Projected Colorectal Cancer Detection Rates in Adults Under Age 45

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Key Findings:

- Based on colorectal cancer detection rates among more than 3 million screening-eligible adults, our model estimates that at age 40 approximately 111 cancers would be detected per 100,000 screenings, compared with 159 per 100,000 screenings at age 45, the current recommended starting age. Based on the model, this equates to nearly 44% more 40-year-olds needing to be screened to detect one colorectal cancer (CRC) case compared to the number of 45-year-olds who would need to be screened.
- However, men had consistently higher projected CRC detection rates than women across all ages. At age 40, an estimated 132 cancers would be detected per 100,000 screenings for men versus 98 for women.
- Regional variation was also evident: the South had the highest projected detection rate at age 40 (128 per 100,000), while the West had the lowest (83 per 100,000).

Colorectal cancer (CRC) is the third most commonly diagnosed cancer and the second leading cause of cancer death in the United States.[1] While overall CRC incidence has declined among older adults, rates have risen substantially in younger populations. Incidence among adults under 50 has increased by approximately 3% per year between 2013 and 2022, and CRC is now the leading cause of cancer death in adults under 50.[1,2] This trend prompted the American Cancer Society to lower its recommended screening starting age from 50 to 45 in 2018,[3] followed by the U.S. Preventive Services Task Force (USPSTF) in 2021.[4] Since those changes, screening uptake among adults aged 45 to 49 has increased substantially, and recent data show a corresponding rise in early-stage CRC diagnoses in this group.[5] Despite this progress, screening rates among newly eligible 45- to 49-year-olds remain the lowest of any eligible age group, and it remains unclear what detection yields would look like if the screening age were lowered further below 45. Understanding the projected rate of colorectal cancer cases at each year of age can inform ongoing discussions about the potential value and trade-offs of earlier screening.

We studied more than 3 million first-time CRC screening events among U.S. adults aged 45 to 59 who were screened after the October 2021 USPSTF recommendation change. Eligible screenings included colonoscopy, stool DNA tests, fecal immunochemical tests, fecal occult blood tests, flexible sigmoidoscopy, and CT colonography. Patients were excluded if they had a prior history of CRC, hereditary CRC syndromes, prior total colectomy, or a history of colorectal polyps. CRC was identified when a patient received two or more CRC diagnoses starting within 12 months of screening, with diagnoses less than 6 months apart; requiring two diagnoses helps distinguish confirmed cancers from rule-out evaluations where a single CRC code might appear during a diagnostic workup but cancer is ultimately not confirmed.

Because routine CRC screening is not currently recommended below age 45, colonoscopies in younger adults are generally not covered by insurance for screening purposes and are more likely performed to evaluate symptoms or elevated risk, which would inflate observed detection rates and make them unreliable as estimates of what routine screening would yield. To address this, we fit an exponential

regression to the observed CRC detection rate by year of age from the screened population and extrapolated backward to project detection rates for ages 35 to 44.

First, we fit exponential curves to the rate of CRC detected by age among patients aged 45 to 59 and projected the trend to younger patients. We tested this methodology against the post-2021 USPSTF change trend: it estimated 180 cases per 100,000 at age 45, which is somewhat higher than the observed 160 per 100,000. Based on the model, this equates to nearly 44% more 40-year-olds needing to be screened to detect one colorectal cancer (CRC) case compared to the number of 45-year-olds who would need to be screened. See the PDF download for additional details.

Projected Colorectal Cancer Detection Rates for Routine Screenings Starting at Age 45

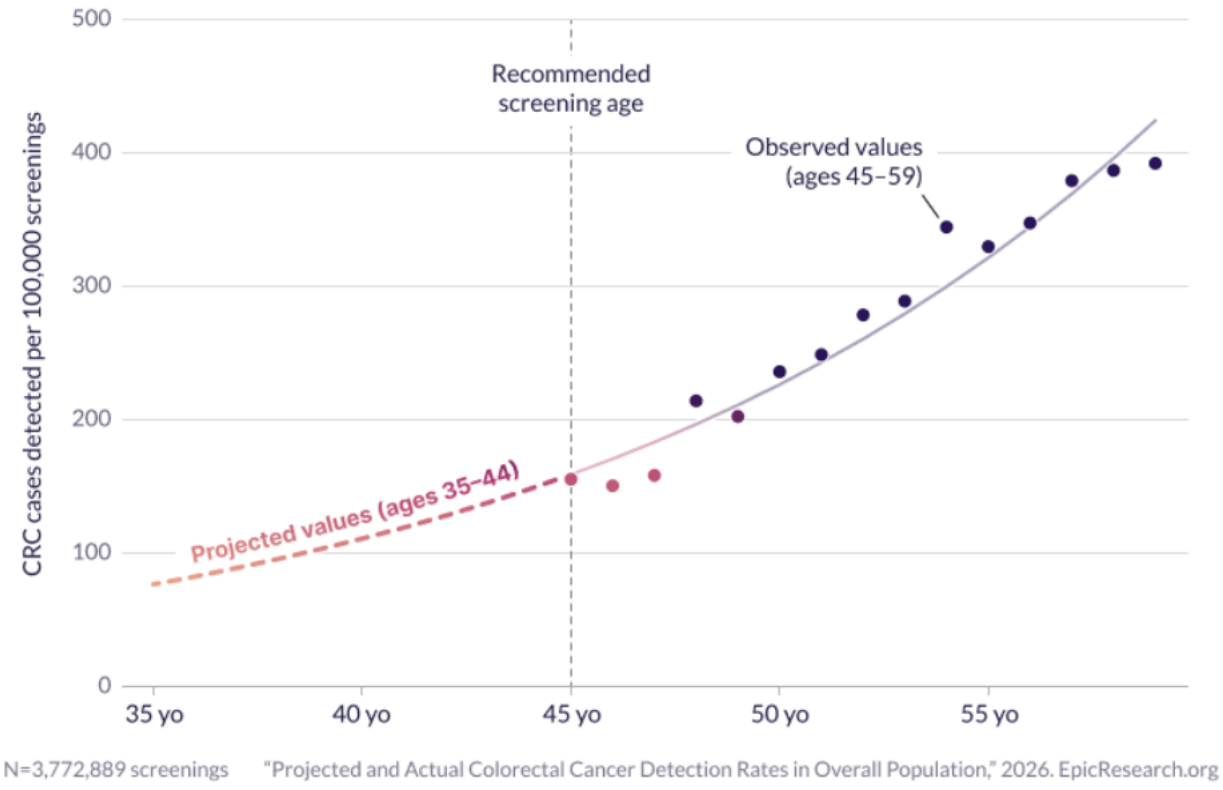

Figure 1. The observed and projected number of detected CRC cases per 100,000 screenings.

We additionally fit the curve to the rate of CRC detected by age in sub-populations split by sex and region among patients aged 45 to 59 and projected the trend to younger ages. Our model projected a steady decline in CRC detection rates at younger ages. At age 45, around 159 cases of CRC are detected per 100,000 screenings, as seen in Figure 2. At age 40, the projected rate fell to 111 cases per 100,000 screenings, and at age 35, the rate dropped to 77 per 100,000. Men had a higher projected detection rate at every age: at age 40, the model estimated 132 cancers per 100,000 screenings for men compared with 98 for women. Regionally, the South had the highest projected detection rate at age 40 (128 per 100,000), while the West had the lowest (83 per 100,000). These regional differences persisted across the sex-by-region stratifications, with men in the South having the highest projected detection rate (151 per 100,000 at age 40) and women in the West the lowest (77 per 100,000 at age 40).

Projected Number of CRC Cases per 100,000 Screenings

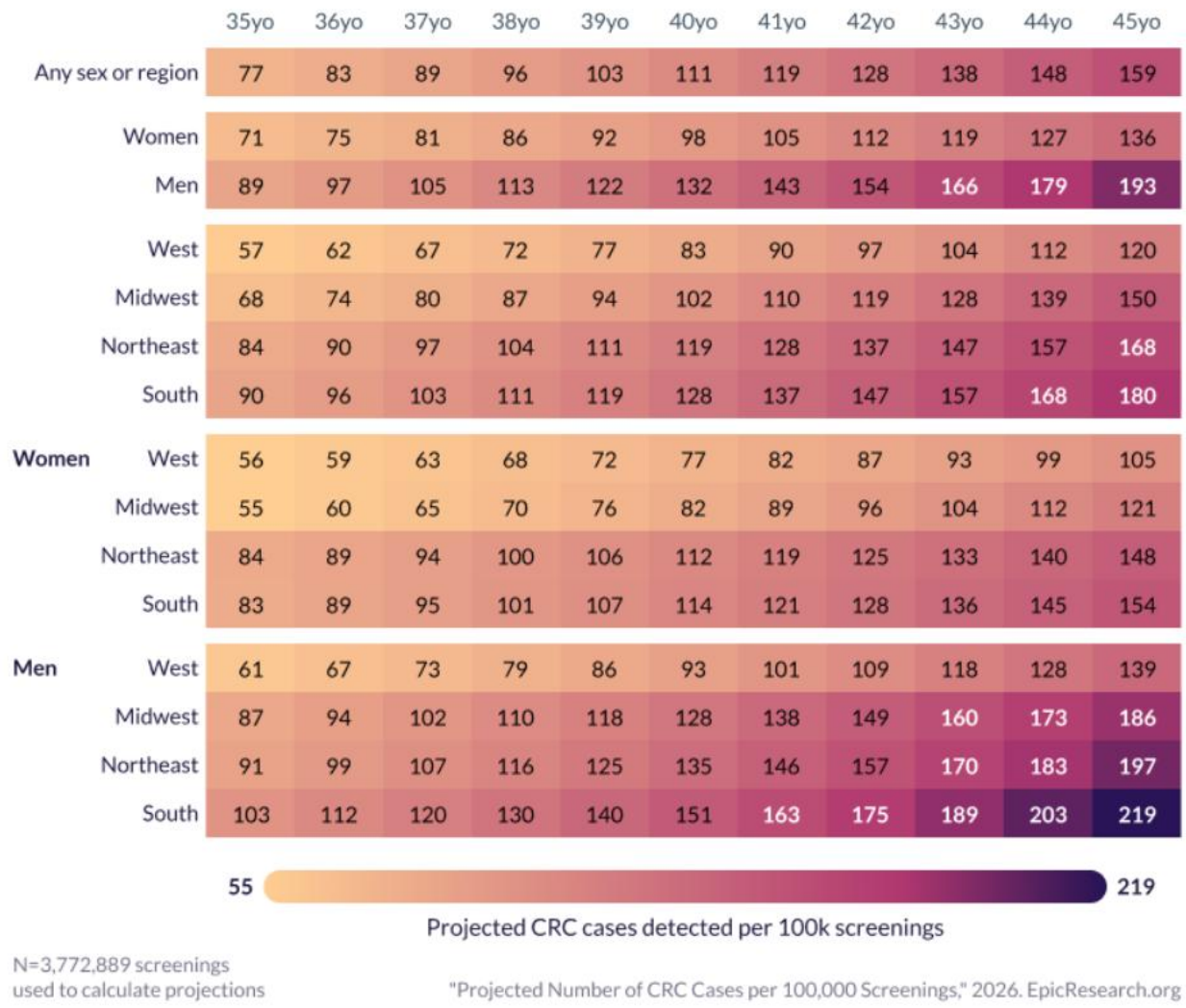

Figure 2. The estimated number of CRC cases per 100,000 screenings by age, sex, and geographic region.

These data come from Cosmos, a dataset created in collaboration with a community of Epic health systems representing more than 304 million patient records from 2,000 hospitals and more than 47,000 clinics from all 50 U.S. states, Canada, Lebanon, and Saudi Arabia. This study was completed by two teams that worked independently, each composed of a clinician and research scientist. The two teams came to similar conclusions. Graphics by Brian Olson.

References

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Data Definitions

Term	Definition
Study period	2022 to 2025
Study population: inclusion	Patients with: 6. A first **CRC screening** at age 45 to 59 7. An **outpatient face-to-face encounter** 5 to 365 days after screening date 8. A U.S. address
Study population: exclusion	History of colorectal cancer: ICD-10-CM code C18*, C19, C20 Known hereditary CRC syndromes (Lynch syndrome, FAP): ICD-10-CM code Z15.09, Z83.71 Prior total colectomy: CPT code 44150, 44155, 44156, 44157, 44158, 44210, 44211, 44212 History of **colorectal polyps**
Colorectal cancer	Two or more diagnoses with ICD-10-CM code C18*, C19, or C20 within 12 months after a **CRC screening** and less than 6 months apart
CRC screening	First procedure or lab with one of the following: **CRC screening only** codes or **ambiguous CRC screening** codes paired with a **screening encounter diagnosis**
CRC screening only	Colonoscopy: HCPCS code G2204, G0105, G0121 sDNA-FIT: CPT code 81528; SNOMED code 457591000124105; LOINC code 77353-1, 77354-9 FIT/gFOBT: LOINC code 14563-1, 14564-9, 14565-6, 2335-8, 27396-1, 29771-3, 50196-5, 57803-9, 58453-2, 57905-2, 56490-6, 56491-4, 80372-6, 12504-7, 27926-5, 27401-9, 12503-9, 27925-7; HCPCS code G0328; CPT code 82270, 82274, 82272 Flexible sigmoidoscopy: HCPCS code G0104, G0106 CT colonography: CPT code 74261, 74262, 74263
Ambiguous CRC screening	One of the following procedures paired with a **screening encounter diagnosis**: Colonoscopy: CPT code 44388, 44389, 44390, 44391, 44394, 44401-44408, 45378-45382, 45384-45386, 45391, 45392 Flexible sigmoidoscopy: CPT code 45330-45335, 45337, 45338, 45340-45342
Screening encounter diagnosis	ICD-10-CM code Z12.11 (screening for malignant neoplasm of colon), Z12.12 (screening for malignant neoplasm of rectum)
Colorectal polyps	ICD-10-CM code D12.0-D12.8, K63.5, K51.40, K51.411, K51.412, K51.413, K51.414, K51.418
Outpatient face-to-face encounter	An encounter of type "Office visit," "Follow-up," "Telemedicine," "Urgent Care," or "Walk-in"
Model specifications	Exponential regression on **colorectal cancer** detection rate by single year of age (45-59) from post-recommendation change screenings (2022+) Extrapolate regression backward to ages 35-45 to estimate projected detection rate

Limitations	Requirement that the screening was the first for the patient may be limited by incomplete patient histories in Cosmos; patients with prior screenings outside the Cosmos network may be misclassified. Extrapolation from screened patients may not generalize to the unscreened population, and detection rates at projected ages are modeled rather than observed. Screening compliance is not known for all ages and may differ across demographic groups.

Table 1: Projected Colorectal Cancer Detection Rates for Routine Screenings Starting at Age 45

Grouping Type	Age in Years	Screenings (N)	Predicted	Actual
First Screenings (2022+)	45	264,410	0.16%	0.16%
First Screenings (2022+)	46	403,904	0.17%	0.15%
First Screenings (2022+)	47	301,992	0.18%	0.16%
First Screenings (2022+)	48	277,718	0.20%	0.21%
First Screenings (2022+)	49	273,129	0.21%	0.20%
First Screenings (2022+)	50	311,902	0.23%	0.24%
First Screenings (2022+)	51	325,606	0.24%	0.25%
First Screenings (2022+)	52	263,928	0.26%	0.28%
First Screenings (2022+)	53	228,101	0.28%	0.29%
First Screenings (2022+)	54	210,532	0.30%	0.34%
First Screenings (2022+)	55	194,733	0.32%	0.33%
First Screenings (2022+)	56	186,199	0.34%	0.35%
First Screenings (2022+)	57	176,966	0.37%	0.38%
First Screenings (2022+)	58	175,022	0.40%	0.39%
First Screenings (2022+)	59	178,747	0.42%	0.39%

Table 2: Screenings Per Cancer by Age, Sex, and Region

Group	45	44	43	42	41	40	39	38	37	36	35
First Screenings (2022+)	629	676	726	781	839	903	971	1,045	1,125	1,212	1,305
Female	736	785	837	893	953	1,017	1,086	1,160	1,240	1,326	1,418
Male	517	558	602	650	701	757	818	884	956	1,034	1,118
Midwest	667	721	779	842	910	984	1,064	1,151	1,246	1,349	1,461
Midwest Female	825	891	963	1,041	1,126	1,217	1,317	1,425	1,543	1,671	1,810
Midwest Male	537	579	624	672	725	782	844	911	984	1,063	1,149
Northeast	596	638	682	730	782	838	898	963	1,032	1,108	1,189
Northeast Female	676	714	754	797	843	892	944	1,000	1,059	1,123	1,191
Northeast Male	507	547	590	636	687	742	801	865	935	1,011	1,094
South	555	594	637	682	731	783	840	901	967	1,039	1,116
South Female	651	691	733	779	827	879	934	994	1,057	1,126	1,199
South Male	457	492	530	571	615	662	714	770	831	896	968
West	834	896	964	1,036	1,115	1,199	1,291	1,390	1,497	1,614	1,740

West Female	953	1,014	1,079	1,149	1,223	1,303	1,389	1,481	1,580	1,687	1,802
West Male	719	779	844	916	993	1,077	1,169	1,269	1,378	1,497	1,626