

Impact of social determinants of health on colorectal cancer screening and surveillance in the COVID reopening phase

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Background/aims Procedural delays due to the coronavirus disease 2019 (COVID-19) pandemic may exacerbate disparities in colorectal cancer (CRC) preventive care. We aimed to measure racial and socioeconomic disparities in the prioritization of CRC screening or adenoma surveillance during the COVID reopening period.

Methods We identified CRC screening or surveillance colonoscopies performed during two time periods: (1) 9 June 2019–30 September 2019 (pre-COVID) and (2) 9 June 2020–30 September 2020 (COVID reopening). We recorded the procedure indication, patient age, sex, race/ethnicity, primary language, insurance status and zip code. Multivariable logistic regression was used to determine factors independently associated with undergoing colonoscopy in the COVID reopening era.

Results We identified 1473 colonoscopies for CRC screening or adenoma surveillance; 890 occurred in the pre-COVID period and 583 occurred in the COVID reopening period. In total 342 (38.4%) pre-COVID patients underwent adenoma surveillance and 548 (61.6%) underwent CRC screening; in the COVID reopening cohort, 257 (44.1%) underwent adenoma surveillance and 326 (55.9%) underwent CRC screening ($P=0.031$). This increased proportion of surveillance procedures in the reopening cohort was statistically significant on multivariable analysis [odds ratio (OR), 1.26; 95% confidence interval (CI), 1.001–1.58]. Black patients comprised 17.4% of the pre-COVID cohort, which declined to 15.3% ($P=0.613$). There was a trend toward an inverse association between reopening phase colonoscopy and Medicaid insurance compared with commercial insurance (OR, 0.71; 95% CI, 0.49–1.04). No significant associations were found between reopening phase colonoscopy and the remaining variables.

Conclusions During the COVID reopening period, colonoscopies for CRC fell by over one-third with significantly more surveillance than screening procedures. Nonwhite patients and non-English speakers comprised a shrinking proportion in the COVID reopening period. *Eur J Gastroenterol Hepatol* 34: 739–743
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Introduction

The USA declared a national emergency in response to the coronavirus disease 2019 (COVID-19) pandemic on 13 March 2020 [1]. As a result, all nonurgent medical procedures, including colonoscopy for colorectal cancer (CRC) screening and surveillance, were suspended in an effort to reduce the risk of infection to patients and healthcare professionals. This led to a nearly 80% decline in CRC screening volume compared to the previous year [2] and has created new barriers to care for more than 23 million adults aged 45–75 years in the USA who are past due for CRC screening [3]. Even as healthcare facilities resume colonoscopies in the COVID reopening era, in-person ambulatory primary care and gastroenterology visits have seen a cumulative decline since the onset of the pandemic, creating fewer opportunities to engage patients in CRC screening [4].

The COVID-19 pandemic has disproportionately affected medically underserved communities, with African American and Hispanic communities suffering the highest rates of COVID-19 infections and deaths [5]. In New York City, rates for COVID-19 related hospitalization and deaths vary substantially by borough and are highest in the Bronx, which has the highest proportion of racial/ethnic minorities, the lowest median income and the second-highest percentage of persons without health insurance [6,7]. There is significant overlap between the populations most affected by COVID-19 and those that experience the highest incidence of CRC and CRC-related death [8]. There is therefore significant concern that the COVID-19 related delays in screening colonoscopies will exacerbate long-standing racial and socioeconomic disparities in access to CRC preventive care [9].

In this study, we aim to investigate whether historically marginalized populations, defined by race/ethnicity, insurance status and area of residence, were disproportionately affected by the slow reuptake of screening and surveillance colonoscopy during the COVID reopening phase.

Methods

Study design

We performed a retrospective analysis comparing patients undergoing CRC screening or adenoma surveillance

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colonoscopy during two time periods: (1) 9 June 2019–30 September 2019 (pre-COVID cohort) and (2) 9 June 2020–30 September 2020 (COVID reopening phase cohort). 9 June 2020 represented the date when elective endoscopic procedures resumed at our medical center in the wake of the initial COVID lockdown. Individuals undergoing colonoscopy for screening and surveillance indications during these time periods were identified using the electronic endoscopy database. We excluded patients undergoing colonoscopy for nonscreening/surveillance indications (i.e. diagnostic procedures in symptomatic patients) and patients who carried a current or prior diagnosis of CRC. Patients who underwent multiple procedures during the study period were only counted once per cohort. This study was approved by the Institutional Review Board of Columbia University Medical Center.

Data collection

Using the electronic health record, we collected patient demographic information including age, sex, race/ethnicity, primary language and insurance status (commercial, Medicare, Medicaid or other). Procedure indication was extracted from the electronic endoscopy database. Patients' 5-digit zip code of residence was also extracted from the medical record. Median household income data for each zip code was obtained using the United States 2018 Census Data and organized into quartiles based on the study population.

Statistical analysis

We compared patients in the pre-COVID cohort to patients in the COVID reopening cohort with regard to the above-listed variables using chi-square tests. We then performed multivariable logistic regression to identify factors independently associated with undergoing colonoscopy in the COVID reopening period after adjusting for the following variables (chosen *a priori*): age, procedure indication (screening vs. surveillance), race/ethnicity, primary language, insurance status and median household income quartile by zip code. All analyses were performed using SAS version 9.4 (Cary, North Carolina, USA).

Results

We identified 1473 colonoscopies performed for CRC screening or adenoma surveillance indications within the specified time periods. In total 890 colonoscopies occurred in the pre-COVID period and 583 occurred in the COVID reopening period. Characteristics of each cohort are shown in Table 1. The subjects in both cohorts were predominantly female (55.5% in 2019, 57.8% in 2020), English-speaking (79.9% in 2019 vs. 79.1% in 2020), commercially insured (53.7% in 2019, 60.9% in 2020) and lived in zip codes in the lowest income quartile (51.1% in 2019 vs. 49.7% in 2020). Mean age was similar in both cohorts (61.6 vs. 62.1 years).

On univariable analysis, there was a significant decline in the percentage of colonoscopies performed for screening indications (as opposed to surveillance) in the COVID reopening cohort (61.5% in 2019 vs. 55.9% in 2020; $P=0.031$). Commercially insured patients comprised a larger portion of the COVID reopening cohort (53.7% in 2019 vs. 60.9% in 2020) whereas Medicaid patients

accounted for a smaller portion (12.2% in 2019 vs. 9.9% in 2020). The percentage of patients insured by Medicare was similar between the two cohorts. There were more patients with 'other' or unknown insurance status in the pre-COVID cohort (6.6% vs. 1.7%; $P\leq 0.001$). The percentage of Black patients undergoing colonoscopy declined in the COVID reopening cohort (17.4% in 2019 vs. 15.3% in 2020) whereas the percentage of White patients increased (45.7% in 2019 vs. 49.9% in 2020); this did not reach statistical significance ($P=0.613$). There was no significant difference between the two cohorts in sex, age, primary language or median household income by zip code quartile.

We performed a multivariable logistic regression analysis as shown in Table 2. Patients who underwent colonoscopy during the COVID reopening phase were more likely to present for adenoma surveillance as compared to CRC screening when adjusting for age, race/ethnicity, primary language, insurance and household income [odds ratio (OR), 1.26; 95% confidence interval (CI), 1.001–1.58]. Other/unknown insurance status was also independently associated with colonoscopy in the COVID reopening phase (OR compared to commercial insurance 0.22; 95% CI, 0.11–0.44). There was a trend towards an inverse association with colonoscopy in the COVID reopening phase and Medicaid insurance status; however, this did not reach statistical significance when adjusting for other covariables in the model (OR for Medicaid compared to commercial insurance 0.71; 95% CI, 0.49–1.04).

Discussion

The COVID-19 pandemic has had an unprecedented impact on the delivery of preventive healthcare around the globe. Screening and surveillance colonoscopy is particularly vulnerable to COVID-related disruptions given that it relies primarily on an in-person, invasive procedure that requires multiple personnel to be present in close physical proximity. In this study, we found that our medical center experienced a significant decline in colonoscopy volume during the immediate COVID reopening phase in June through September 2020, resulting in a 34% reduction in CRC screening and surveillance procedures compared to the same months in 2019. Our results are consistent with other recent studies that quantify the gap in the number of colonoscopies performed in 2020 compared with 2019 [10–13].

We found that surveillance indications, such as a personal history of colonic adenomas or high-risk comorbidities such as inflammatory bowel disease, familial polyposis and Lynch syndrome, were associated with a higher likelihood of undergoing colonoscopy during the COVID reopening phase. The proportion of screening colonoscopies, on the other hand, fell from 61.6 to 55.9% during the reopening period compared with the previous year. These findings suggest that patients at higher risk for developing CRC were prioritized for colonoscopy in the setting of limited procedural capacity. High-risk patients may also be more likely to follow regularly with a gastroenterologist who may encourage timely surveillance. Additionally, patients undergoing surveillance colonoscopy may have overall greater motivation to pursue in-person preventive care despite the pandemic than patients at average risk.

Table 1 Univariable analysis of colonoscopies performed pre-COVID and during the COVID reopening phase

	2019 (n, %)	2020 (n, %)	P value
Gender			0.384
Men	396 (44.49)	246 (42.20)	
Women	494 (55.51)	337 (57.80)	
Age			0.907
<50 years	83 (9.33)	47 (8.06)	
50–59 years	291 (32.70)	190 (32.59)	
60–69 years	280 (31.46)	188 (32.25)	
70–79 years	205 (23.03)	140 (24.01)	
≥80 years	31 (3.48)	18 (3.09)	
Indication			0.031
Screening	548 (61.57)	326 (55.92)	
Surveillance	342 (38.43)	257 (44.08)	
Race/ethnicity			0.613
Black	155 (17.42)	89 (15.27)	
White	407 (45.73)	288 (49.40)	
Hispanic	245 (27.53)	159 (27.27)	
Other	64 (7.19)	37 (6.35)	
Unknown	19 (2.13)	10 (1.72)	
Primary language			0.635
English	711 (79.89)	461 (79.07)	
Spanish	160 (17.98)	105 (18.01)	
Other	19 (2.13)	17 (2.92)	
Insurance			<0.001
Commercial	403 (45.28)	355 (60.89)	
Medicare	212 (23.82)	160 (27.44)	
Medicaid	83 (9.33)	58 (9.95)	
Other/unknown	192 (21.5)	10 (1.72)	
Income by zip code			0.285
Highest quartile	166 (18.65)	111 (19.04)	
Second quartile	99 (11.12)	83 (14.24)	
Third quartile	170 (19.10)	99 (16.98)	
Lowest quartile	455 (51.12)	290 (49.74)	

Table 2 Multivariable logistic regression of factors associated with undergoing colonoscopy in the COVID reopening phase (June–September 2020)

	2020 (OR, 95% CI)	P value
Age		
<50 years	0.83 (0.55, 1.25)	0.361
50–59 years	1.0	
60–69 years	0.97 (0.74, 1.27)	0.803
70–79 years	0.94 (0.67, 1.33)	0.725
≥80 years	0.75 (0.39, 1.42)	0.375
Indication		
Screening	1.0	
Surveillance	1.26 (1.001, 1.58)	0.049
Race/ethnicity		
Black	0.91 (0.65, 1.28)	0.588
White	1.0	
Hispanic	0.99 (0.65, 1.28)	0.980
Other	0.86 (0.55, 1.33)	0.491
Unknown	0.89 (0.40, 1.99)	0.780
Primary language		
English	1.0	
Spanish	1.11 (0.76, 1.60)	0.595
Other	1.73 (0.86, 3.49)	0.126
Insurance		
Commercial	1.0	
Medicare	0.86 (0.64, 1.15)	0.308
Medicaid	0.71 (0.49, 1.04)	0.077
Other/unknown	0.22 (0.11, 0.44)	<0.001
Income by zip code		
Highest quartile	1.0	
Second quartile	1.29 (0.88, 1.89)	0.193
Third quartile	0.96 (0.67, 1.37)	0.815
Lowest quartile	1.05 (0.75, 1.46)	0.793

CI, confidence interval; OR, odds ratio.

The impact of pandemic-related declines in CRC screening and surveillance on CRC detection and outcomes is currently under investigation. A study from the UK using

a national endoscopy database demonstrated a decrease in the weekly number of CRC detected via screening colonoscopy by 58% compared to prepandemic detection rates [11]. Model-based estimates of CRC outcomes due to the COVID pandemic predict that 37.6% fewer patients would complete CRC screening and 32.6% fewer cancers would be diagnosed if COVID-related declines in colonoscopy-based CRC screening persist for 9 months; these estimates climbed to 42.9 and 37.6%, respectively, in the event that postfirst wave COVID colonoscopy rates remain low for 18 months [14]. Although a decline in CRC detection has yet to be quantified in our patient population, these findings together with the results from our study suggest an impending increase in late or missed CRC diagnoses.

Our study also provides insight into how pandemic-related changes in colonoscopy rates varied by several social determinants of health. We found an association, though not statistically significant, between insurance status and undergoing CRC screening or adenoma surveillance in the immediate COVID reopening phase. Patients with Medicaid insurance showed a trend toward being less likely to undergo colonoscopy during the reopening phase than those with commercial insurance when adjusting for race/ethnicity, age, indication, primary language and income. Medicaid patients have been consistently shown to have lower rates of colorectal and other cancer screenings, such as breast and cervical cancer, than commercially insured patients [15,16]. Given that these same patients also experienced higher rates of COVID-related invasive mechanical ventilation, ICU admission and mortality [17], our findings suggest that the pandemic exacerbated these preexisting disparities among Medicaid-insured patients.

Though the long-term implications of these lower post-pandemic rates in this population have yet to be determined, Medicaid insurance status is already associated with later-stage CRC presentation and lower overall CRC survival [18–20]. Of note, other/unknown insurance had a strong inverse association with colonoscopy in the COVID reopening phase. We hypothesize that this is more likely explained by improved data collection after a transition to a new electronic medical record in our institution in February 2020 rather than a true pandemic-related association.

Colonoscopy rates varied between different ethnic/racial groups, primary language and median household income by zip code. White, English-speaking and low-income patients comprised the largest percentage in both cohorts. These findings are in stark contrast to the demographics of the surrounding neighborhood of our medical center in which white residents comprise less than 20% of the population and primary English speakers less than 33% [21]. Nonwhite patients represented a smaller proportion of patients undergoing colonoscopy in the COVID reopening cohort compared to the pre-COVID cohort. Yet, after adjusting for the other covariables, race/ethnicity was not an independent predictor of COVID reopening phase colonoscopy, nor were primary language or zip code quartile. Other studies performed within our hospital system looking beyond colonoscopies among outpatients have demonstrated a statistically significant demographic shift [22]. It is important to recognize that the barriers to CRC screening and surveillance encompass a complex combination of these and other structural factors, such as transportation, appointment wait times, health literacy and fear of medical care. The lack of statistical significance in these findings should not underestimate the impact of social determinants of health on CRC preventive care.

Of note, this study does not directly evaluate the impact of other CRC screening modalities, such as fecal immunochemical testing (FIT) or FIT-fecal DNA, on screening colonoscopy volume in our study population. These modalities offer an attractive alternative to colonoscopy for average-risk patients who seek a lower-cost option due to their insurance status or who wish to minimize interaction with the healthcare system during the COVID pandemic. Optimal utilization of these screening modalities could maximize screening rates and increase colonoscopy yield [23,24]. Further study is necessary to evaluate the utilization of stool-based testing in the COVID pandemic and how social determinants of health may impact the choice of CRC screening modality.

To our knowledge, this is the first study to evaluate the impact of race, ethnicity, insurance status and income on CRC screening and surveillance in the context of the COVID-19 pandemic. Our study has several limitations. First, the retrospective nature of this study limits the ability to make definitive conclusions about the impact of these factors on undergoing screening or surveillance colonoscopy in the COVID reopening phase. The study population only included outpatients in a single medical center in New York City located in a region severely affected by COVID-19 early in the pandemic; generalizability of these findings to other regions in the country is therefore limited. Additionally, incomplete demographic data regarding

patient race and ethnicity prevented our ability to analyze these as independent variables.

In summary, our study demonstrated a sharp decline in colonoscopy for CRC screening and adenoma surveillance in the immediate COVID reopening phase with a significant trend towards surveillance over screening procedures. Rates of screening and surveillance colonoscopy in the reopening phase varied across several social determinants of health, including race/ethnicity and insurance status. Even as colonoscopy volumes rebound towards prepandemic rates, the downstream effects of delayed screening and surveillance during the COVID-19 pandemic may impact neoplasia detection rates for years to come.

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Conflicts of interest

There are no conflicts of interest.

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