COLORECTAL CANCER SCREENING CAPACITY IN ARIZONA

by

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STATEMENT BY AUTHOR

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Background: Colorectal cancer is the third most commonly diagnosed cancer and the second leading cause of cancer death in Arizona. Asymptomatic colorectal adenomas and colorectal cancers can be detected with the aid of screening tests. Given that by the year 2030 Arizona is expected to be the second most populated state in the U.S., the logical question is whether this state has the colorectal screening capacity to accommodate the growing older population.

Objective: To estimate the current and potential additional volume of endoscopic procedures in Arizona and to identify the resources needed to increase such capacity.

Design: Cross-sectional survey.

Methods: Using a mailing list from the American College of Gastroenterology (ACG), all 338 members registered as gastroenterologists or colorectal surgeons practicing in Arizona were invited to participate. Information for the total number of colonoscopies and sigmoidoscopies performed by a gastroenterologist or colorectal surgeon during an average week was ascertained by analyzing 105 surveys. We estimated the current and potential volume of screening procedures.

Results: Physicians ranged in age from 30 to 67 years, 26.7% were female; approximately 90% were gastroenterologists and 10% identified themselves as colorectal surgeons. Most physicians in our sample (87.6%) practiced in urban areas. Physicians reported performing 8,717 endoscopic procedures weekly (7,990 colonoscopies and 727 sigmoidoscopies); they reported being able to increase their capacity by an additional

3,183 (36.5%) procedures a week (2,347 colonoscopies and 836 flexible sigmoidoscopies).

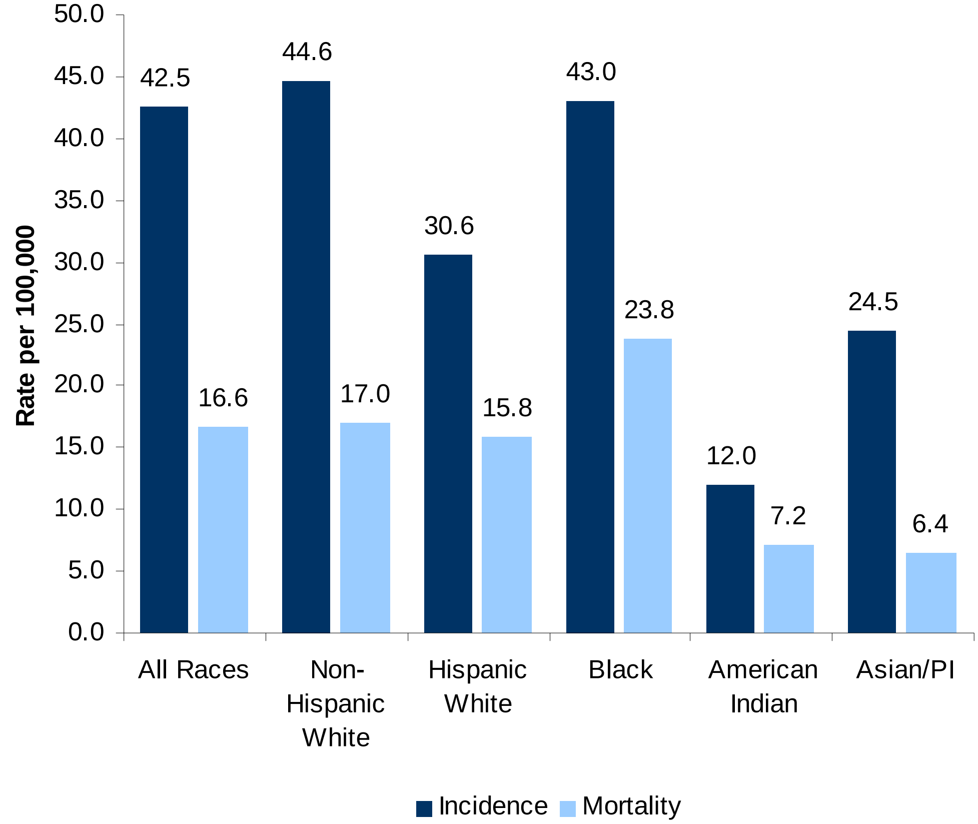
Conclusions: Results from the Arizona Colon Cancer Screening Capacity Survey contribute to the body of published estimates of state level colorectal cancer screening capacity and bring to light local differences essential in planning future colorectal screening interventions at the state level. Our results suggest that Arizona has the ability to significantly expand its endoscopic capacity, which will be critical in accommodating the growing population of screening-eligible residents of Arizona.

INTRODUCTION

Colorectal Cancer Statistics

Based on 2008 estimates from the American Cancer Society (1), someone in Arizona will be diagnosed with colorectal cancer approximately every 3 hours for a total of 2620 new cases. According to these same estimates, it is anticipated that someone will die approximately every 9 hours of this malignancy for a total of 950 deaths. These figures will make colorectal cancer the third most commonly diagnosed cancer and the second leading cause of cancer death in Arizona in 2008. The 2004 Arizona age adjusted incidence rates for colorectal cancer were 46.6 and 33.7 per 100,000 for men and women, respectively (2). These rates may have reflected differences in preventable colorectal cancer risk factors such as tobacco and alcohol use, diets low in fruits and vegetables, obesity, and physical inactivity. As shown in Figure 1, the 2002-2004 colorectal cancer incidence rates in Arizona were highest among Non-Hispanic Whites and lowest among American Indians (44.6 and 12.0 per 100,000, respectively) (2). Overall, the 2002-2004 mortality rates for colorectal cancer in Arizona were highest among African Americans and lowest among Asian or Pacific Islanders (23.8 and 6.4 per 100,000, respectively) (2). Differences in risk factors, co-morbidities, and tumor stage at the time of diagnosis are considered major contributing factors to the racial disparity in colorectal cancer mortality rates (3).

Figure 1. Average Annual Age-Adjusted Incidence and Mortality Rates of Colorectal Cancer in Arizona by Race/Ethnicity, 2002-2004



Colorectal Cancer Screening

Death from colorectal cancer can be prevented by the detection of early-stage disease that has not metastasized. Colorectal cancer itself can be prevented by the detection and removal of colorectal adenomas (4). It has been suggested that 75% of colorectal cancers result from benign adenomatous polyps among average-risk older adults with no significant colorectal symptoms, family history, or genetic predisposition (5).

Asymptomatic colorectal adenomas and colorectal cancers can be detected with the aid of screening tests such as the fecal occult blood test (FOBT), sigmoidoscopy, colonoscopy, double-contrast barium enema, and computed tomographic colonography. These screenings tests can be organized into 2 categories: stool tests, which are more appropriate for detecting cancer; and structural exams, which have the capacity of detecting cancer and adenomatous polyps (6). In 2003 the GI Consortium Panel suggested that the rationale for presenting multiple options was that no single test had shown to be superior and that presenting patients with multiple options would allow them to apply personal preferences; thus increasing the likelihood of being screened (7).

Serial FOBT has been shown to reduce colorectal cancer incidence by 17% to 20% (8) and to reduce colorectal cancer mortality by 15% to 33% (9, 10). Although FOBT remains one of the recommended options, consumption of red meats, fresh fruits and vegetables such as radishes, turnips, and broccoli have the potential to produce false positive results. Tests more specific to humans have been developed, such as the fecal immunochemical test (FIT), the guaiac-based and immunochemical-based stool tests (gFOBT), and the stool DNA test (sDNA). FIT sensitivity is 81.8% and specificity is 96.9%, which eliminates the need for pretest restrictions on diet (11). In one study (11), sensitivity for detecting advanced colorectal adenomas was 41.3% (95% CI = 32.7% to 50.4%) for the unrehydrated gFOBT. The same study reported that the sensitive gFOBT's specificity for detecting cancer was 90.1% (95% CI = 89.3% to 90.8%) and the specificity for detecting adenomas was 90.6% (95% CI = 89.8% to 91.4%). Adding sigmoidoscopy at five- or ten-year intervals to annual fecal occult blood test has also been recommended and can achieve a sensitivity of 70% to 80%. This strategy resulted in a 43% reduction in mortality from colorectal cancer in one study (12), and has been estimated to have the potential for a 60% reduction in incidence and an 80% reduction in colorectal cancer mortality in one cost-effectiveness analysis (13). It has been reported that the sensitivity and specificity of sDNA testing for colorectal cancer detection ranged from 52% to 91% and from 93% to 97% respectively (6). Sigmoidoscopy alone also reduces colorectal cancer mortality; one study observed a 59% reduction (14), while 16% to 50% reductions in colorectal cancer mortality and 14% to 42% reductions in incidence were predicted by the cost-effectiveness analysis (13). Using sigmoidoscopy alone, however, might not detect a significant number of adenomas or other lesions in the proximal colon. In one study, where patients underwent complete colonoscopies, 52% of patients with proximal adenomas had no distal adenomas (15). A proportion of these proximal lesions would have been missed if sigmoidoscopy alone had been utilized as the screening method (16). In 2005 the virtual colonoscopy's performance data were reviewed. The results of these meta-analyses were summarized by Levin and colleagues (6); pooled sensitivity for large (≥10 mm) polyps was found to be 85% to 93%. The pooled specificity for large (≥10 mm) polyps was 97%. For detecting small polyps, pooled sensitivity was 70% to 86% while specificity ranged from 86% to 93%.

A significant amount of evidence indicates that all these tests are effective, but they differ in their sensitivity, specificity, cost and safety. The available evidence does not currently support choosing one test over another (6, 7, 12, 14). However, any screening test is better than no screening test.

Current American Cancer Society guidelines for detecting colorectal cancer recommend that men and women age 50 and over adopt one of the following screening strategies (6):

Tests that Detect Adenomatous Polyps and Cancer

- Flexible sigmoidoscopy every 5 years, or
- Colonoscopy every 10 years, or
- Double-contrast barium enema every 5 years, or
- Computer tomographic colonography every 5 years

Tests that Primarily Detect Cancer

- Annual guaiac-based fecal occult blood test with high test sensitivity for cancer, or
- Annual fecal immunochemical test with high test sensitivity for cancer, or
- Stool DNA test with high sensitivity for cancer, interval uncertain

The National Cancer Institute estimates that if current screening recommendations were followed, approximately 50% of colorectal cancer deaths per year could be avoided (17). In 2008, that estimate would translate to more than 24,980 lives saved in the US and approximately 475 in Arizona (1). Colorectal cancer screening has been proven effective and is strongly recommended by the ACS, the US Preventive Services Task Force, the Gastrointestinal Consortium, and others. However, adherence to colorectal cancer screening recommendations in the general population is extremely low when compared with screening for other common cancers, such as breast and cervix (18). There are various reasons for this low screening rate, ranging from lack of knowledge, lack of provider recommendations, low level of public and professional enthusiasm, multiple modalities, lack of insurance coverage, and implementation barriers (19-21). Perhaps the strongest barriers are lack of knowledge and lack of physician recommendation, as was shown in recent data from the National Health Survey (22). In Arizona in particular, assessing barriers to colorectal cancer screening is of critical importance due to the growing proportion of elderly in the state.

By the year 2030 Arizona is expected to be the second most populated state in the U.S. (23). Arizona will have more people and more elderly as baby boomers age (24). With the gradual increase in colorectal cancer screening over the past few years (25), the logical question is whether Arizona has the screening capacity to keep up with the ever growing older population, let alone accomplishing the Healthy People 2010 objective that 50% of adults 50 years of age or older would have received colorectal cancer screening by 2010 (26). In 2003, the New York Times reported that in some U.S. cities, waiting lists for colonoscopies were up to eight months (27). Issues like this have created concerns about the increasing demand for colonoscopies. In planning for future colorectal cancer screening strategies, the Arizona Cancer Center began in 2004 a cross-sectional survey of gastroenterologists and colorectal surgeons to estimate colorectal cancer screening capacity and to identify the resources needed to increase such capacity. The state-level data generated by these surveys will be essential in planning future screening interventions. The purpose of this analysis is to provide an estimate of the current and potential additional volume of endoscopic procedures in Arizona.

METHODS

In 2004 the Arizona Cancer Center conducted a state level survey to determine Arizona's capacity to perform screening by sigmoidoscopy and/or colonoscopy and the potential number that could be performed by gastroenterologists or colorectal surgeons actively practicing in Arizona. Using a mailing list from the American College of Gastroenterology (ACG), all 338 members registered as gastroenterologists or colorectal surgeons practicing in Arizona were invited to participate. Other ACG members such as hepatologists, pathologists, pediatricians, nurses and others with a shared interest in the care of patients with digestive diseases who typically do not perform endoscopic screening procedures were excluded.

Survey Design and Administration

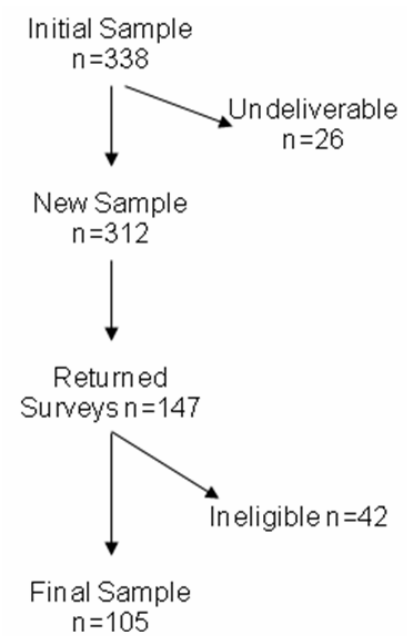
The Colon Cancer Screening Capacity Survey was based on an instrument used to survey New Mexico gastroenterologists and was provided to us by Dr. Richard Hoffman of the University of New Mexico. The version of the instrument that was used, modified from the New Mexico instrument (28), is included in Appendix 1. The 10 questions included in the original survey were formulated based on literature review, the BRFSS, and the experience of researchers and clinicians from New Mexico. Question number 10 ("What resources would be required to perform additional endoscopic procedures?") was modified in the survey given in Arizona to include an extra choice; specifically, "Reasonable/Appropriate compensation". As shown in Figure 2, a three-phase mailing was carried out with each physician. The initial mailing consisted of a cover letter introducing the survey and asking physicians for their participation, the survey, and a stamped, self-addressed return envelope. During the second phase, a reminder postcard was mailed out to physicians 3 weeks following the first mailing in an effort to increase response rates. Finally, phase one was repeated three weeks after the second mailing. This protocol was approved by the University of Arizona Human Subjects Board and the Institutional Review Board.

Figure 2. Overview of data collection procedure

Overview of Data Collection Procedure	
Phase I	Initial mailing included invitation latter, survey, and self-addressed return envelope
Phase II	A reminder postcard was mailed out to non-respondents 3 weeks following the first mailing
Phase III	Three weeks after the second mailing, phase one was repeated

The flow of study participants can be best discussed with the aid of a simple diagram (Figure 3). Invitation letters and surveys were mailed to 338 physicians. A total of 26 mailing packages were returned as undeliverable citing various reasons such as the address was incomplete or the person had moved without leaving a forwarding address. Thus, the sample size was reduced to 312. A total of 147 completed surveys were returned. Of the returned surveys, 42 (29%) were ineligible because at the time of the surveys these physicians did not perform colon cancer screening procedures, or they did not currently practice in the state of Arizona. The final sample for analysis was 105. Excluding the 42 ineligible surveys from the denominator we had a 39% (105/270) response rate.

Figure 3. Flow of study participants



With the purpose of gaining a better understanding of the current screening situation in Arizona, data were stratified by Urban/Rural settings following the U.S. Census Bureau's classification. An urban area is defined as core census block groups or block that have a population density of at least 1,000 people per square mile and surrounding blocks that have an overall density of at least 500 people per square mile (29).

Statistical Analysis

The survey data were managed and analyzed using SAS software 9.1.3, Cary, NC. (30). Data were entered and managed at the Data Management section of the Colon Cancer Prevention Program Project part of the Arizona Cancer Center. Standard descriptive statistics, including means and medians, were used to analyze these data.

Similar to the analysis conducted by Hoffman and colleagues (28), information for the total number of colonoscopies and sigmoidoscopies performed by a gastroenterologist or colorectal surgeon during an average week was obtained. Using these data we estimated the number of colonoscopies and sigmoidoscopies performed by all physicians (current volume) in our Arizona sample. In the same way, we calculated the number of additional screening colonoscopies and sigmoidoscopies that could be performed by all physicians (potential volume) in our sample by asking participants to estimate the weekly potential maximum number of colonoscopies and sigmoidoscopies they could perform. Surplus capacity was then determined by subtracting the current volume from the potential volume. For this analysis it was assumed that physicians perform procedures for 46 weeks of the year (31).

RESULTS

As previously described, the final sample for analysis contained 105 surveys. The responding physicians ranged in age from 30 to 67 years, 26.7% were female, and approximately 90% were gastroenterologists, while approximately 10% identified themselves as colorectal surgeons. Most physicians in our sample (87.6%) practiced in urban areas. Responders represented 8 of the 15 Arizona counties (Figure 4). The seven counties without representation were classified as rural.

Figure 4. Number of gastroenterologists/colorectal surgeons by County by Urban/Rural

Current and Potential Screening Capacity

Survey respondents were asked to report their average number of endoscopic procedures performed during a week and to estimate the number of additional procedures that could be performed during a week. The average numbers of weekly colonoscopies and sigmoidoscopies per endoscopist were 21 and 2 respectively. Table 1 shows that overall, physicians reported performing 8,717 endoscopic procedures weekly (7,990 colonoscopies and 727 sigmoidoscopies); they reported being able to increase their capacity by an additional 3,183 (36.5%) procedures a week (2,347 colonoscopies and 836 flexible sigmoidoscopies).

Table 1. Current Volume and Additional Volume for Flexible Sigmoidoscopies and Colonoscopies by Rural/Urban, 2004 (n=105).

	Current volume No. per week	Additional volume No. per week, (% Increase)
Colonoscopy		
All regions	7990	2347 (29.4%)
Urban	7562	2177 (28.8%)
Rural	428	170 (39.7%)
Flexible Sigmoidoscopy		
All regions	727	836 (114.9%)
Urban	714	761 (106.6%)

Rural	13	75 (576.9%)
Total Endoscopic Procedures	8717	3183 (36.5%)

Rural areas have poor capacity to perform endoscopic procedures; only 441 (5%) procedures were expected to occur in these areas. In contrast, data suggested that the greatest ability to increase the number of procedures was reported in the rural settings. The number of colonoscopies can be increased by 39.7% in the rural areas while urban areas anticipated a more modest increase (28.8%). Rural physicians reported having the capacity to increase the number of weekly flexible sigmoidoscopies five-fold while their urban counterparts reported having the capacity to double their numbers.

Compared to colorectal surgeons, gastroenterologists performed more colonoscopies per week (Table 2). Flexible sigmoidoscopies were performed more often by colorectal surgeons than by gastroenterologists.

Table 2. Weekly Number of Endoscopic Procedures by Specialty (n=105).

	Colonoscopy Median (Interquartile Range)	Flexible Sigmoidoscopy Median (Interquartile Range)
Gastroenterologists	20 (15-25)	1 (0-2)
Colorectal Surgeons	14 (10-20)	5 (2-10)

Respondents were asked about the resources that would be required to performed additional endoscopic procedures; survey answers were stratified by Urban/Rural (Table 3). Overall, the most common response was that more physicians would be required to perform additional procedures. Among respondents from the rural areas, the most common response was that a more appropriate compensation would be required to perform additional procedures. Among urban physicians the most frequent response was that more physicians would be required to perform additional procedures.

Table 3. Resources Required for Additional Endoscopic Procedures (n=105).

	All regions	Rural (n=13)	Urban (n=92)
	n (%)	n (%)	n (%)
Appropriate compensation	35 (33.33)	6 (46.15)	29 (31.52)
More equipment	23 (21.90)	2 (15.38)	21 (22.83)
More space	34 (32.38)	2 (15.38)	32 (34.78)
More staff	43 (40.95)	3 (23.08)	40 (43.48)
More physicians	52 (49.52)	3 (23.08)	49 (53.26)
None	17 (16.19)	4 (30.77)	13 (14.13)

DISCUSSION

Colorectal cancer screening prevalence continues to lag behind use of mammography and Pap smears testing (25,28). The American Cancer Society reported in 2007 that between 2000 and 2005, the use of colorectal cancer screening among US adults aged 50 and older increased from 42.5% to 46.8% (25). Measuring the current endoscopic screening capacity and being able to estimate the potential additional volume of endoscopic procedures in Arizona is important as the elderly population is expected to keep growing and as a recent study reported that only 11.7% of the American Indian in the southwest participating in their study had a colonoscopy or sigmoidoscopy in the past 5 yeas (32).

Surveyed physicians were found to have the capacity to increase their weekly number of endoscopic procedures by about 37%, from 8,717 to 11,900. This percent increase is comparable to the number reported by the New Mexico's group (28) and may suggest that the ability to improve screening capacity is attainable. The 2005 BRFSS data reported that the percent of the adult population age 50 who reported ever having a sigmoidoscopy or colonoscopy increased to 56% (33). This screening rate can be improved based on our findings.

Brown and colleagues (34) concluded that increasing capacity for screening colonoscopy is feasible, but will require attention to other problems, such as avoiding unnecessary procedures in low-risk patients. Physicians recommend colonoscopic surveillance more frequently than is recommended by practice guidelines for several reasons, including medical liability and unawareness of current guidelines (35-37). These unnecessary referrals compromise the current capacity to perform screening colonoscopies. Interventions aimed at educating gastroenterologists, colorectal surgeons, primary care physicians, and in general all those who perform or recommend endoscopic screening procedures about current guidelines will further increase the screening capacity.

Another way to improve colorectal cancer screening rates is to train family physicians to provide safe and technically competent colonoscopies, especially in rural settings. This strategy has been successful in Canada, rural Virginia, and rural Idaho (38-40).

One important factor in assessing colorectal cancer screening is to focus on the resources needed to increase capacity. Overall among Arizona gastroenterologists and colorectal surgeons, the major barriers noted were the number of physicians (50%), support staff (41%) and space (32%). For rural endoscopists, the major barriers were compensation (46%), number of physicians (23%) and space (23%). Seeff and colleagues (31) also found that nationally 63.9% of sites noted the need for space to perform procedures; however, they reported a greater need for supporting staff (76%) and less need for physicians (55.8%). Another important finding is that 31% of rural physicians said they need no additional resources to increase colorectal screening capacity. The data suggests that specialists need a higher financial incentive to relocate in these rural areas and that the resources needed resources need to increase capacity are different for urban and rural physicians.

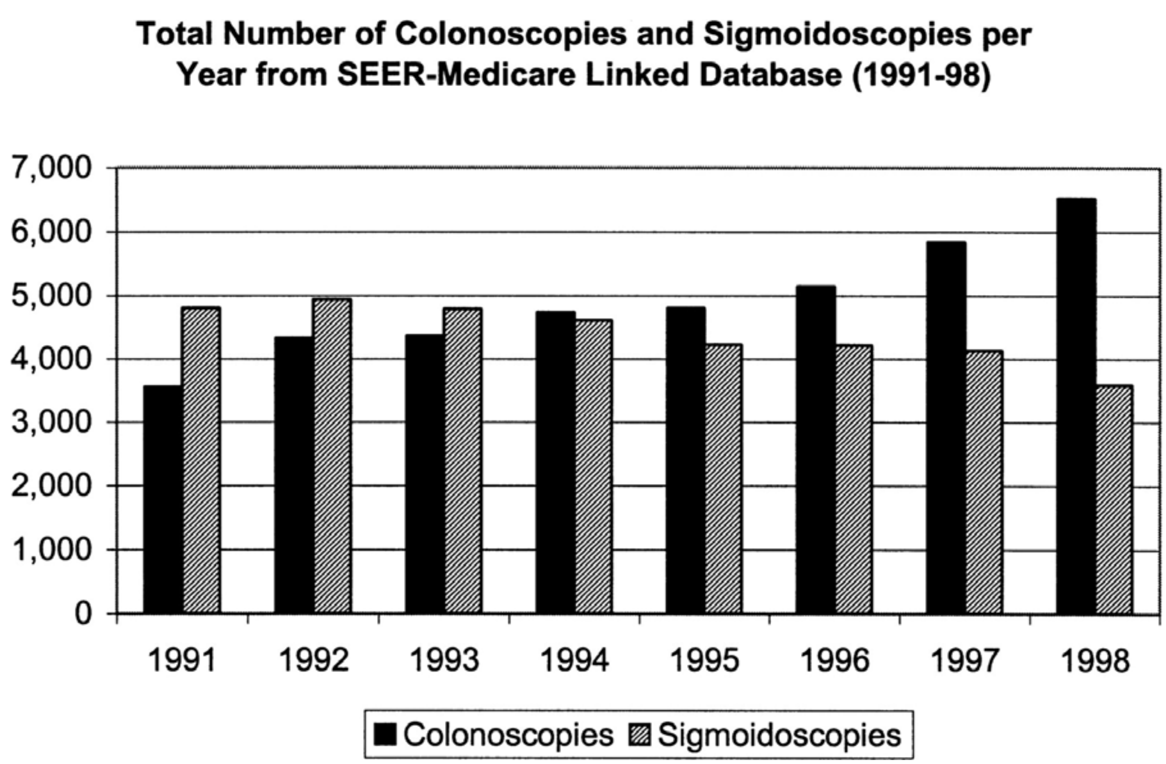
Estimates of the average number of colonoscopies performed by endoscopists are variable. Arizona gastroenterologists and colorectal surgeons reported performing on average approximately 21 colonoscopies and 2 sigmoidoscopies a week. These numbers compare well with Iowa and New Mexico estimates (28, 41), but differ from the NCI, CORI database, and New Hampshire estimates (34, 42). These differences might be due diverse data collection methodology and timing. Table 4 summarizes the findings of six different efforts to estimate the average number of colonoscopies performed by endoscopists.

Table 4. Average Number of Colonoscopies

Data Source (Reference)	Collection Year	Colonoscopy Mean
NCI (34)	1999-2000	32 per month
New Mexico (28)	2001	20 per week
CORI database (42)	2002-2003	21 per month
Iowa (41)	2003	24 per week
New Hampshire (42)	2003-2004	39-43 per month
Arizona	2004	21 per week

Furthermore, there is new evidence suggesting that the number of colonoscopies is increasing while the number of sigmoidoscopies is decreasing. Sonnenberg at al 2008 concluded that “colonoscopy is now the most common endoscopic procedure in the United Sates” (43) and Gatto et al 2003 reported a graphic (Figure 5) showing the negative trend for sigmoidoscopy and the positive trend for colonoscopy (44). Our estmates may reflect test preferences by both patients and physicians or may be the result of physicians ordering unnecessary colonoscopies.

Figure 5. Colonoscopies and Sigmoidoscopies per Year.



Gatto, N. M. et al. J. Natl. Cancer Inst. 2003 95:230-236; doi:10.1093/jnci/95.3.230

Limitations

One of the limitations of this study was the inability to validate the self reported weekly procedures performed by each physician. Future attempts to quantify current volume of endoscopic procedures should include validating survey responses against claims data or data from chart reviews. Hoffman et al (28) reported that a group of gastroenterologists' part of his study reviewed their billing records for the previous year and found that they overestimated their annual number of performed procedures by 10%. This could suggest that Arizona physicians could have overestimated their numbers, thus inflating the current and potential volume of procedures. Another limitation is that some health care providers known to perform colorectal cancer screening procedures such as pediatricians and primary care physicians may have been excluded.

As we mentioned previously, the response rate was 39%. This rate is within that expected based on the literature of physician surveys where no incentive is provided (45); furthermore, response bias might not be a problem given that in the same publication it was shown that responses between physician responders and non-responders were very similar.

Another limitation was the utilization of a membership database to obtain potential participants. These databases are not always updated and often times they do not reflect the correct location of their members or the members current practice status. For our study, these discrepancies resulted in undeliverable mail and in the removal of gastroenterologist and colorectal surgeons from our sample as they were retired or not longer performing endoscopic procedures.

Conclusions

Results from the Arizona Colon Cancer Screening Capacity Survey contribute to the body of published estimates of state level colorectal cancer screening capacity and bring to light local differences essential in planning future colorectal screening interventions at the state level. Our numbers show that Arizona has the ability to significantly expand its endoscopic capacity.

Special efforts should be made to provide needed screening services to those who live in rural Arizona. Adequately trained family physicians could represent another strategy for improving colorectal cancer screening rates especially in these areas.

Knowledge of physicians regarding screening recommendations and surveillance of colorectal cancer needs to be improved. This knowledge will translate in less unnecessary referrals thus shifting resources from surveillance to screening

APPENDIX 1

Colon Cancer Screening Capacity Survey

Colon Cancer Screening Capacity in Arizona Survey 2004

1. How many Endoscopists work in your practice?
2. How many perform colonoscopy?
3. How many perform sigmoidoscopy?
4. During an average week, how many colonoscopies do you perform?
5. During an average week, how many colonoscopies are performed in your practice?
6. During an average week, how many sigmoidoscopies do you perform?
7. During an average week, how many sigmoidoscopies are performed in your practice?
8. How many additional screening colonoscopies could your practice perform in a week?
9. How many additional screening sigmoidoscopies could your practice perform in a week?
10. What resources would be required to perform additional endoscopic procedures? (Please circle all that apply)

1. None
2. Reasonable/Appropriate compensation for performing the procedure
3. More equipment
4. More Space
5. More support staff
6. More physicians
7. Other

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