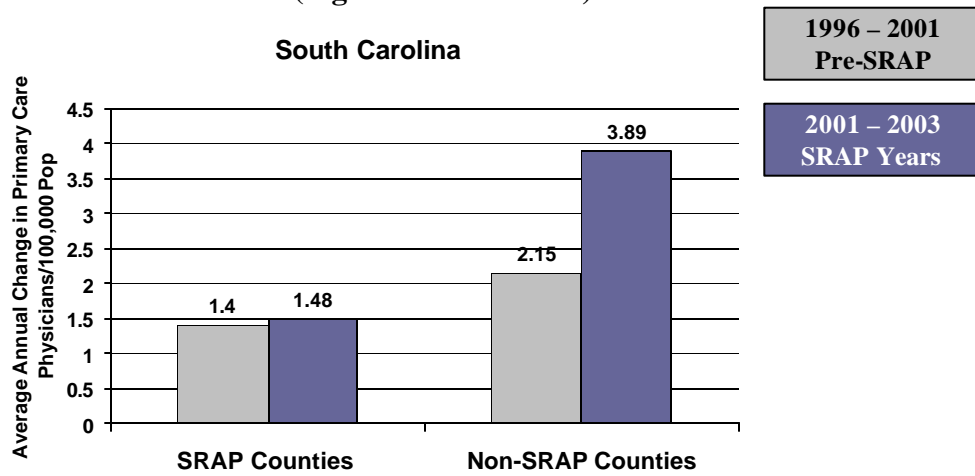
Figure 5. Average annual change in primary care physicians per 100,000 population in SRAP and non-SRAP counties of each state



(Figure 5. Continued)



(Figure 5. Continued)



Primary Care Physicians in High Poverty Rate Counties

5. **Nearly 83% of SRAP counties had more than 18% of individuals living in poverty, whereas 44% of non-SRAP counties did. Within these high-poverty counties, primary care physician-to-population ratios in SRAP and non-SRAP areas were similar at baseline (2001) but had been growing faster in non-SRAP counties from 1996 to 2001. From December 2001 to December 2003 during the years of SRAP support, ratios of primary care physicians-to-population grew by 0.59 physicians per 100,000 population in SRAP counties but *shrank* by 0.08 physicians per 100,000 population in non-SRAP counties. Growth patterns suggest that the effects of SRAP interventions within poor counties and parishes were positive in four states (Alabama, Louisiana, Texas and West Virginia) and negative in two states (Georgia and Mississippi).**
- 124 of the 150 rural SRAP counties (82.7%) had more than 18.0% individuals in poverty in 1999; among non-SRAP counties a lower proportion—202 of the 457, 44.2%—had poverty rates over 18.0%.
 - Baseline (2001) primary care physicians per 100,000 population ratios were only minimally lower in the grouped 124 SRAP counties with population poverty rates above 18% than in the 150 SRAP counties as a whole (56.5 versus 58.1) (comparing data in **Tables 6** and **7**). Baseline primary care physician-to-population ratios were substantially lower in non-SRAP high poverty counties than in non-SRAP counties as a whole (54.1 versus 61.5).
 - For all states combined, average annual growth in primary care physicians per 100,000 population from December 2001 to December 2003 in high poverty SRAP counties was greater than in high poverty non-SRAP counties (0.59 vs. -0.08) (**Table 7**). During the 1996 to 2001 pre-intervention period, on the other hand, annual growth rate was slightly higher in high poverty non-SRAP counties than high poverty SRAP counties (1.20 vs. 1.06). This growth pattern suggests a positive effect of the SRAP on primary care physician growth in high poverty rate counties.
 - The greatest apparent *positive* effect of SRAP initiatives on primary care physician growth among high poverty counties and parishes was seen in the states of Alabama, Louisiana, Texas and West Virginia. In each of these four states baseline growth (1996 to 2001) in primary care physician-to-population ratios was substantially greater in high poverty non-SRAP than SRAP counties. From 2001 to 2003 during the period of SRAP initiatives, greater growth (or less shrinkage) occurred in SRAP than non-SRAP counties.
 - The only growth rate pattern to suggest a *negative* effect of SRAP-initiatives on primary care physician growth in high poverty counties was in the state of Georgia. In Georgia growth was greater in high poverty SRAP counties than high poverty non-SRAP counties at baseline (1996 to 2001), whereas the opposite was true from 2001-2003.

- Pre-post and intervention-nonintervention comparisons yielded mixed or ambiguous evidence for the effects of the SRAP's interventions on primary care physician-to-population growth in the poor counties in Arkansas and Mississippi. In South Carolina there was only one non-SRAP county with greater than 18% poverty; consequently, comparisons of SRAP vs. non-SRAP primary care physician growth among poorest counties were not possible in this state.

Table 7. Average annual change in primary care physicians per 100,000 population in SRAP and non-SRAP non-metropolitan counties and parishes with high population poverty rates (more than 18.0%) from end of years 1996 to 2001 and 2001 to 2003, by state

	SRAP Counties					Non-SRAP Counties				
	1996	2001		2003		1996	2001		2003	
	PCPs per 100,000 pop	PCPs per 100,000 pop	Average annual change in PCPs per 100,000 pop, 1996 to 2001	PCPs per 100,000 pop	Average annual change in PCPs per 100,000 pop, 2001 to 2003	PCPs per 100,000 pop	PCPs per 100,000 pop	Average annual change in PCPs per 100,000 pop, 1996 to 2001	PCPs per 100,000 pop	Average annual change in PCPs per 100,000 pop, 2001 to 2003
ALL SRAP STATES	51.2	56.5	1.06	57.6	0.59	48.1	54.1	1.20	53.9	(0.08)
Alabama	49.8	49.4	(0.09)	54.0	2.31	53.7	65.1	2.28	65.3	0.11
Arkansas	47.7	52.6	0.99	49.1	(1.76)	49.8	58.7	1.77	54.8	(1.97)
Georgia	47.3	61.7	2.88	63.0	0.69	54.1	60.9	1.38	64.4	1.74
Louisiana	51.9	56.1	0.84	59.6	1.74	44.6	50.2	1.12	47.1	(1.59)
Mississippi	51.2	57.7	1.31	55.9	(0.92)	51.0	55.5	0.90	54.9	(0.32)
South Carolina	49.3	57.6	1.66	60.9	1.63	-- *	-- *	-- *	-- *	-- *
Texas	56.4	58.2	0.36	64.1	2.92	42.1	46.9	0.95	47.5	0.33
West Virginia	55.6	56.7	0.23	55.6	(0.58)	75.3	81.6	1.24	75.1	(3.21)

Data: AMA Masterfile standard addresses

3. With only one non-SRAP county with more than 18% poverty, its non-SRAP data are unstable and therefore not presented

In-Migration and Out-Migration/Retirement of Primary Care Physicians

- 6. The slightly greater growth in primary care physicians in SRAP than non-SRAP counties of the combined eight states from December 2001 to December 2003 resulted from a greater in-migration rate of physicians into SRAP counties than into non-SRAP counties, which more than compensated for the modestly greater out-migration/retirement rate from SRAP than non-SRAP counties during this period.**
- From December 2001 to December 2003, 474 primary care physicians moved into and 390 moved out of or retired from the combined SRAP counties of the eight states. Given the 2,013 primary care physicians in these counties in December 2001, this represents a 23.5% in-migration percentage over the two years and 19.4% out-migration/retirement rate, the difference yielding the 4.2% overall growth rate.
 - From December 2001 to December 2003, 1,423 primary care physicians moved into and 1,185 moved out of (or retired from) the combined non-SRAP counties of the eight states. With 6,257 primary care physicians present in 2001, this represents a 22.7% in-migration percentage over the two years and 18.9% out-migration/retirement percentage, the difference yielding a 3.8% overall growth rate.
 - The slightly greater growth in SRAP than non-SRAP counties of the eight states (4.2% vs. 3.8%), therefore, resulted from greater in-migration rates into SRAP than non-SRAP counties (23.5% vs. 22.7%) despite the modestly greater out-migration/retirement rate in SRAP counties (19.4% vs. 18.9%).
 - Of the six states that experienced more than a 5% growth in primary care physician numbers from 2001 to 2003, only one (SC) had both a higher in-migration and lower out-migration/retirement rate than the 8-state combined rates; three states (AL, LA, WV) had both higher in-migration and higher out-migration/retirement rates than the 8-state overall rates; and two (GA, TX) had both lower in-migration and lower out-migration/retirement rates than the 8-state overall rates.

Table 8. In-migration and out-migration/retirement of primary care physicians into and from SRAP and non-SRAP counties and parishes from December 2001 to December 2003, by state

State	Total # 2001	Total # 2003	% Growth in #'s from 2001 to 2003	# In-migrants from 2001 to 2003	# Out-migrants from 2001 to 2003	Ratio of in-migrants to 2001 total	Ratio of out-migrants to 2001 total
ALL STATES							
SRAP	2,013	2,097	4.2%	474	390	0.235	0.194
Non-SRAP	6,257	6,495	3.8%	1,423	1,185	0.227	0.189
ALABAMA							
SRAP	179	195	8.9 %	65	49	0.363	0.273
Non-SRAP	554	557	5.4 %	109	106	0.197	0.190
ARKANSAS							
SRAP	141	133	- 5.7 %	26	34	0.184	0.241
Non-SRAP	691	690	- 0.1 %	115	116	0.166	0.168
GEORGIA							
SRAP	229	241	5.2 %	52	40	0.227	0.175
Non-SRAP	1,420	1,542	8.6 %	347	225	0.244	0.158
LOUISIANA							
SRAP	220	233	5.9 %	57	44	0.259	0.200
Non-SRAP	356	326	- 8.4 %	73	103	0.205	0.289
MISSISSIPPI							
SRAP	412	400	- 2.9 %	63	75	0.153	0.182
Non-SRAP	659	681	3.3 %	133	111	0.202	0.168
SOUTH CAROLINA							
SRAP	270	290	7.4 %	69	49	0.256	0.169
Non-SRAP	534	593	4.0 %	167	108	0.313	0.202
TEXAS							
SRAP	237	250	5.5 %	49	36	0.207	0.152
Non-SRAP	1,411	1,468	4.0 %	324	267	0.230	0.189
WEST VIRGINIA							
SRAP	325	355	9.2 %	97	67	0.298	0.206
Non-SRAP	632	638	1.0 %	172	166	0.272	0.263

Data: AMA Masterfile "Max Office" addresses

Nurse Practitioners and Certified Nurse Midwives

- 7. From 2001 to 2003 nurse practitioners and certified nurse midwives per population ratios grew modestly in both SRAP and non-SRAP counties in the combined four states for which we have data. The numbers and changes were small and growth patterns varied across states, with nurse to population ratios increasing in two states and decreasing in two states. Taken together, these data suggest that the SRAP has not had a significant effect on the expansion of the primary care advanced practice nurse workforce in its targeted counties, at least within the four states for which we have data.**

A number of SRAP initiatives across the participating states targeted the recruitment and retention of nurse practitioners and certified nurse midwives, the two primary care advanced practice nurse disciplines. Only four of the eight SRAP state nurse licensing boards had personnel data in a usable form and were willing to share the information with us at both the baseline and post-intervention periods; therefore, we can assess the impact of nursing initiatives in only these four states. We have no reason to believe that states' availability of data and willingness to share it were related to the success of their SRAP nursing recruitment and retention initiatives. We find the following, based on the data of **Tables 9 and 10**:

- For the four states together, combined nurse practitioner and certified nurse midwife-to-population ratios were about one-third the primary care physician-to-population ratios (see practitioner to population ratios of **Tables 2 and 9**) in both SRAP and non-SRAP counties in 2001.
- For the four states together, the average annual percent change in counts of nurse practitioners and certified nurse midwives were comparable in SRAP and non-SRAP counties.
- Combined nurse practitioner and certified nurse midwife-to-population ratios for the four states together grew minimally and about the same on average each year in SRAP counties and non-SRAP counties (0.52 vs. 0.36 per 100,000) during the intervention period.
- There was significant variation across the four states in terms of their baseline nurse practitioner/certified nurse midwife to population ratios and change in ratios from 2001 to 2003. Ratios grew (availability improved) in both SRAP and non-SRAP counties in two states (Mississippi and West Virginia) and decreased in both sets of counties in two states (South Carolina and Texas).

Table 9. Nurse practitioner (NP) and nurse midwife (CNM) counts, ratios to population and changes in SRAP and non-SRAP rural counties of Mississippi, South Carolina, Texas and West Virginia, December 2001 and December 2003

	SRAP Counties (n=83)		Non-SRAP Counties (n=259)	
	2001	2003	2001	2003
Total number of NPs and CNMs	438	458	926	974
Total number of NPs	410	426	895	940
Total number of CNMs	28	32	31	34
Average annual change in NPs and CNMs from 2001 to 2003	---	10 (2.3%)	---	24 (2.6%)
Number (%) of counties with increase in NPs and CNMs from 2001 to 2003	---	34 (41%)	---	76 (29%)
NPs and CNMs per 100,000 pop	21.0	22.1	17.9	18.6
Average annual change in NPs and CNMs per 100,000 pop from 2001 to 2003	---	0.52	---	0.36
Average annual % change in NPs and CNMs per 100,000 pop from 2001 to 2003	---	2.5%	---	2.0%

Data: State nursing licensing authorities

Table 10. Average annual change in combined nurse practitioner and certified nurse midwives per 100,000 population in SRAP and non-SRAP rural counties from 2001 to 2004, by state.

	SRAP Counties			Non-SRAP Counties		
	2001	2003	Average annual change in NPs/CNMs per 100,000 pop, 2001 to 2003	2001	2003	Average annual change in NPs/CNMs per 100,000 pop, 2001 to 2003
MS, SC, TX and WV combined	21.0	22.1	0.52	17.9	18.6	0.36
Mississippi	26.1	28.5	1.22	28.2	33.4	2.61
South Carolina	22.6	20.2	-1.19	17.0	15.0	-0.98
Texas	14.7	13.9	-0.38	12.5	12.0	-0.21
West Virginia	17.7	21.8	2.05	25.6	26.7	0.55

Data: State nursing licensing authorities

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