Published in final edited form as:

J Health Care Poor Underserved. 2013 August ; 24(3): 1125–1135. doi:10.1353/hpu.2013.0139.

A Comparison of Colorectal Cancer Screening Uptake Among Average-Risk Insured American Indian/Alaska Native and White Women

David G. Perdue, MD, MSPH, Jessica Chubak, PhD, MBHL, Andy Bogart, MS, Denise A. Dillard, PhD, Eva Marie Garrouette, PhD, and Dedra Buchwald, MD

Minnesota Gastroenterology P.A. and the American Indian Cancer Foundation, Minneapolis, Minnesota [DGP]; Group Health Research Institute, Seattle, Washington [JC, AB]; Department of Epidemiology, University of Washington (UW), Seattle [JC, DB]; Southcentral Foundation, Anchorage, Alaska [DAD]; Department of Sociology, Boston College, Chestnut Hill, Massachusetts [EMG]; Department of Medicine, UW [DB]; Partnership for Native Health, UW [DB].

Abstract

Introduction—American Indian and Alaska Native (AI/AN) women have among the lowest rates of colorectal cancer (CRC) screening. Whether screening disparities persist with equal access to health care is unknown.

Methods—Using administrative data from 1996–2007, we compared CRC screening events for 286 AI/AN and 14,042 White women aged 50 years and older from a health maintenance organization in the Pacific Northwest of the U.S.

Results—The proportion of AI/AN and White women screened for CRC at age 50 was similar (13.3% vs. 14.0%, $p = .74$). No differences were seen in the type of screening test. Time elapsed to first screening among AI/AN women who were not screened at age 50 did not differ from White women (hazard ratio 1.0, 95% confidence interval 0.8–1.3).

Conclusions—Uptake for CRC screening was similar among insured AI/AN and White women, suggesting that when access to care is equal, racial disparities in screening diminish.

Keywords

Colorectal cancer screening; health disparities; American Indians; health care access

Screening and surveillance reduce the incidence and mortality of colorectal cancer (CRC).^{1–9} Although the overall rate of CRC is lower in American Indian and Alaska Native (AI/AN) men and women than non-Hispanic Whites, AI/ANs have not experienced similar reductions in incidence and mortality.¹⁰ AI/ANs are more likely to be diagnosed with

Please address correspondence to David G. Perdue, MD, MSPH, American Indian Cancer Foundation, 800 IDS Center, 80 South Eighth Street, Minneapolis, MN 55402 USA. dperdue@aicaf.org..

Conflict of Interest

All authors declare that they have no conflicts of interest of any kind.

advanced-stage CRC than non-Hispanic Whites, a difference assumed to be due primarily to racial/ethnic disparities in screening access and uptake.¹¹⁻¹⁶

Understanding the factors that influence AI/AN CRC screening participation is a critical public health objective. Health care access factors known to influence screening participation in the general population include insurance coverage, having a usual provider, physician recommendation, and socioeconomic status.¹⁷⁻²⁷ All of these access factors also affect AI/AN patients,^{14, 28, 29} often disproportionately,³⁰ and are likely reflected in their low CRC screening rates. The extent to which sociocultural factors may also play a role is unclear. It is possible that AI/AN patients share values or experiences that affect the acceptability of CRC screening, or of specific screening modalities, and contribute to low uptake.

In this analysis, we compared cohorts of White and AI/AN women from the Pacific Northwest who had equal access to CRC screening through a common integrated health care delivery system. We examined whether these racial cohorts differed in 1) proportion of women screened at age 50, 2) tests used for initial screening, and 3) time elapsed to first CRC screening among women who were not screened at age 50. Our goal was to elucidate the extent to which health care access may be associated with screening disparities.

Methods

Setting

Group Health is a nonprofit integrated health care system serving more than 600,000 people in Washington and North Idaho.³¹ CRC screening guidelines, which have been in place at Group Health since 1983, recommend that average-risk members begin screening at age 50. Options for screening have included fecal occult blood testing (FOBT), flexible sigmoidoscopy, and colonoscopy.

Group Health does not routinely collect information on race as part of its administrative data. However, data on self-reported race are available for the subset of women participating in the system's Breast Cancer Screening Program. Since 1986, all female enrollees have been invited to participate in this program beginning at age 40.³² An AI/AN race variable was added to these surveys beginning in 1996.

Patient selection

Our sample consisted of self-identified AI/AN and White female Group Health enrollees who turned 50 between January 1, 1996, and December 31, 2007. Participants had reported race on one or more Breast Cancer Screening Program surveys between ages 45 and 50 (inclusive), had not declined participation in research, and had been enrolled in Group Health from their 45th birthday to their 50th birthday with enrollment gaps of one month or less. Group Health's institutional review board approved all study procedures.

To limit our study to average-risk screening, we used administrative data to exclude women diagnosed with CRC, ulcerative colitis, or Crohn's disease before age 50; those with family histories of CRC; and women who had colonoscopies or flexible sigmoidoscopies before

age 50. Applying these inclusion and exclusion criteria produced a sample of 286 AI/AN and 14,042 White women.

Outcomes

Our primary outcome was receipt of first CRC screening examination at age 50. However, FOBT, flexible sigmoidoscopy, and colonoscopy may also be used to investigate patient symptoms or conditions such as abdominal pain, constipation, iron deficiency, and chronic diarrhea. Because the indication for endoscopy was not readily available in administrative data, we used International Classification of Diseases-9 (ICD-9), Certified Procedural Terminology (CPT), and G codes to classify tests as either for average-risk CRC screening or for another purpose. Any endoscopy occurring in the three months following a diagnosis of a condition commonly investigated with endoscopy was not considered to have been performed for screening purposes. Participants were eligible for inclusion in the sample from their 50th birthday until the first of the following: Group Health disenrollment, CRC screening, a diagnosis disqualifying a subsequent endoscopy as a screening test, or December 31, 2007.

Covariates

We obtained data on known potential confounders from self-report on the Breast Cancer Screening Program questionnaire. Variables of interest included educational level,^{27, 33-36} place of residence, smoking status,³⁷ and body mass index (BMI).³⁸ Residence was considered either rural or urban based on zip code designations used by the Centers for Medicare and Medicaid Services.³⁹

Statistical analysis

To describe our cohort, we compared AI/AN and White women with respect to the year in which they turned 50, education, urban/rural residence, smoking history, and BMI. To assess potential confounders, we also evaluated the association of these variables with receipt of CRC screening. P-values were based on a 2-sample chi-square test of proportions.

Our primary analysis of CRC screening uptake addressed whether AI/AN and White women differed with respect to initiating screening at age 50, as recommended. To answer this question, we compared the proportion of women, by race, who had been screened by their 51st birthday. We also compared the distribution of type of screening examination (FOBT, flexible sigmoidoscopy, and colonoscopy). P-values were based on a 2-sample chi-square test of proportions.

Our second analysis addressed whether AI/AN and White women who were not screened at age 50 later became adherent to this recommendation at the same rate. We constructed Kaplan-Meier survival curves for each race category and used Cox proportional hazards regression to obtain unadjusted and adjusted estimates. Our model included variables identified as potential confounders *a priori*: year of entry into the cohort, education, urban/rural residence, smoking history, and BMI.

All inferential statistics are presented with 95% confidence intervals (CI) and P-values based on 2-sided hypothesis tests using a type-I error rate of $\alpha = 0.05$. Analyses were conducted using SPSS 17.0 (Chicago, IL), R (www.r-project.org), and Stata (College Station, TX) software packages.

Results

Characteristics of the cohort, stratified by race, show that AI/AN women tended to enter the cohort in later calendar years (i.e., in 2004-2007) (Table 1). Fewer AI/AN women than White women had completed college (37% vs. 52%, $p < .001$). Obesity (BMI ≥ 30 kg/m²) was more prevalent among AI/AN women than among White women (46% vs. 33%, $p < .001$). Overall, receipt of CRC screening at age 50 was associated with higher educational attainment, no history of smoking, and lower BMI ($p < .001$, data not shown). Women entering the cohort in later years were more likely to be screened within one year of their 50th birthday ($p < .001$). Residence was not independently associated with screening completion at age 50.

Overall, screening uptake at age 50 was similar in the AI/AN and White women (13.3% vs. 14.0%, $p = .74$) (Table 2). The distribution of the CRC screening tests used among those screened at age 50 did not differ by race: over 80% of both AI/AN and White women screened at age 50 received FOBT as their first screening test.

Among women who were not screened at age 50, the rate at which women became adherent (i.e., received their first screening exam) also did not differ by race (Figure 1). The crude hazard ratio from Cox regression, with White women as the reference group, was 1.0 (95% CI = 0.8-1.3). Adjustment for education, year of entry into cohort, smoking history, and BMI did not meaningfully alter results (hazard ratio = 0.9 (95% CI = 0.7-1.3)).

Discussion

After lung and breast cancer, CRC is the leading cause of cancer mortality in U.S. women.¹⁰ Although CRC incidence rates declined in the U.S. general population between 1999 and 2004, incidence among AI/AN women remained unchanged, and their cancers were diagnosed at more advanced stages.^{10, 40} Differences in CRC screening are likely responsible for a majority of this difference. Behavioral Risk Factor Surveillance Survey (BRFSS) found only 36.2% of Pacific Northwest AI/AN women reported being up-to-date with CRC screening for the period 2000-2006, compared with 52.4% of U.S. non-Hispanic White women.¹⁵ Understanding the factors that influence CRC screening behavior is a critical step in addressing these CRC disparities.

In the insured, mostly urban cohort that we examined, we did not observe any meaningful differences in CRC screening uptake between AI/AN and White women. In our analysis, approximately 50% of both White and AI/AN women had received screening by age 56. This was despite AI/AN women's higher prevalence of factors associated with reduced screening in the general population, including lower educational attainment, higher BMI, and history of smoking.

It is likely that the differences between our findings and those of the BRFSS reflect the distinctive characteristics of the samples used, particularly their differing access to screening. That is, the BRFSS drew on a national sample of AI/ANs, thus reflecting a population that faces dramatic variability in the availability and quality of health care, including substantial barriers to CRC screening.⁴¹ Specifically, the Indian Health Service, which provides care for 69% of the AI/AN population either directly or through arrangements with tribes, is chronically underfunded and structured to provide primary and acute rather than specialty care.⁴² Endoscopic screening is limited by lack of endoscopists and lack of resources to pay for procedures. Additionally, 26% of AI/ANs lack either health insurance or access to Indian Health Service or tribal health care.⁴³

By contrast, AI/AN women in our sample departed from the typical pattern of reduced access. As members of an integrated health care delivery system, they have equal eligibility for screening, regardless of race. Notably, in this context of equal access, AI/AN women screened at about the same rates as their White counterparts and on a similar timetable. They also showed similar patterns of choice among screening modalities. These observations are consistent with the interpretation that equal access is associated with reduced racial disparities.⁴⁴

However, we cannot conclude that equality in healthcare access by itself erases differences in screening uptake between AI/AN and non-Hispanic white women. Our sample drew on an urban, insured population in which cultural factors that influence health behaviors may be quite different from those of the AI/AN population at large. As we have shown in a previous publication, cultural practice measures, such as speaking one's Native language at home, can be associated with reduced screening uptake among reservation-dwelling AI/AN populations.¹¹ Others have found similar inverse relationships between measures of traditionalism and cancer screening.^{45, 46}

The term “culture” itself must be used with caution in the context of Native peoples, as there are more than 560 Federally-recognized tribal entities in the U.S., and many others that are not recognized. Culture varies across tribes, and between groups and individuals. As we do not have data on tribal affiliation, or the degree to which women in our AI/AN cohort identify with or practice their traditional cultures, we cannot comment on how these beliefs may influence screening participation.

Our AI/AN sample likely differed from AI/AN women in general in other important ways. Eighty-two percent of our sample had attended college, whereas 58% of AI/AN women nationwide have a high school degree or less.¹⁵ Most of the women in our sample had work-related insurance, whereas only 56% of AI/AN women nationwide participate in the paid workforce.¹⁵ These related factors are associated with increased CRC screening and ultimately with health care access. While such differences limit the generalizability of our findings within the AI/AN population, they do not affect our ability to demonstrate the role of access in reducing disparities across racial populations.

We also note that our results may not apply to all Group Health enrollees because of the inclusion criteria used in this study. Like the majority of large health systems, Group Health

does not routinely collect race data. The AI/AN women in our analysis were participating in a voluntary breast cancer screening program that did collect this information, making their dataset a rare resource. It is possible that these women represent a subgroup unusually sensitive to the need for cancer screening in general, and thus are more likely than other AI/AN women to participate in CRC screening. Further, we required that women be enrolled in Group Health from age 45 to 50 to restrict our analysis to women at average risk for CRC. This approach may have admitted into the study cohort a small number of women who received screening before age 45 and who were missing codes indicating a family history of CRC.

We chose to include information on race ascertained until a woman's 51st birthday. The primary reason for this choice was that many women first reported their race between their 50th and 51st birthdays. Consequently, looking at the time until the first screening event beginning at the 50th birthday would have meant classifying exposure at a given time based on assessment of exposure at a future time. Instead, we looked at the proportion of women screened according to guidelines during the full year following their 50th birthday, as well as the rate at which women who did not initially meet guidelines became adherent. This subtlety must be considered when comparing our results to those of other studies examining CRC screening uptake. Because guidelines recommend that screening begin at age 50 for average-risk individuals, we thought it reasonable to allow woman a full year (until their 51st birthday) to become adherent.

It is important to note the challenges implicit in using administrative data to examine CRC screening behavior, given the necessary assumption that diagnostic codes are both correct and complete and can distinguish between screening and diagnostic procedures. A final limitation is that, although screening rates in our sample increased over the 10-year observation period, they were low for both AI/AN and White women. It is possible that a sample in which overall screening participation was higher might have identified larger differences between AI/AN and White participants.

A major strength of this study was our ability to compare screening uptake by race in a population with equal access to health care. Such opportunities are limited, as most AI/ANs receive health care in settings where no other groups are available to make comparisons, or where the number of AI/ANs served is limited or unknown. Because we did not observe screening differences between AI/AN and White women, our findings suggest that screening disparities reported nationally may be partially attributable to differences in health care access. Since screening and surveillance can decrease the incidence and mortality of CRC, developing evidence-based programs that encourage appropriate screening and provide access to men and women of all races is essential.

Acknowledgments

This research was funded by grants numbered U01 CA114642, from the National Cancer Institute, which supports the Native People for Cancer Control, a Community Networks Program (D. Buchwald, Principal Investigator); 1KL2-RR02-5015, from the National Center for Research Resources, which supports the Institute for Translational Health Sciences (M. Disis, Principal Investigator); and U01 CA063731, which supports the Group Health Breast Cancer Screening Project (D. Buist, Principal Investigator). Manuscript preparation was further supported by grant number 1K01AG022434-01A2 from the National Institute on Aging (E. Garrouette, Principal Investigator).

Abbreviations

AN	Alaska Native
AI	American Indian
BMI	body mass index
BRFSS	Behavioral Risk Factor Surveillance Survey
CPT	Certified Procedural Terminology
CRC	colorectal cancer
FOBT	fecal occult blood test
ICD	International Classification of Diseases

References

- Collett JA, Olynyk JK, Platell CF. Flexible sigmoidoscopy screening for colorectal cancer in average-risk people: update of a community-based project. *Medical Journal of Australia*. Nov 6; 2000 173(9):463–6. [PubMed: 11149301]
- Lieberman DA, Weiss DG, Bond JH, et al. Use of colonoscopy to screen asymptomatic adults for colorectal cancer. Veterans Affairs Cooperative Study Group 380. *New England Journal of Medicine*. Jul 20; 2000 343(3):162–8. [PubMed: 10900274] [see comment][erratum appears in *N Engl J Med* 2000 Oct 19;343(16):1204].
- Mandel JS, Church TR, Bond JH, et al. The effect of fecal occult-blood screening on the incidence of colorectal cancer. *New England Journal of Medicine*. Nov 30; 2000 343(22):1603–7. [see comment][comment]. [PubMed: 11096167]
- Selby JV, Friedman GD, Collen MF. Sigmoidoscopy and mortality from colorectal cancer: the Kaiser Permanente Multiphasic Evaluation Study. *Journal of clinical epidemiology*. 1988; 41(5): 427–34. [PubMed: 3367172]
- Whitlock EP, Lin JS, Liles E, et al. Screening for colorectal cancer: a targeted, updated systematic review for the U.S. Preventive Services Task Force. *Ann Intern Med*. 2008; 149(9):638–58. [PubMed: 18838718]
- Schoen RE, Pinsky PF, Weissfeld JL, et al. Colorectal-Cancer Incidence and Mortality with Screening Flexible Sigmoidoscopy. *N Engl J Med*. May 21.2012
- Segnan N, Armaroli P, Bonelli L, et al. Once-only sigmoidoscopy in colorectal cancer screening: follow-up findings of the Italian Randomized Controlled Trial--SCORE. *J Natl Cancer Inst*. Sep 7; 2011 103(17):1310–22. [PubMed: 21852264]
- Weissfeld JL, Schoen RE, Pinsky PF, et al. Flexible Sigmoidoscopy in the Randomized Prostate, Lung, Colorectal, and Ovarian (PLCO) Cancer Screening Trial: Added Yield from a Second Screening Examination. *J Nat Cancer Inst*. Feb 22; 2012 104(4):280–9. 2012. [PubMed: 22298838]
- Atkin WS, Edwards R, Kralj-Hans I, et al. Once-only flexible sigmoidoscopy screening in prevention of colorectal cancer: a multicentre randomised controlled trial. *Lancet*. May 8; 2010 375(9726):1624–33. [PubMed: 20430429]
- Jemal A, Siegel R, Xu J, et al. Cancer statistics, 2010. *CA Cancer J Clin*. Sep-Oct;2010 60(5):277–300. [PubMed: 20610543]
- Perdue DG, Henderson JA, Garrouette E, et al. Culture and colorectal cancer screening on three American Indian reservations. *Ethn Dis*. 2011; 21(3):342–8. Summer. [PubMed: 21942168]
- Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Mortality - All COD, Public-Use With State, Total U.S. (1969-2003), National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2006. Underlying mortality data provided by NCHS (www.cdc.gov/nchs). 2006.

13. Ward E, Jemal A, Cokkinides V, et al. Cancer disparities by race/ethnicity and socioeconomic status. *CA Cancer J Clin.* Mar-Apr;2004 54(2):78–93. [PubMed: 15061598]
14. Pandhi N, Guadagnolo BA, Kanekar S, et al. Cancer screening in Native Americans from the Northern Plains. *Am J Prev Med.* Apr; 2010 38(4):389–95. [PubMed: 20307807]
15. Steele CB, Cardinez CJ, Richardson LC, et al. Surveillance for health behaviors of American Indians and Alaska Natives—findings from the behavioral risk factor surveillance system, 2000–2006. *Cancer.* Sep 1; 2008 113(5 Suppl):1131–41. [PubMed: 18720374]
16. Chien C, Morimoto LM, Tom J, et al. Differences in colorectal carcinoma stage and survival by race and ethnicity. *Cancer.* Aug 1; 2005 104(3):629–39. [PubMed: 15983985]
17. Cairns CP, Viswanath K. Communication and colorectal cancer screening among the uninsured: data from the Health Information National Trends Survey (United States). *Cancer Causes Control.* Nov; 2006 17(9):1115–25. [PubMed: 17006717]
18. Codori AM, Petersen GM, Miglioretti DL, et al. Health beliefs and endoscopic screening for colorectal cancer: potential for cancer prevention. *Prev Med.* Aug; 2001 33(2 Pt 1):128–36. [PubMed: 11493046]
19. de Bosset V, Atashili J, Miller W, et al. Health insurance-related disparities in colorectal cancer screening in Virginia. *Cancer Epidemiol Biomarkers Prev.* Apr; 2008 17(4):834–7. [PubMed: 18398024]
20. Etzioni DA, Ponce NA, Babey SH, et al. A population-based study of colorectal cancer test use: results from the 2001 California Health Interview Survey. *Cancer.* Dec 1; 2004 101(11):2523–32. [PubMed: 15505783]
21. Hsia J, Kemper E, Kiefe C, et al. The importance of health insurance as a determinant of cancer screening: evidence from the Women's Health Initiative. *Prev Med.* Sep; 2000 31(3):261–70. [PubMed: 10964640]
22. Klabunde CN, Schenck AP, Davis WW. Barriers to colorectal cancer screening among Medicare consumers. *Am J Prev Med.* Apr; 2006 30(4):313–9. [PubMed: 16530618]
23. Levy BT, Dawson J, Hartz AJ, et al. Colorectal cancer testing among patients cared for by Iowa family physicians. *Am J Prev Med.* Sep; 2006 31(3):193–201. [PubMed: 16905029]
24. Matthews BA, Anderson RC, Nattinger AB. Colorectal cancer screening behavior and health insurance status (United States). *Cancer Causes Control.* Aug; 2005 16(6):735–42. [PubMed: 16049812]
25. Meissner HI, Breen N, Klabunde CN, et al. Patterns of colorectal cancer screening uptake among men and women in the United States. *Cancer Epidemiol Biomarkers Prev.* Feb; 2006 15(2):389–94. [PubMed: 16492934]
26. Varghese RK, Friedman C, Ahmed F, et al. Does health insurance coverage of office visits influence colorectal cancer testing? *Cancer Epidemiol Biomarkers Prev.* Mar; 2005 14(3):744–7. [PubMed: 15767362]
27. Bressler B, Lo C, Amar J, et al. Prospective evaluation of screening colonoscopy: who is being screened? *Gastrointestinal endoscopy.* Dec; 2004 60(6):921–6. [PubMed: 15605007]
28. Schumacher MC, Slattery ML, Lanier AP, et al. Prevalence and predictors of cancer screening among American Indian and Alaska native people: the EARTH study. *Cancer Causes Control.* Sep; 2008 19(7):725–37. [PubMed: 18307048]
29. Simonds VW, Colditz GA, Rudd RE, et al. Cancer screening among Native Americans in California. *Ethn Dis.* 2011; 21(2):202–9. Spring. [PubMed: 21749025]
30. Coughlin SS, Thompson T. Physician recommendation for colorectal cancer screening by race, ethnicity, and health insurance status among men and women in the United States, 2000. *Health Promot Pract.* Oct; 2005 6(4):369–78. [PubMed: 16210678]
31. Group Health Cooperative. [December 17, 2012] Fast Facts About Group Health. 2012. [updated September 2012]; Available from: http://www.ghc.org/about_gh/co-op_overview/fastFacts.jhtml
32. Taplin SH, Ichikawa L, Buist DS, et al. Evaluating organized breast cancer screening implementation: the prevention of late-stage disease? *Cancer Epidemiol Biomarkers Prev.* Feb; 2004 13(2):225–34. [PubMed: 14973097]

33. Bao Y, Fox SA, Escarce JJ. Socioeconomic and racial/ethnic differences in the discussion of cancer screening: “between-” versus “within-” physician differences. *Health services research*. Jun; 2007 42(3 Pt 1):950–70. [PubMed: 17489898]
34. Beydoun HA, Beydoun MA. Predictors of colorectal cancer screening behaviors among average-risk older adults in the United States. *Cancer Causes Control*. May; 2008 19(4):339–59. [PubMed: 18085415]
35. Ioannou GN, Chapko MK, Dominitz JA. Predictors of colorectal cancer screening participation in the United States. *American Journal of Gastroenterology*. Sep; 2003 98(9):2082–91. [PubMed: 14499792]
36. Ford JS, Coups EJ, Hay JL. Knowledge of colon cancer screening in a national probability sample in the United States. *J Health Commun*. 2006; 11(Suppl 1):19–35. [PubMed: 16641072]
37. Farmer DF, Bell RA, Stark N. Cancer screening among Native Americans in eastern North Carolina. *Journal of Health Care for the Poor & Underserved*. Nov; 2005 16(4):634–42. [PubMed: 16311489]
38. Rosen AB, Schneider EC. Colorectal cancer screening disparities related to obesity and gender. *J Gen Intern Med*. Apr; 2004 19(4):332–8. [PubMed: 15061742]
39. Centers for Medicare & Medicaid Services. National Breakout of Geographic Area Definitions by Zip Code. Centers for Medicare and Medicaid Services; Baltimore: 2008. [updated March 5, 2012]; Available from: <http://www.cms.hhs.gov/ambulancefeeschedule/> [20012 July 19]
40. Espey DK, Wu XC, Swan J, et al. Annual report to the nation on the status of cancer, 1975-2004, featuring cancer in American Indians and Alaska Natives. *Cancer*. Nov 15; 2007 110(10):2119–52. [PubMed: 17939129]
41. Perdue DG, Perkins C, Jackson-Thompson J, et al. Regional differences in colorectal cancer incidence, stage, and subsite among American Indians and Alaska Natives, 1999-2004. *Cancer*. Sep 1; 2008 113(5 Suppl):1179–90. [PubMed: 18720388]
42. Seng, N.; Chinitz, J. Native health underfunded & promises unfulfilled: The importance of investing in the Indian Health Service. Northwest Federation of Community Organizations 2010 Contract No.: Northwest Federation of Community Organizations; Seattle:
43. Zuckerman S, Haley J, Roubideaux Y, et al. Health service access, use, and insurance coverage among American Indians/Alaska Natives and Whites: what role does the Indian Health Service play? *Am J Public Health*. Jan; 2004 94(1):53–9. [PubMed: 14713698]
44. Soneji S, Armstrong K, Asch DA. Socioeconomic and physician supply determinants of racial disparities in colorectal cancer screening. *J Oncol Pract*. Sep; 2012 8(5):e125–34. [PubMed: 23277775]
45. Canales MK, Rakowski W, Howard A. Traditionality and cancer screening practices among American Indian women in Vermont. *Health Care Women Int*. Feb; 2007 28(2):155–81. [PubMed: 17364978]
46. Solomon TG, Gottlieb NH. Measures of American Indian traditionality and its relationship to cervical cancer screening. *Health Care Women Int*. Sep-Oct;1999 20(5):493–504. [PubMed: 10776118]

Figure 1.

Time until first colorectal cancer screening test for American Indian/Alaska Native (AI/AN) and White women who were not screened at age 50, Group Health, 1996-2007.

Table 1

Baseline characteristics of American Indian/Alaska Native (AI/AN) and White women in cohort, Group Health, 1996-2007

	AI/AN (n = 286) %	White (n = 14,042) %	Chi-square <i>P</i>
<i>Year turned age 50</i>			
1996 – 1999	17%	31%	< 0.001
2000 – 2003	30%	36%	
2004 – 2007	53%	33%	
<i>Highest education^a</i>			
High school graduate or less	15%	13%	< 0.001
Some college	48%	35%	
College graduate or higher	37%	52%	
<i>Zip code^a</i>			
Urban	91%	94%	0.03
Rural	9%	6%	
<i>Smoking status^a</i>			
Non-smoker	61%	78%	< 0.001
Former smoker	17%	10%	
Current smoker	22%	12%	
<i>Body mass index^a</i>			
Normal (< 25 kg/m ²)	23%	39%	< 0.001
Overweight (25 – 29 kg/m ²)	32%	28%	
Obese (≥ 30 kg/m ²)	46%	33%	

^aObservations with missing data excluded from calculations: Education (AI/AN = 15, White = 689); Zip code (AI/AN = 0, White = 75); Smoking status (AI/AN = 72, White = 5,353); Body mass index (AI/AN = 8, White = 289)

Table 2

Proportion of American Indian/Alaska Native and White (AI/AN) women who received screening for colorectal cancer at age 50, Group Health, 1996-2007

	AI/AN N = 286 n (%)	White N = 14,042 n (%)
Total screened	38 (13.3%)	1,964 (14.0%)
Screening FOBT	31 (81.6%)	1,718 (87.5%)
Screening flexible sigmoidoscopy	2 (5.3%)	112 (5.7%)
Screening colonoscopy	5 (13.2%)	134 (6.8%)

FOBT= fecal occult blood test; *P*-value from chi square comparing total screened = 0.74; *P*-value from chi square comparing type of screening test = 0.31