

# Use of Screening CT Colonography by Age and Race: A Study of Potential Access Barriers Related to Medicare Noncoverage Based on Data From the ACR's National CT Colonography Registry

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## Abstract

**Objective:** The primary objectives of this investigation were to evaluate the use of screening CT colonography (CTC) examinations by age comparing individuals of Medicare-eligible age to younger cohorts and to determine if the association between use of CTC and Medicare-eligible age varies by race. Although the Affordable Care Act requires commercial insurance coverage of screening CTC, Medicare does not cover screening CTC.

**Materials and Methods:** Using the ACR's CTC registry, the distribution of procedures by age was evaluated using a negative binomial model with patient age (to capture overall trend), indicator of Medicare-eligible age (to capture immediate changes in trend at age 65), and their interaction (to capture gradual changes after age 65) as independent variables. The association between the number of screening CTCs and age was compared by racial identity.

**Results:** The CTC registry contained data on 12,648 screening examinations. Between ages 52 and 64, the number of screening examinations increased; each additional age year was associated with a 5.3% ( $P < .001$ ) increase in the number of screenings. However, after age 65, the number of screening examinations decreased by -6.9% per additional year of age above 65 compared with the trend between ages 52 and 64 ( $P < .001$ ). The modal age group for CTC use was 65 to 69 years in white and 55 to 59 in Black individuals.

**Conclusion:** After age 65, the number of screening CTC examinations decreased, likely due, at least in part, to lack of Medicare coverage. Medicare noncoverage may have a disproportionate impact on Black patients and other racial minorities.

**Key Words:** Colorectal cancer screening, CT colonography, health care disparities, Medicare noncoverage

J Am Coll Radiol 2020; ■: ■-■. Copyright © 2020 American College of Radiology

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Dr Duszak and Dr Horný receive research support from the Harvey L. Neiman Health Policy Institute. The other authors state that they have no conflict of interest related to the material discussed in this article. Dr Moreno, Dr Judy Yee, Dr Dachman, Dr Duszak, Ms Goldman, and Dr Horný are nonpartner, non-partnership track employees.

## INTRODUCTION

Colorectal cancer remains the second leading cause of cancer-related death in the United States despite the fact that it is preventable with screening [1]. Annually, an estimated 105,000 Americans are newly diagnosed with colorectal cancer, and 53,000 die as a result of the disease [1]. Screening is proven to reduce deaths by detecting and removing precancerous polyps and also by detecting disease at an earlier stage, when it is more treatable [2-5]. Increased screening accounts for much of the decrease in colorectal cancer mortality observed in the United States during the last three decades [6]. However, only 61% of individuals aged 50 to 64 years and 71% aged 65 years and older report being up to date with colorectal cancer screening [7].

In its 2009 Decision Memo for Screening Computed Tomography Colonography (CTC) for Colorectal Cancer (CAG-00396N), CMS determined that there was inadequate evidence to conclude that CTC is an appropriate colorectal cancer screening test, and screening CTC has remained noncovered by Medicare [8]. Medicare does cover other colorectal cancer screening tests including screening colonoscopies [9], screening fecal occult blood tests [10], multitarget stool DNA tests [11], screening barium enemas [12], and screening flexible sigmoidoscopies [13].

Since 2016, however, CTC is among the colorectal cancer screening tests recommended by the US Preventive Services Task Force (USPSTF) and is also a test recommended by the American Cancer Society [14,15]. Based on its A grade from the USPSTF, nongrandfathered commercial insurance plans are required to cover screening CTC without patient cost-sharing (no deductible, copayment, or coinsurance) as part of the Affordable Care Act of 2010 [16]. Although Medicare does not cover screening CTC, it does cover diagnostic CTC for some indications. Annual Medicare claims for diagnostic CTC have increased over time [17,18]. The primary objectives of this investigation were to evaluate the use of screening CTC examinations by age, comparing individuals of Medicare-eligible age to younger cohorts and to determine whether the association between the use of CTC and Medicare-eligible age varies by race.

## MATERIALS AND METHODS

This study involved no protected health information. As such, it did not constitute human subjects research and did not require institutional review board oversight.

Deidentified, aggregated data on CTC encounters were obtained from the ACR's National Radiology Data Registry CTC Registry for which facility participation is voluntary. Registry data were submitted by 50 sites between years 2008 and 2020, with a median 146.5 cases submitted per site. We

limited the sample to screening examinations, which were defined as examinations performed in asymptomatic patients including those with a history of failed screening optical colonoscopy unless the optical colonoscopy failed because of a visualized stricture or mass. These definitions of a screening examination and a diagnostic examination are provided on the registry input forms.

Extracted variables included patient age at the time of examination, sex, and race. Date of birth, examination date, sex, and whether the examination was performed as a screening or diagnostic examination are required input variables when entering an examination into the registry, whereas patient race is optional.

To test whether Medicare noncoverage of screening CTC is associated with a change in utilization, we examined the distribution of procedures by age using a negative binomial model with patient age (to capture the overall trend), indicator of Medicare-eligible age (65 or more; to capture an immediate change from the trend at age 65), and their interaction (to capture a gradual change after the age of 65) as the independent variables. Although patients with end-stage renal disease and those who have been eligible for Social Security disability benefits for at least 24 months are eligible for Medicare benefits at younger ages, the age threshold of 65 was chosen because it is the typical age at which the overwhelming majority of Americans become eligible for Medicare benefits.

Under the null hypothesis, we would expect a smooth trend in the distribution of screening CTCs by age. The trend could be either increasing as the risk of colorectal cancer increases with age or decreasing as the underlying population size decreases with age [19,20]. Because the USPSTF currently recommends that screening begin at age 50 and continue until age 75 for average risk individuals [14], and a disproportionate number of individuals initiate their screening at age 50 or 51, we estimated the model using a subsample restricted to procedures delivered to patients aged 52 to 75 years.

To evaluate the use of CTC by race, we limited the sample to individuals with disclosed racial identity, and we compared the relative distribution of screening CTCs associated with various racial identities by age group to the relative distribution of race by age group in the general US population [21]. Additionally, we also assessed the distribution of screening CTC examination by age, stratified by race to determine whether the association between the use of CTC and Medicare-eligible age varies by race.

## RESULTS

The CTC registry contained data on 12,648 screening CTC examinations. Table 1 describes the characteristics of the

**Table 1.** Characteristics of study subjects

Variable	Statistic
Total screening procedures	12,648
Age, mean (SD)	65.7 (14.3)
Sex, n (%)	
Female	7,803 (61.7)
Male	4,819 (38.1)
Other/unknown	26 (0.2)
Race, n (%)	
Asian	98 (0.8)
Black	623 (4.9)
Hawaiian Native or Pacific Islander	12 (0.1)
Native American or Alaska Native	25 (0.2)
White	7,920 (62.6)
Other	4 (0.03)
Unknown	3,966 (31.4)

study subjects. Most patients undergoing screening CTC were female (61.7%) and white (91.2% of the 8,682 patients with disclosed racial identity). Examinations were most commonly submitted from multispecialty clinics (37.0%) followed by academic or university-based facilities (26.7%), community hospital-based facilities (16.5%), freestanding imaging centers (16.4%), and military or Veterans Affairs facilities (3.5%).

The distribution of screening procedures by age showed a spike at the age of 50 (Fig. 1). Between ages 52 and 64, we observed an increasing trend in the number of screenings—on average, each additional year of age was associated with a 5.3% ( $P < .001$ ) increase in the number of screenings (Table 2). We found no statistically significant

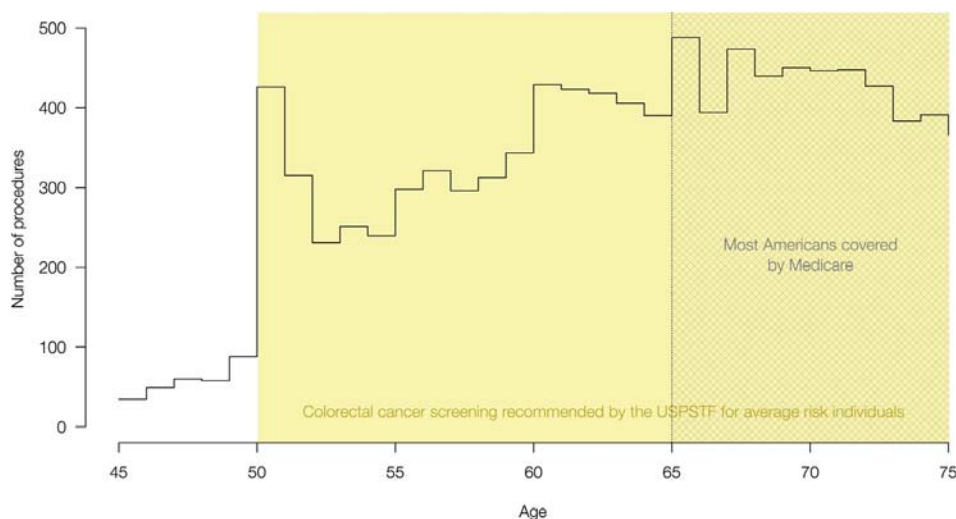
discontinuity in the number of screening CTCs at the age of 65 (a change of  $-0.4\%$ ;  $P = .95$ ). However, the trend changed direction after the age of 65 and started to decline with increasing age (a change of  $-6.9\%$  per additional year of age above 65 compared with the trend between ages 52 and 64;  $P < .001$ ).

Among patients with disclosed racial identity, Black individuals above the age of 50, as well as Asian individuals and other racial minorities of any age, were underrepresented in the CTC Registry, and white individuals in all age groups were overrepresented compared with the general US population (Fig. 2).

We observed differences in the number of screening CTC examinations by age for white individuals compared with racial minorities (Fig. 3). The age group with the highest screening CTC utilization among Black individuals was 55 to 59 years. In contrast, the modal age group for screening CTC utilization among white individuals was 65 to 69—an age group typically covered by Medicare. The number of screening examinations decreased considerably after the age of 65 for individuals who identify themselves with a race other than Black or white (eg, Asians, Native Americans, Alaska Natives, Hawaiian Natives, Pacific Islanders; Fig. 3).

## DISCUSSION

Using data from the ACR's CTC Registry over a 13-year period, we observed that the relative utilization of screening CTC in individuals typically eligible for Medicare coverage decreased after age 65, suggesting access barriers related to more restrictive Medicare coverage policy. We additionally found potential racial disparities in the utilization of screening CTC. Both findings have important policy and patient access implications.



**Fig 1.** Distribution of screening CT colonography utilization by age. USPSTF = US Preventive Services Task Force.

**Table 2.** Negative binomial regression model estimates (sample limited to individuals aged 52-75)

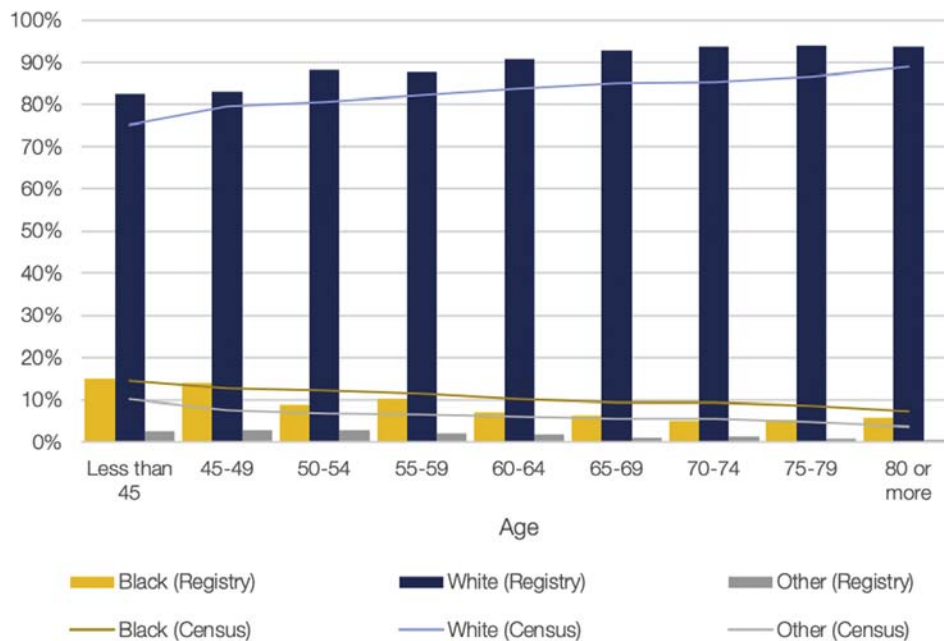
Parameter	Estimate	SE	P	% $\Delta$	95% CI
Intercept	6.159	0.044	<.001		
Age (centered at 65)	0.052	0.006	<.001	+5.3%	4.1%-6.5%
Indicator of age of 65+	-0.004	0.060	0.95	-0.4%	-11.4%-12.1%
Age $\times$ indicator of age of 65+	-0.072	0.009	<.001	-6.9%	-8.6% to -5.2%
Dispersion	0.003	0.002			

CI = confidence interval; SE = standard error.

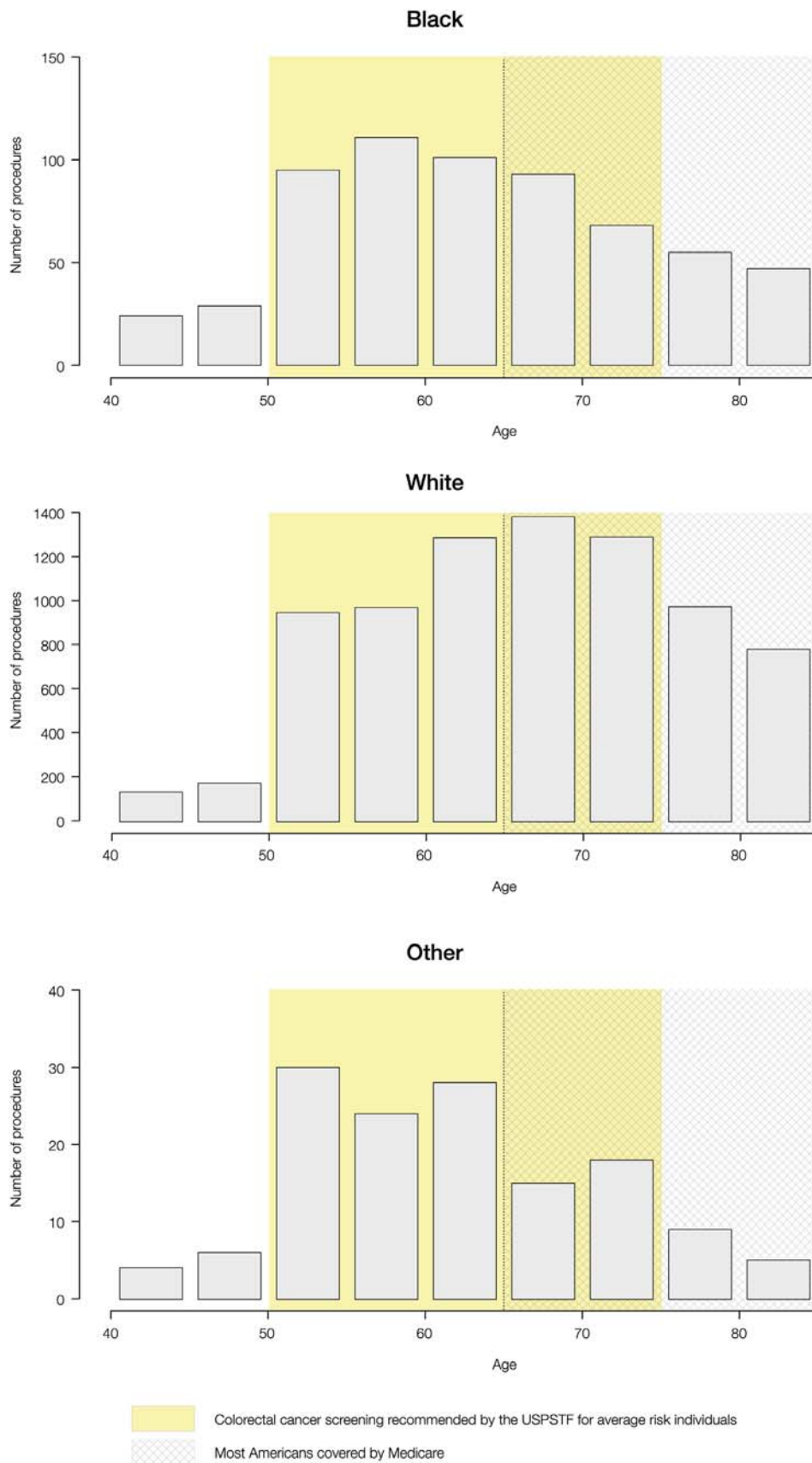
The decrease in the number of CTC examinations beginning after age 65 in stark comparison to the growth rate seen before 65 is likely due to, at least in part, the lack of national Medicare coverage for screening CTC. According to data from CDC, more Americans of Medicare age (65-75 years) report being up to date with colorectal cancer screening compared with those aged 50 to 64 years using tests other than CTC (eg, fecal occult blood testing, fecal occult blood testing plus flexible sigmoidoscopy, and optical colonoscopy—all of which are covered by Medicare) [22]. For example, 71.9% of those aged 65 to 75 years report being up to date with colonoscopy screening compared with only 55.4% aged 50 to 64 years [22].

When an examination is not covered by an insurance provider, the patient is typically expected to pay for the examination out of pocket. According to a crowdsourced consumer-facing website, patients in the United States for whom CTC was not covered by health insurance reported an average cost of \$2,400 (range \$750-\$5,000) for CTC plus approximately \$5 to \$40 for the cost of preprocedural laxatives [23]. A report from the Board of Governors of the Federal Reserve System of the United States found that 4 in 10 adults would have some difficulty in covering an unexpected expense of \$400 [24].

The impact of a lack of Medicare coverage was previously demonstrated for patients with non-MRI conditional cardiac implantable electronic devices (CIEDs). CMS



**Fig 2.** Comparison of the distribution of race in patients undergoing screening CT colonography, by age group, and the distribution of race by age group in the general US population. Sample was limited to individuals with disclosed racial identity. The group "Other" includes patients identifying themselves as Asian, Native American, Alaska Native, Hawaiian Native, Pacific Islander, or other.



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**Fig 3.** Distribution of screening CT colonography utilization by age group, stratified by race. USPSTF = US Preventive Services Task Force. The group “Other” includes patients identifying themselves as Asian, Native American, Alaska Native, Hawaiian Native, Pacific Islander, or other.

previously did not reimburse MRI examinations for patients with non-MRI conditional CIEDs, and patients with such devices and Medicare or Medicaid insurance were found to be undergoing significantly fewer appropriate outpatient diagnostic MRI examinations (3% of ordered examinations were completed) than patients with commercial insurance (86% of ordered examinations were completed) [25]. After publications documenting the safety of non-MRI conditional CIEDs [26,27] and advocacy by groups including the ACR, the American College of Cardiology, the Heart Rhythm Society, and the Society for Cardiovascular Magnetic Resonance [28], CMS updated its national coverage decision in 2018 to cover MRI examinations for patients with non-MRI conditional CIEDs under conditions including 1.5 T field strength [29].

In its 2009 Decision Memo for Screening CTC for Colorectal Cancer (CAG-00396N), CMS concluded that “the evidence is inadequate to conclude that CT colonography is an appropriate colorectal cancer screening test under §1861(pp)(1) of the Social Security Act. CT colonography for colorectal cancer screening remains non-covered” [8]. The CMS Decision Memo cited insufficient evidence on the test characteristics and performance of screening CTC in Medicare-aged individuals and also a lack of published subgroup data on CTC’s performance in Black individuals [8]. Since the publication of the CMS 2009 decision, however, a systematic review and meta-analysis of CTC performance for the detection of polyps and cancer in adults  $\geq 65$  years old published in 2018 by Pickhardt et al found a sensitivity of CTC for colorectal cancer of 93.0% in senior-age patients compared with 92.0% in younger patients [30]. Additionally, an evaluation of a cohort of Black individuals in the CTC program at a large Veterans Affairs Medical Center (n = 2,490 CTC studies) found that CTC was an effective screening modality for Black adults [31].

Medicare coverage of screening CTC would be expected to increase the number of individuals of Medicare age undergoing screening CTC and could potentially increase colorectal cancer screening across all age cohorts. The goal of cancer screening is for as many people to be screened as possible, and the best way to accomplish this is to reduce barriers to all methods of colorectal cancer screening—including CTC. As noted in the 2016 USPSTF Recommendation Statement, colorectal cancer screening is a substantially underused preventive health strategy, and no empirical data suggest that any of the recommended screening strategies result in a greater net benefit [14]. Therefore, the best screening test is the one that is completed [14].

It may be that the lack of universal insurance coverage for screening CTC (mandated commercial insurance

coverage as part of the Affordable Care Act of 2010 but no coverage by Medicare) results in general confusion among providers and patients leading to depressed utilization of CTC in all cohorts. Lower health insurance literacy and lack of knowledge of whether preventive screening services are covered by one’s insurance plan are associated with greater avoidance of both preventive and nonpreventive services [32,33].

Colorectal cancer screening rates are lower in Black individuals and other racial minorities compared with white individuals, and Black individuals have the highest rate of mortality and lowest survival when compared with other racial groups [22,34-36]. The overrepresentation of white individuals in all age groups of patients undergoing screening CTC reflects this trend. Approximately 60% of Black Americans report being up to date with colonoscopy screening compared with 62.5% of white Americans [22]. In our data, the number of white patients undergoing screening CTC outnumbered Black patients by approximately 12:1, despite that the ratio of white individuals to Black individuals in the general US population is approximately 8:1. Additionally, the modal age for Black individuals undergoing CTC screening was 55 to 59 years and for white individuals was 65 to 69 years, and the number of screening examinations for other racial minorities also dropped considerably after the age of 65, indicating that lack of Medicare coverage may be having a disproportionate impact on racial minorities.

Further investigations are needed to determine the causes of this screening CTC utilization disparity based on age and race, and further outreach is needed to lessen and eliminate these disparities. The factors contributing to this disparity are likely social and structural [37]. For example, median per person yearly income is lower for Black Medicare beneficiaries (\$16,150 in 2014) compared with white Medicare beneficiaries (\$27,450), and average savings are also lower for Black Medicare beneficiaries (\$12,350) compared with white Medicare beneficiaries (\$91,950), suggesting that Black Medicare beneficiaries may be less able to afford an out of pocket expense for screening CTC [38]. Additionally, it may be that the disparities observed in the present investigation reflect selection bias based on the sites that voluntarily participate in the CTC registry or patient preferences regarding CTC screening. However, a prior investigation of 10,538 asymptomatic Medicare beneficiaries who underwent CTC also found that CTC utilization was higher among white patients [39].

First-line screening by CTC in patients with low to intermediate risk of colorectal cancer is cost-effective compared with optical colonoscopy, mostly because of the

lack of anesthesia charges and greatly reduced use of pathology services [40]. More specifically, CTC is a cost-effective colorectal cancer screening option compared with optical colonoscopy for the Medicare population and could reduce Medicare expenditures for colorectal cancer screening [41]. In another study, CTC was found to be a cost-effective colorectal cancer screening option for Medicare enrollees compared with fecal occult blood tests, flexible sigmoidoscopy, and colonoscopy with the cost-effective reimbursement rate varying based on the relative adherence to CTC screening [42].

### Limitations

This study has several limitations. Participation in the ACR's National Radiology Data Registry CTC Registry is optional and voluntary, and the submitted data therefore do not reflect the entirety of the screening CTC practice in the United States. It may be that well-resourced centers (eg, centers with adequate resources to collect and submit data to the CTC registry) are overrepresented in the registry. Race is an optional field in the registry, and information about race was not available for some examinations. Data are manually entered into the registry, and we cannot exclude the possibility of data entry errors. Also, we attributed patients to Medicare based on age. However, some patients may be covered by Medicare before our assumed threshold of 65 years, and other patients older than 65 may be covered by employer-sponsored insurance in addition to Medicare or by a Medicare Advantage plan.

In conclusion, our findings suggest that the growth in the number of patients undergoing screening CTC decreases when patients reach the typical age for Medicare coverage eligibility, because Medicare does not cover CTC for a screening indication. The association between the use of CTC and Medicare-eligible age varied for white individuals compared with Black individuals and other racial minorities, suggesting that the lack of Medicare coverage may be more negatively impacting racial minorities. Medicare coverage of screening CTC is needed so that Medicare patients who cannot afford to pay for this test out of pocket can undergo screening CTC. The goal of cancer screening is for as many people to be screened as possible, and the best way to accomplish this is to reduce barriers to all methods of colorectal cancer screening including CTC.

### TAKE-HOME POINTS

- Screening CTC examinations increased an average of 5.3% per year between ages 52 and 64 but *decreased* an average of 6.9% per year of age after age 65.

- Black individuals and other racial minorities, including those of Medicare age, were underrepresented in the ACR's CTC registry.
- Commercial insurance coverage of screening CTC is mandated by the Affordable Care Act of 2010, but Medicare does not cover screening CTC, and this lack of Medicare coverage likely contributes to the decreasing number of CTC examinations performed in individuals after age 65 including racial minorities.

### ACKNOWLEDGMENTS

This research was supported by the ACR's National Radiology Data Registry (NRDR). The authors wish to thank ACR staff for assistance in preparation of the CT Colonography (CTC) Registry data and acknowledge guidance and input by the CTC Registry steering committee for this analysis. The authors also wish to thank all the individuals who have submitted data to the ACR's NRDR-CTC Registry, because their work makes research like this possible.

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