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Coronavirus Disease 2019 Pandemic–related Colorectal Cancer Screening Delays Impact Unscreened Older Adults the Most, But Mitigation Strategies Exist

Colorectal cancer (CRC) screening between ages 50 and 75 years is a US Preventive Services Task Force Grade A recommendation.¹ The coronavirus disease 2019 (COVID-19) pandemic initially decreased CRC screening participation by as much as 82%,² and new variants continue to disrupt preventive care. Screening colonoscopy is more vulnerable to pandemic-related delays than the fecal immunochemical test (FIT).² We estimated the potential clinical impact of pandemic-related interruptions in CRC screening on the US population.

Using a validated CRC Markov model³ with a lifetime horizon, we evaluated 3 average-risk CRC cohorts: unscreened at age 50; unscreened at age 65, the age of Medicare eligibility; and screened at age 50 and due for screening colonoscopy at age 60. CRC risk was adjusted to birth cohort.³

We assessed the impact on CRC incidence and mortality in the United States of 1- and 2-year delays vs prompt screening colonoscopy every 10 years or an annual FIT through age 75, with surveillance colonoscopy through age 80. We then explored “rescue” strategies including FIT-based CRC screening for a postulated 1 or 2 years as access to colonoscopy may be limited by the pandemic⁵; extended CRC screening past age 75 to ages 76 or 77 and CRC surveillance past age 80 to ages 81 or 82, both consistent with a US Preventive Services Task Force Grade C recommendation, to “make up” for the postulated 1 or 2 years of pandemic-related limited colonoscopy access; or a combination of the strategies above. Outcomes were CRC incidence and deaths per 100,000 individuals for each birth cohort.

Figure 1A and B demonstrates the effect of 1- or 2-year delays on colonoscopy-based CRC screening for 50- and 65-year-old average-risk cohorts previously unscreened for CRC. For unscreened 50-year-olds (Figure 1A), a 1- or 2-year delay in initiation of colonoscopy diminished the reduction in CRC incidence (70% to 69%) and CRC-related mortality (76% to 75%) by 1 absolute percentage point each. Rescue strategies were effective in mitigating or negating the impact of a 1- or 2-year CRC screening delay. From most to least effective were the combined strategy of FIT-based CRC screening when access to colonoscopy was limited, plus extension of the upper ages for screening/surveillance colonoscopy; extension of CRC screening/surveillance; and then FIT-based CRC screening in lieu of colonoscopy screening.

For unscreened 65-year-olds (Figure 1B), a 1- or 2-year delay in initiation of colonoscopy resulted in a diminished reduction by 12%–14% absolute percentage points of CRC incidence (66% to 53%–54%) and CRC-related mortality (74% to 60%). Starting at age 65

afforded individuals 2 lifetime colonoscopies, as opposed to 1 at age 66 or later, given that CRC screening ended at age 75. Rescue strategies decreased but did not negate the impact of pandemic-related CRC screening delays.

Figure 1C and D demonstrates the effect of 1- or 2-year delays on FIT-based CRC screening for 50- and 65-year-old average-risk cohorts previously unscreened for CRC. For unscreened 50-year-olds (Figure 1C), a 1- or 2-year delay in initiation of a FIT resulted in an absolute 1% per-year diminution in reduction of both CRC incidence (58% to 57% [1-year delay] to 56% [2-year delay]) and CRC-related mortality (71% to 70% [1-year delay] and 69% [2-year delay]). Extension of CRC screening/surveillance periods was effective in mitigating or negating the impact of these delays.

For unscreened 65-year-olds (Figure 1D), a 1- or 2-year delay in initiation of a FIT resulted in an absolute 3% per-year decrease in reduction in CRC incidence (44% to 41% [1-year delay] to 38% [2-year delay]) and CRC-related mortality (60% to 57% [1-year delay] to 54% [2-year delay]). Extending FIT-based CRC screening/surveillance reduced but did not negate the impact of CRC screening delays.

In a cohort of individuals who started colonoscopy-based CRC screening at age 50 (Supplementary Figure 1), a 1- or 2-year delay in CRC screening at age 60 resulted in minimal decreases in reduction in CRC incidence and mortality. Rescue strategies mitigated or negated the impact from CRC screening delays and included FIT-based screening when colonoscopy was unavailable, with or without extended screening through ages 75 or 76.

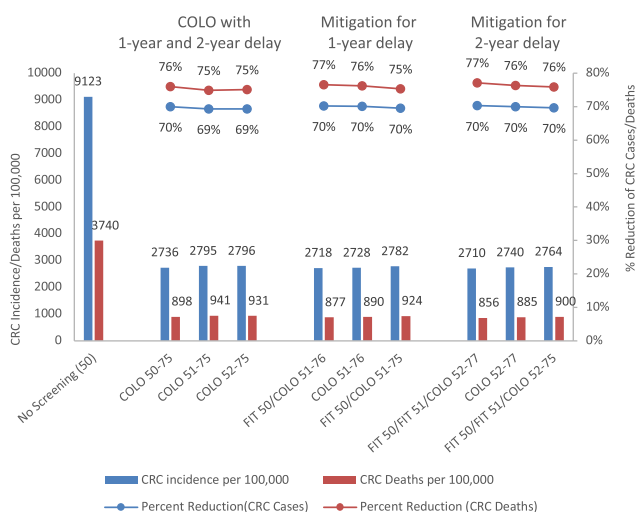
In summary, COVID-19 pandemic-related 1- and 2-year delays in CRC screening were estimated to result in a minimal impact on the CRC incidence and mortality reductions achieved by screening in previously unscreened 50- and in 60-year-olds due for rescreening colonoscopy, but substantial blunting was found of the benefit of screening in previously unscreened 65-year-olds, especially if age 75 is strictly applied as the upper age limit for screening colonoscopy. The impact of delaying colonoscopy by a single year was pronounced in the 65-year-old unscreened cohort given the reduction of lifetime screening colonoscopies from 2 to 1. Rescue strategies for pandemic-related delays could

Abbreviations used in this paper: COVID-19, coronavirus disease 2019; CRC, colorectal cancer; FIT, fecal immunochemical test.

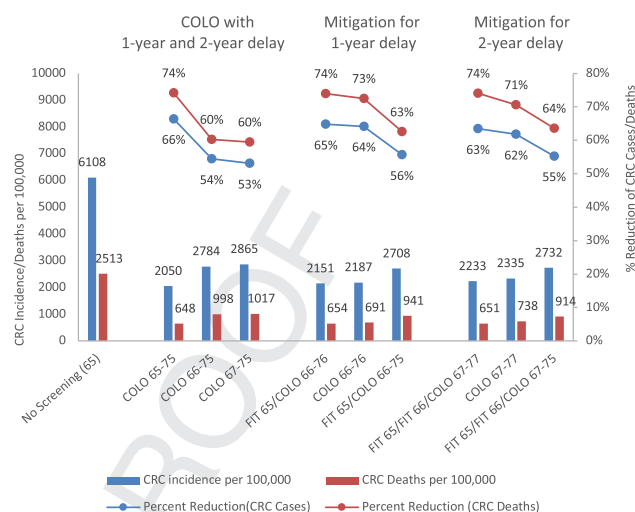
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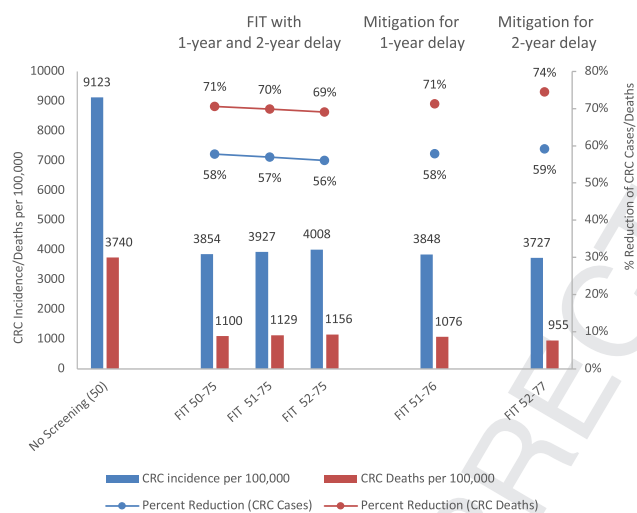
A. Colonoscopy starting at age 50



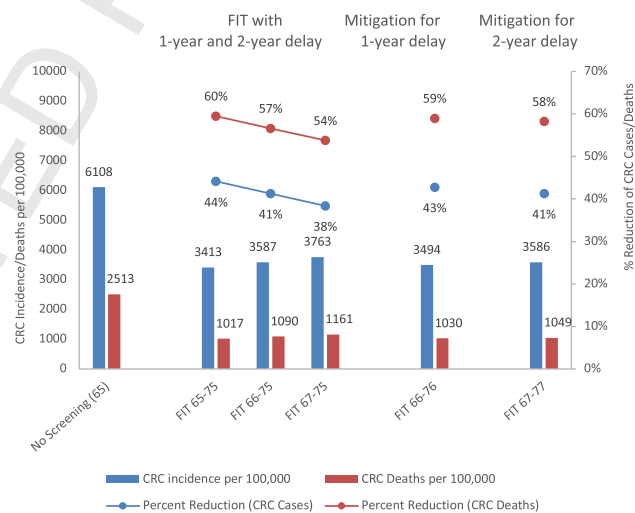
B. Colonoscopy starting at age 65



C. FIT starting at age 50



D. FIT starting at age 65



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Figure 1. Impact of postulated 1- and 2-year pandemic-related delays in CRC screening on CRC-related incidence and mortality for unscreened 50- and 65-year-olds. Delays of 1–2 years in CRC screening initiation had significantly lower impact on the 50-year-old cohort (A and C) compared with the 65-year-old cohort (B and D). Rescue strategies in the 65-year-old cohort, unlike for the 50-year-old cohort, decreased but could not negate the impact of pandemic-related CRC screening delays. COLO x-y, screening colonoscopy initiation at age x years and termination at y years; FIT x-y, FIT screening initiation at age x years and termination at y years (surveillance stops 5 years after y); FIT x/COLO y, hybrid strategies with FIT initiation at age x years continuing with colonoscopy at age y years (screening stops at age 75).

negate reductions in CRC incidence and mortality for previously unscreened 50- and in 60-year-olds due for rescreening colonoscopy but not for previously unscreened 65-year-olds.

Our study has limitations. Costs or incremental cost-effectiveness ratios were not calculated; as such, economic implications could not be assessed. We modeled specific scenarios, although results can be extrapolated. We did not model a cohort of those with early signs and symptoms of CRC, but this would empirically be a priority group for colonoscopy during a period of limited resources. Other studies have modeled the pandemic’s effects on CRC screening, primarily in non-US populations,

using only a FIT or colonoscopy^{5–9} but showed that similar rescue strategies can mitigate pandemic-related effects on CRC screening.

Our work suggests that among the 20% of the US population aged 50–75 years who are unscreened for CRC,¹⁰ older adults would experience the most clinical benefit from CRC screening if resources were limited during the COVID-19 pandemic; younger unscreened individuals and those awaiting CRC rescreening colonoscopy would be less affected. Pandemic-related delays could be mitigated or nullified by strategies including use of the FIT or an extended age window for CRC screening.

Supplementary Material

Note: To access the supplementary material accompanying this article, visit the online version of *Gastroenterology* at www.gastrojournal.org and at <https://doi.org/10.1053/j.gastro.2022.08.035>.

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Conflicts of Interest

This author discloses the following: Uri Ladabaum is advisor to Universal Dx and Lean Medical and consultant to Clinical Genomics, Medtronic, Guardant Health, and Freenome. The remaining authors disclose no conflicts. 318

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Supplementary Figure 1. The impact of postulated 1- and 2-year pandemic-related delays in individuals who had CRC screening at age 50 and were due for repeat CRC screening at age 60. Delays of 1–2 years in individuals due for repeat CRC screening had little impact on clinical outcomes, and rescue strategies were able to mitigate or negate the effect of pandemic-related delays. We noted that for the 2-year delay group, CRC deaths per 100,000 were lower for Colo 50 FIT 60/61 than for COLO 50. This was attributed to differences in CRC stage distribution between the 2 groups and the fact that Colo 50 FIT 60/61 group had 2 sequential annual CRC screening examinations at ages 60 and 61. COLO, colonoscopy; Colo x, colonoscopy starting at age x; FIT x/y, use of FIT instead of colonoscopy at ages i/y. If screening was extended by 1 or 2 years, surveillance colonoscopy was extended by the same amount.