HHS Public Access

Author manuscript

*Cancer*. Author manuscript; available in PMC 2018 May 01.

Published in final edited form as:

*Cancer*. 2017 May 01; 123(9): 1585–1589. doi:10.1002/cncr.30476.

# Cancer Preventive Services, Socioeconomic Status and the Affordable Care Act

**Gregory S Cooper, MD**, **Tzuyung Doug Kou, PhD**, **Avi Dor, PhD**, **Siran M Koroukian, PhD**, and **Mark D Schluchter, PhD**

Division of Gastroenterology (GSC, TDK), University Hospitals Case Medical Center; Comprehensive Cancer Center (GSC, SMK, MDS) and the Department of Epidemiology and Biostatistics (SMK), Case Western Reserve University School of Medicine and the Department of Health Policy (AD), George Washington University.

## Abstract

**Background—**Out of pocket expenditures are thought to be an important barrier to receipt of cancer preventive services, especially among lower socioeconomic status (SES). The Affordable Care Act (ACA) eliminated out-of-pocket expenditures for recommended services, including mammography and colonoscopy. Our objective was to determine changes in uptake of mammography and colonoscopy among fee-for-service Medicare beneficiaries before and after ACA implementation.

**Methods—**Using Medicare claims data, we identified women ≥ 70 without mammography in the previous 2 years, and men and women ≥ 70 at increased risk for colorectal cancer without colonoscopy in the past 5 years. We identified procedure receipt in the two-year period prior to ACA implementation (2009-2010) and after implementation (2011-September 2012). Multivariable generalized estimating equation models determine the independent association of and county-level quartile of median income and education with receipt of testing.

**Results—**For mammography, lower SES quartile was associated with less uptake but the post-ACA disparities were smaller compared to the pre-ACA period. In addition, mammography rates increased from pre- to post-ACA in all SES quartiles. For colonoscopy, in both the pre- and post-ACA periods, there was an association between uptake and educational level and to some extent, income. However, there were no appreciable changes with colonoscopy and SES following the ACA.

**Conclusions—**Removal of out-of-pocket expenditures may overcome a barrier to receipt of recommended preventive services but for colonoscopy, other procedural factors may remain as deterrents.

### Keywords

Mammography; colonoscopy; socioeconomic factors; Affordable Care Act; cancer screening

Address all correspondence to: Gregory S Cooper, MD, Division of Gastroenterology, University Hospitals Case Medical Center, 11100 Euclid Avenue, Cleveland, OH 44106-5066; Phone: (216) 844-5385; Fax: (216) 983-0347; greg.cooper@case.edu.

Conflicts of Interest: None

## Introduction

The Affordable Care Act (ACA), which was signed into law in 2010 and began phased-in implementation in 2011, provided expanded health care insurance coverage to previously uninsured or underinsured individuals. Although the major objectives of the ACA were to be achieved through Medicaid expansion, insurance mandates and elimination of exclusions for preexisting conditions, another goal was to eliminate out-of-pocket expenditures for preventive services that were approved by the United States Preventive Services Task Force (USPSTF), including screening mammography and colonoscopy. Reduction of financial barriers to receipt of cancer screening is thought to be an important step in eliminating known socioeconomic disparities in cancer incidence and stage at presentation (1).

Although it is assumed that elimination of out-of-pocket expenses would reduce disparities, there is little empirical evidence to support this contention. Previous studies have reported inconsistent findings with regard to changes in screening following the ACA (2-7) and few have compared changes across socioeconomic strata. Therefore, we examined the uptake of mammography and colonoscopy according to county-level socioeconomic status among fee-for-service Medicare beneficiaries in the two year period prior to the ACA (2009-2010) and two years after the ACA (2011-2012).

## Methods

The design of the study has been previously reported (8). In brief, we used a 5% random sample of fee-for-service Medicare beneficiaries aged 70 and older who were continuously enrolled in Medicare Parts A and B. Files included 2009-2012 Medicare Provider Analysis and Review (MEDPAR), outpatient and Carrier or physician claims files, as well as the Medicare Beneficiary Summary files which contain enrollment data. Based on their most recent screening procedure date, we identified women without mammography in the last 24-month period and men and women who were at increased risk for colorectal cancer (previous polyp diagnosis or polypectomy, inflammatory bowel disease or family history of colon cancer) without colonoscopy in the past five years. Using previously developed algorithms, the analysis was limited to procedures that were performed for preventive as opposed to diagnostic indications (9,10). We excluded beneficiaries who were enrolled in Medicare because of end stage renal disease or disability, or a diagnosis of cancer or carcinoma-in-situ during the previous 5 year period. Because of the need to have a five-year look back period, we excluded beneficiaries aged 65-69 and eligible patients entered the sample at age 70.

As the Medicare files do not contain beneficiary level socioeconomic status (SES), using the 2010 US Census data, we included county-level median household income and proportion of high school graduates among adults aged 25 and older as a proxy. These measures were stratified by quartile. Other measures included demographic characteristics (age, race, gender for colonoscopy), geographic region Northeast, Midwest, South, West), comorbidity score (11), receipt of Medicare wellness visits or welcome to Medicare visits, presence of additional breast cancer risk factors (includes benign breast neoplasm, abnormal findings on radiological and other breast examinations, complications due to breast prostheses, Cowden

syndrome, personal history of chest irradiation, and family history of breast or ovarian cancer) (for mammography), county density of primary care providers and county density of gastroenterologists (for colonoscopy) as measured by the 2010 AMA Masterfile.

Because individual patients were eligible for screening in more than one year, patient-level generalized estimating equation (GEE) logistic regression was used to account for within-patient correlation. Multivariable GEE models were used to determine the independent association of quartile of SES measures with receipt of testing, and we calculated the odds ratio for procedure receipt within each SES quartile. Analyses were performed for the two-year period prior to ACA implementation (2009-2010) and after implementation (2011-September 2012). The models included an indicator variable for time period as well as interactions between period and income and education quartile. The resulting models allowed the effects of education and income quartile to vary between the two periods, and allowed testing whether relationships between screening and these factors changed from pre- to post-ACA periods.

## Results

The sample included 862,267 women for the mammography analysis. In the mammography sample, the mean age was 79.7 ± 6.9 years, 86.5% were white, and 8.2% were African American. More than 16% had evidence of increased breast cancer risk and 57.2% underwent one or more mammograms within the previous five years. The estimated odds ratios for the effects of income quartile and education for the pre- and post-ACA periods are shown (Tables 1 and 2). Although for both time periods there appeared to be an association of lower SES quartile and less receipt of mammography (Table 1), following the ACA, the odds ratios differed significantly between the two time periods, and the post-ACA disparities were smaller compared to the pre-ACA period. For example, compared to the highest quartile, the odds ratio for the lowest quartile increased from 0.87 (95% CI 0.86, 0.88) pre-ACA to 0.94 (95% CI 0.93, 0.95) post-ACA for income and from 0.76 (95% CI 0.75, 0.77) to 0.86 (95% CI 0.85, 0.87) for education ($p<0.0001$ for comparison of time periods). In addition, significant interaction with time period was found for the effects of income and education. We then compared screening rates in the post-ACA period to rates pre-ACA, within each category of income and education quartile (Table 2). These data indicate that mammography rates increased from pre- to post-ACA in all categories.

The sample included 326,503 men and women for the colonoscopy analysis. In the colonoscopy sample, the mean age was 77.1 ± 6.1 years, 59% were female and 89.9% were white, and 6.3% were African American. There was evidence of receipt of colonoscopy in the past five years in 68%. The estimated odds ratios for the effects of income quartile and education for the pre- and post-ACA periods are shown (Tables 3 and 4). In both the pre- and post-ACA periods, there was an association of educational level and to some extent, income, with receipt of colonoscopy (Table 3). However, in contrast to mammography, there were no appreciable changes following the ACA. For example, compared to the highest quartile, the odds ratio for the lowest quartile was 0.94 (95% CI 0.91-0.97) pre-ACA and 0.92 (95% CI 0.90-0.95) post-ACA for income and 0.96 (95% CI 0.93, 0.99) pre-ACA and 1.00 (95% CI 0.97, 1.03) post-ACA for education ($p=0.40$ for comparison of time periods

for income and p=0.07 for education). The interaction tests indicate the effects of income, education and quartile did not differ significantly between the two time periods, which is consistent with the results of the more specific tests. In addition, odds ratios comparing colonoscopy rates pre- and post-ACA indicated a slight decrease in uptake (Table 4).

## Discussion

It has been well documented that members of lower socioeconomic groups are less likely to receive cancer preventive services. For example, data from the 2013 National Health Interview Survey (NHIS) indicate differences in colorectal endoscopy, fecal occult blood testing, mammography, Pap testing and prostate specific antigen testing according to level of education and presence of health insurance (12). Thus, elimination or reduction of out of pocket expenditures should ideally reduce these disparities. Using a cohort of Medicare beneficiaries, we found that following ACA implementation there was not only an increment in mammography uptake, but the gap in mammography receipt between lowest and highest SES strata narrowed. In contrast, overall colonoscopy uptake did not differ substantively across strata and was stagnant with no change in any observed disparities post-ACA.

Although screening mammography and colonoscopy were covered benefits under Medicare prior to ACA implementation, beneficiaries were responsible for paying 20% coinsurance for mammography and 25% coinsurance for colonoscopy. For diagnostic mammography or colonoscopy, including colonoscopy with preventive indications that resulted in biopsy or polypectomy, beneficiaries were also responsible for the annual deductible. Following the ACA, both coinsurance and deductibles were waived for screening examinations, but for diagnostic indications, beneficiaries were still responsible for coinsurance.

Previous studies have used changes in reimbursement policy to examine the impact of decreased out-of-pocket expenditures on procedure uptake. In 1991, when screening mammography was first reimbursed under Medicare, rates of mammography remained similar to the previous year, though were consistently lower in women who lacked supplemental insurance (13). In 1998, Medicare coverage changed from biennial to annual mammography and this policy change was associated with a decrease in advanced stage cancers among women enrolled in fee-for-service as opposed to managed care plans (14). However, out-of-pocket expenditures continued to be a barrier to mammography receipt, as demonstrated in a study of Medicare managed care enrollees (15). Overall colonoscopy use increased following coverage of screening colonoscopy for high-risk individuals (16), and increased further after universal coverage in July 2001 (17,18). In patients younger than 65, state mandates for insurance coverage for screening colonoscopy has been associated with higher screening rates (19). However, none of the above studies examined the impact of these changes on known socioeconomic disparities in screening.

More recently, studies have examined changes in screening procedures in health plans (4,5,7) and Medicare beneficiaries (3,6) after ACA implementation and have found either no substantive change in screening or only increases in a subgroup of patients. Although most studies did not stratify their findings by SES, one study in a high deductible health plan found that colorectal screening rates increased post-ACA but the change was limited to

higher income individuals (7). The current findings contrast to that of two cross-sectional studies. Fedewa and colleagues used NHIS data and found an increase in colon cancer screening from 2008 to 2013 among Medicare beneficiaries and individuals with lower income and educational attainment, and no overall change in mammography uptake (2). Hamman and Kapinos used Behavioral Risk Factor Surveillance System data and found an increase in colorectal screening in men but not women post-ACA, with the largest increase in socioeconomically disadvantaged men (6). However, our methodology differed in that the same population was examined pre- and post-ACA, and thus accounted for pre-ACA screening behavior. In addition, our study included a colonoscopy population with additional risk factors and thus these individuals may exhibit different behavior than an average risk population.

We acknowledge several limitations of the data. First, the administrative data lack clinical detail, including the inability to differentiate screening versus diagnostic indications, though we used previously developed algorithms to select screening procedures. The study also did not examine beneficiaries who were enrolled in Medicare advantage plans but focused on the impact of reform changes in fee-for-service enrollees. The analysis was also limited to an older patient population that was predominantly Caucasian, and thus the impact of reform legislation in other populations, including younger, privately insured or predominantly minority individuals could not be measured. Although routine screening colonoscopy is not universally recommended past age 75, in patients at increased cancer risk such as in this study, there is no upper age limit. Another limitation is the lack of data on supplemental or Medigap insurance, as individuals with such insurance would not be subject to out-of-pocket expenses for diagnostic procedures. However, the presence of Medigap insurance would have the greatest effect in the pre-ACA period, where out-of-pocket expenses were greater. The current legislation also does not waive co-payments for colonoscopy with biopsy or polypectomy in Medicare beneficiaries, even if the procedure indication was preventive, and it is unknown if this loophole served as a deterrent to colonoscopy uptake. Finally, because patient level socioeconomic status was not available in claims data, we used small area measures, an approach that is commonly used in studies of Medicare data. However, we acknowledge that within a given region, there is some degree of heterogeneity of socioeconomic status.

Although we were unable to measure a direct cause and effect relationship, we found that following ACA implementation, there was reduction in socioeconomic disparities for screening mammography but not colonoscopy. The findings support the removal of out-of-pocket expenditures as a barrier to receipt of recommended preventive services but emphasize that for colonoscopy, other factors such as fear of sedation, perceived discomfort and need for bowel preparation should be considered. We would suggest that future studies examine the ACA's impact in other populations including newly insured individuals.

## Acknowledgments

Supported by the American Cancer Society, Grant Number RSGI-12-218-01-CPHPS, the Case Clinical and Translational Scientific Collaborative, National Center for Advancing Translational Sciences Grant Number UL1TR000439, and the Case Comprehensive Cancer Center, National Cancer Institute Grant Number P30 CA043703.

## References


1. Siegel R, Miller KD, Jemal A. Cancer statistics, 2016. Ca Cancer J Clin. 2016; 66:7–30. [PubMed: 26742998]
2. Fedewa SA, Goodman M, Flanders WD, et al. Elimination of cost-sharing and receipt of screening for colorectal and breast cancer. Cancer. 2015; 121:3272–80. [PubMed: 26042576]
3. Jensen GA, Salloum RG, Hu J, Baghban Ferdows N, Tarraf W. A slow start: use of preventive services among seniors following the Affordable Care Act's enhancement of Medicare benefits in the US. Prev Med. 2015; 76:37–42. [PubMed: 25895838]
4. Mehta SJ, Polsky D, Zhu J, et al. ACA-mandated elimination of cost sharing for preventive screening has had limited early impact. Am J Manag Care. 2015; 21:511–7. [PubMed: 26247741]
5. Nelson HD, Weerasinghe R, Wang L, Grunkemeier G. Mammography screening in a large health system following the US Preventive Services Task Force recommendations and the Affordable Care Act. PLoS ONE. 2015; 10(6):e0131903. [PubMed: 26121485]
6. Hamman MK, Kapinos KA. Affordable Care Act provision lowered out-of-pocket cost and increased colonoscopy rates among men in Medicare. Health Affairs. 2015; 34:2069–76. [PubMed: 26643627]
7. Wharam JF, Zhang F, Landon BE, LeCates R, Soumerai S, Ross-Degnan D. Colorectal cancer screening in a nationwide high-deductible health plan before and after the Affordable Care Act. Med Care. 2016; 54:466–73. [PubMed: 27078821]
8. Cooper GS, Kou TD, Schluchter MD, Dor A, Koroukian SM. Changes in receipt of cancer screening in Medicare beneficiaries following the Affordable Care Act. J Natl Cancer Inst. Dec 6.2015 108(5):djv374. doi: 10.1093/jnci/djv374. [PubMed: 26640244]
9. Fenton JJ, Zhu W, Balch S, Smith-Bindman R, Fishman P, Hubbard RA. Distinguishing screening from diagnostic mammograms using Medicare claims data. Med Care. 2014; 52:e44–e51. [PubMed: 22922433]
10. Cooper GS, Koroukian SM. Racial disparities in the use of and indications for colorectal procedures in Medicare beneficiaries. Cancer. 2004; 100:418–24. [PubMed: 14716780]
11. Klabunde CN, Warren JL, Legler JM. Assessing comorbidity using claims data. Med Care. 2002; 40(8)(Suppl):26–35. [PubMed: 11748424]
12. Smith RA, Andrews K, Brooks D, et al. Cancer screening in the United States, 2015. A review of current American Cancer Society guidelines and current issues in cancer screening. Ca Cancer J Clin. 2015; 65:30–54. [PubMed: 25581023]
13. Bluestein J. Medicare coverage, supplemental insurance and the use of mammography by older women. N Engl J Med. 1995; 332:1138–43. [PubMed: 7700288]
14. Habermann EB, Virnig BA, Riley GF, Baxter NN. The impact of a change in Medicare reimbursement policy and HEDIS measures on stage at diagnosis among Medicare HMO and fee-for-service female breast cancer patients. Med Care. 2007; 45:761–6. [PubMed: 17667310]
15. Trivedi AN, Rakowski W, Ayanian JZ. Effect of cost-sharing on screening mammography in Medicare health plans. N Engl J Med. 2008; 358:375–83. [PubMed: 18216358]
16. Cooper GS, Koroukian SM. Racial disparities in the use of and indications for colorectal procedures in Medicare beneficiaries. Cancer. 2004; 100:418–24. [PubMed: 14716780]
17. Harewood GC, Lieberman DA. Colonoscopy practice patterns since introduction of Medicare coverage for average-risk screening. Clin Gastroenterol Hepatol. 2004; 2:72–7. [PubMed: 15017635]
18. Gross CP, Andersen MS, Krumholtz HM, et al. Relation between Medicare screening reimbursement and stage at diagnosis for older patients with colon cancer. JAMA. 2006; 296:2815–22. [PubMed: 17179458]
19. Cokkinides V, Bandi P, Shah M, Virgo K, Ward E. The association between state mandates of colorectal cancer screening coverage and colorectal cancer screening utilization among US adults aged 50 to 64 years with health insurance. BMC Health Services Research. 2011; 11:19. [PubMed: 21272321]

**Table 1**

Mammography Screening Results

| | | Pre-ACA | | | Post-ACA | | | p-value comparing periods[2] | p-value for interaction[3] |
|---|---|---|---|---|---|---|---|---|---|
| | | OR | 95% CI | p[1] | OR | 95% CI | p[1] | | |
| Income | Q1vQ4 | 0.87 | (0.86, 0.88) | <0.0001 | 0.94 | (0.93, 0.95) | <0.0001 | <0.0001 | <0.0001 |
| | Q2vQ4 | 0.96 | (0.95, 0.97) | <0.0001 | 1.00 | (0.99, 1.01) | 0.53 | <0.0001 | |
| | Q3vQ4 | 1.01 | (1.00,1.02) | 0.0091 | 1.01 | (1.00, 1.02) | 0.0048 | 0.97 | |
| Education | Q1vQ4 | 0.76 | (0.75, 0.77) | <0.0001 | 0.86 | (0.85, 0.87) | <0.0001 | <0.0001 | <0.0001 |
| | Q2vQ4 | 0.83 | (0.82, 0.84) | <0.0001 | 0.91 | (0.91, 0.92) | <0.0001 | <0.0001 | |
| | Q3vQ4 | 0.89 | (0.88, 0.90) | <0.0001 | 0.95 | (0.94, 0.96) | <0.0001 | <0.0001 | |

OR's comparing screening rates for Post-ACA vs. Pre-ACA periods, by income and education quartiles

[1]Tests whether the corresponding odds ratio equals 1.0

[2]Tests whether the odds ratios from different periods are equal

[3]Tests the null hypothesis that none of the odds ratios comparing quartiles differ between the two periods

**Table 2**

Comparison of Mammography Use for Post-ACA vs. Pre-ACA Periods, According to Income and Education Quartile

| | | OR | 95% CI | p |
|---|---|---|---|---|
| Income | Q1 | 1.28 | (1.26, 1.29) | <0.0001 |
| | Q2 | 1.23 | (1.21, 1.24) | <0.0001 |
| | Q3 | 1.18 | (1.17, 1.19) | <0.0001 |
| | Q4 | 1.18 | (1.16, 1.19) | <0.0001 |
| Education | Q1 | 1.28 | (1.27, 1.30) | <0.0001 |
| | Q2 | 1.24 | (1.23, 1.25) | <0.0001 |
| | Q3 | 1.21 | (1.20, 1.22) | <0.0001 |
| | Q4 | 1.13 | (1.12, 1.14) | <0.0001 |

**Table 3**

Colonoscopy Screening Results

| | | Pre-ACA | | | Post-ACA | | | p-value comparing periods[2] | p-value for interaction[3] |
|---|---|---|---|---|---|---|---|---|---|
| | | OR | 95% CI | p[1] | OR | 95% CI | p[1] | | |
| Income | Q1vQ4 | 0.94 | 0.91-0.97 | <0.0001 | 0.92 | 0.90-0.95 | <0.0001 | 0.40 | 0.44 |
| | Q2vQ4 | 0.99 | 0.96-1.02 | 0.40 | 0.96 | 0.94-0.99 | 0.0078 | 0.15 | |
| | Q3vQ4 | 0.99 | 0.97-1.02 | 0.58 | 0.99 | 0.97-1.01 | 0.41 | 0.81 | |
| Educ | Q1vQ4 | 0.96 | 0.93-0.99 | 0.005 | 1.00 | 0.97-1.03 | 0.77 | 0.073 | 0.23 |
| | Q2vQ4 | 0.97 | 0.95-1.00 | 0.030 | 0.98 | 0.95-1.01 | 0.19 | 0.57 | |
| | Q3vQ4 | 0.98 | 0.96-1.00 | 0.070 | 1.00 | 0.98-1.02 | 0.95 | 0.21 | |

OR's comparing screening rates for Post-ACA vs. Pre-ACA periods, by income and education quartiles

[1]Tests whether the corresponding odds ratio equals 1.0

[2]Tests whether the odds ratios from different periods are equal

[3]Tests the null hypothesis that none of the odds ratios comparing quartiles differ between the two periods

**Table 4**

Comparison of Colonoscopy Use for Post-ACA vs. Pre-ACA Periods, According to Income and Education Quartile

| | | OR | 95% CI | p |
|---|---|---|---|---|
| Income | Q1 | 0.96 | (0.93, 0.99) | 0.005 |
| | Q2 | 0.95 | (0.92, 0.98) | 0.0006 |
| | Q3 | 0.97 | (0.94, 1.00) | 0.04 |
| | Q4 | 0.97 | (0.94, 1.01) | 0.10 |
| Education | Q1 | 0.98 | (0.95, 1.01) | 0.21 |
| | Q2 | 0.96 | (0.93, 0.98) | 0.0033 |
| | Q3 | 0.97 | (0.94, 0.99) | 0.020 |
| | Q4 | 0.95 | (0.91, 0.98) | 0.0009 |