



Multilevel predictors of colorectal cancer testing modality among publicly and privately insured people turning 50

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ARTICLE INFO

Article history:

Received 4 May 2016

Received in revised form 14 September 2016

Accepted 24 November 2016

Available online 7 December 2016

Keywords:

Colorectal cancer

Colonoscopy

Fecal occult blood test

Cancer screening tests

Medicaid

Medicare

Multilevel analysis

ABSTRACT

Understanding multilevel predictors of colorectal cancer (CRC) screening test modality can help inform screening program design and implementation. We used North Carolina Medicare, Medicaid, and private, commercially available, health plan insurance claims data from 2003 to 2008 to ascertain CRC test modality among people who received CRC screening around their 50th birthday, when guidelines recommend that screening should commence for normal risk individuals. We ascertained receipt of colonoscopy, fecal occult blood test (FOBT) and fecal immunochemical test (FIT) from billing codes. Person-level and county-level contextual variables were included in multilevel random intercepts models to understand predictors of CRC test modality, stratified by insurance type.

Of 12,570 publicly-insured persons turning 50 during the study period who received CRC testing, 57% received colonoscopy, whereas 43% received FOBT/FIT, with significant regional variation. In multivariable models, females with public insurance had lower odds of colonoscopy than males (odds ratio [OR] = 0.68; $p < 0.05$). Of 56,151 privately-insured persons turning 50 years old who received CRC testing, 42% received colonoscopy, whereas 58% received FOBT/FIT, with significant regional variation. In multivariable models, females with private insurance had lower odds of colonoscopy than males (OR = 0.43; $p < 0.05$). People living 10–15 miles away from endoscopy facilities also had lower odds of colonoscopy than those living within 5 miles (OR = 0.91; $p < 0.05$). Both colonoscopy and FOBT/FIT are widely used in North Carolina among insured persons newly age-eligible for screening. The high level of FOBT/FIT use among privately insured persons and women suggests that renewed emphasis on FOBT/FIT as a viable screening alternative to colonoscopy may be important.

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1. Introduction

Colorectal cancer (CRC) screening is a proven strategy to reduce colon cancer morbidity and mortality when used according to guidelines by average-risk people ages 50–75 years old. When used as

recommended by guidelines, CRC screening reduces the chances of developing and dying from CRC (US Preventive Services Task Force, 2008). Screening for clinically undetectable pre-cancers and cancers among average-risk men and women can be performed by several modalities, including: colonoscopy once every 10 years; fecal occult blood test (FOBT) or fecal immunochemical test (FIT) every year; or flexible sigmoidoscopy once every 5 years (Levin et al., 2008). In practice, colonoscopy and FOBT/FIT are the most widely used screening tests, with differing sensitivity and specificity, preparation procedures, invasiveness, recovery time, and follow-up procedures recommended (US Preventive

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Services Task Force, 2008; Centers for Disease Control and Prevention, 2013).

Since 2000, the US has seen an increase in CRC screening (Klabunde et al., 2011; Meissner et al., 2006; Kim et al., 2005; Centers for Disease Control and Prevention, 2011) with variation in choice of test modality over time. Specifically, there has been a notable increase in colonoscopy uptake (Meissner et al., 2006; Kim et al., 2005) and a slight decrease in fecal testing uptake (Klabunde et al., 2011; Centers for Disease Control and Prevention, 2011; Steele et al., 2013; Bandi et al., 2012). While no single factor caused this shift in screening modality, between 1998 and 2001, Medicare and state General Assemblies implemented policy changes that required insurers to reimburse providers at least in part for the cost of colonoscopy screening, along with other types of CRC screening, for age-eligible or high-risk persons (Kim et al., 2005; Centers for Medicare and Medicaid Services, CMS, 2009). These policy changes may have incentivized providers to recommend screening with colonoscopy more often due to higher reimbursement and may have motivated patients to be screened via colonoscopy due to reduced out-of-pocket cost and longer duration of coverage (Klabunde et al., 2011).

Physician recommendation and patient preferences factor into choice of CRC screening modality (Hawley et al., 2014; Inadomi et al., 2012). Some physicians have been noted to prefer and recommend colonoscopies over FOBT/FIT for screening (Bandi et al., 2012; Hawley et al., 2014; Inadomi et al., 2012; Schwartz, 2004; Reed et al., 2008; Pruitt et al., 2014; Shariff-Marco et al., 2013). Patient preferences differ widely across populations, with some evidence suggesting that preference for colonoscopy is associated with family history of CRC and desire for accuracy, whereas preference for fecal testing may be associated with desire for ease, lower cost, and convenience (Meissner et al., 2006; Steele et al., 2013; Towne et al., 2014). Racial variation in screening modality indicates that non-Hispanic Whites receive colonoscopies more often (Steele et al., 2013; Inadomi et al., 2012). Latinos and non-Hispanic Blacks prefer FOBT over colonoscopy (Klabunde et al., 2011; Steele et al., 2013; Bandi et al., 2012; Inadomi et al., 2012; Towne et al., 2014), despite low levels of overall CRC screening among both of these groups (Klabunde et al., 2011). Although individual-level factors explain much of the variation in screening modality (Pruitt et al., 2014; Shariff-Marco et al., 2013), area-level resources have been associated with screening modality in some studies (Shariff-Marco et al., 2013), and geographic location and access to screening are significantly associated with screening choices among some racial/ethnic minority populations (Towne et al., 2014). These observations prompt a need to further evaluate geographic and area-level factors in order to more clearly understand how individual and geographic factors simultaneously influence CRC screening modality received by certain populations.

Given continued variation in patient preferences and physician recommendation, as well as the need for a more in-depth examination of area-level factors, we sought to gain a better understanding of geographic variation in, and the specific predictors of, CRC screening modality (colonoscopy versus FOBT/FIT) among average-risk people who were incident screeners—that is, newly age-eligible for CRC screening. We focused on incident screeners because these individuals would not be expected to have a prior history of CRC testing that may affect choice of modality. We were interested in the first CRC test modality received. We therefore investigated these questions among publicly and privately insured people in North Carolina (NC) who received CRC testing around their 50th birthday, the age screening is recommended to commence by the United States Preventive Services Task Force (USPSTF) for normal risk individuals. We focused on NC because it is a large, racially, socio-economically, and geographically heterogeneous state with high CRC mortality and is an ideal setting in which to compare CRC testing from linked claims data to national self-reported data. Self-report accuracy is higher among individuals receiving colonoscopies than for FOBT/FIT

(Dodou & de Winter, 2014), perhaps due to the substantial preparation and recovery time required for colonoscopy compared to FOBT/FIT. Such recall bias may potentially result in misleading assessments of the balance among modalities. Therefore, assessing CRC modality using data other than self-reported information is essential.

2. Methods

2.1. Data

We used NC Medicare and Medicaid fee-for-service insurance claims data from people insured by either or both of these public insurance providers in 2003–2008, inclusive. We also used fee-for-service claims data from private, commercially available health plans in NC in 2003–2008, inclusive. We required continuous enrollment to ensure that we were able to fully capture receipt of CRC testing from health insurance claims.

2.2. Study population

In accordance with the USPSTF guidelines for initiation of CRC screening at 50 years old, we included people who turned 50 at any time during the study period and received at least one CRC screening test. Among Medicaid and Medicare enrollees, due to eligibility criteria, this primarily represents a disabled population, whereas this age group in the privately insured population primarily represents working adults receiving employer-sponsored insurance. Although Medicare covers screening colonoscopy or FOBT/FIT without coinsurance or copay according to recommended testing schedules (Centers for Medicare and Medicaid Services, CMS, 2015), state Medicaid programs and private insurance plans vary in their CRC screening coverage policies. We included people who had received either colonoscopy, FOBT or FIT during the study period (14,787 publicly, 59,875 privately insured), as this represents approximately 96% of CRC screening tests performed in this population (Wheeler et al., 2014). We also limited our study population to those individuals who remained alive and did not move to a different county during the study period so that we could understand regional variation in modality and examine the effect of area-level factors, such as distance from patient residence to an endoscopy provider, on CRC testing modality (2183 publicly, 2813 privately insured were excluded). Because we were interested in distance to endoscopy centers as a measure of geographic access, we further excluded a small number of people without valid ZIP code data (3 publicly, 769 privately insured). Finally, we also excluded people with prior history of CRC or colectomy (31 publicly, 142 privately insured), as defined in the available claims data, to ensure that our measures reflected screening rather than surveillance procedures.

2.3. Dependent variable

CRC testing was defined as beneficiary receipt of colonoscopy or FOBT/FIT in the claims during the study period. Receipt of colonoscopy was defined as our binary, dependent variable (receipt of FOBT/FIT was the reference category). Billing codes used are listed in Supplemental Table 1 (Online). Codes included procedures performed for screening and diagnostic intent, since these cannot be reliably distinguished in claims data because billing practices vary across institutions (Schenck et al., 2008; Schenck et al., 2007).

For people who received both procedures, the first procedure received was designated as the primary outcome for analysis because it more likely aligns with initial choice of modality. For example, an initial abnormal FOBT/FIT would require follow-up colonoscopy, but this second procedure was not included in our analysis.

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