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Colonoscopy screening and surveillance disparities during the COVID-19 pandemic

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ABSTRACT

Background: The COVID-19 pandemic has increased barriers to accessing preventive healthcare. This study identifies populations disproportionately underrepresented in screening and surveillance colonoscopies during the COVID-19 pandemic.

Methods: In this single-center cohort study, colonoscopy procedures were reviewed during 6-month intervals before the pandemic (July 1, 2019 - December 31, 2019) and during the pandemic (July 1, 2020 - December 31, 2020 and January 1, 2021 - June 30, 2021). 7095 patients were categorized based on procedure indication, demographics, Charlson Comorbidity Index and Social Vulnerability Index (SVI). Statistics performed using VassarStats.

Results: 2387 (2019) colonoscopies pre-pandemic and 2585 (2020) and 2123 (2021) during the pandemic were identified. There was a decrease in colonoscopies performed during months when COVID-19 cases peaked. The total number of average CRC risk patients presenting for first colonoscopy declined during the pandemic: 232 (10%) pre-pandemic to 190 (7%) in 2020, 145 (7%) in 2021 ($p < 0.001$). Fewer of these patients presented from highly vulnerable communities, SVI > 0.8, during the pandemic, 39 in 2019 vs 16 in 2020 and 22 in 2021. Of all screening and surveillance patients, fewer presented from communities with SVI > 0.8 during the pandemic, 106 in 2019 versus 67 in 2020 and 77 in 2021.

Conclusion: It is important to address the decline in CRC preventive care during this pandemic among average CRC risk first-time screeners and vulnerable community patients. An emphasis on addressing social determinants of health and establishing patients in gastroenterology clinics is imperative to promote future health in these populations.

1. Introduction

The coronavirus pandemic (COVID-19) is placing significant stress on healthcare systems in the United States (US). Emphasis and resources have shifted from standard preventive healthcare to essential measures to treat and reduce the spread of the virus. Colorectal Cancer (CRC), the third most common cancer and second-leading cause of cancer deaths in the US, has largely benefited from preventive screening. Relative to the beginning of CRC screening programs, from 1991 to 2011 the US had a 35% reduction in CRC incidence with a corresponding 37% reduction in mortality [1]. While this is promising, racial and ethnic minoritized people, persons without insurance, and those with lower household

income have lower rates of CRC screening [2]. These groups have also been disproportionately impacted by the COVID-19 pandemic [3,4], raising concern for increased disparities in CRC screening and surveillance in these medically underserved populations. Delays in timely CRC screening could reduce detection of the disease at an early stage when treatment is most effective, and complications are preventable [5].

Historically, disparities in CRC morbidity and mortality have been perpetuated through differences in prevention, indicating the importance of identifying the populations that did not complete CRC screening and surveillance during the pandemic. Colonoscopies are the most common CRC screening method in the US [6]. In March 2020 of the pandemic, colonoscopies were one of the nonurgent medical procedures

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the US Surgeon general advised should be delayed, which created a large backlog of patients needing the procedure [7]. By limiting access to colonoscopies, existent disparities in CRC screening have continued in minoritized and marginalized populations.

The purpose of this study is to determine whether the COVID-19 pandemic has created or widened colonoscopy screening and surveillance disparities. Patients who had a colonoscopy before versus during the pandemic were compared based on procedure indication, social vulnerability, age, gender, race, and comorbidities before versus during the pandemic. These data can contribute to recommendations on where to direct initiatives and allocate resources to prevent a future increase in CRC in the minority populations.

2. Material and methods

In this single-center cohort study, colonoscopy procedures were reviewed during 6-month intervals before the pandemic (July 1 - December 31, 2019) and during the pandemic (July 1 - December 31, 2020 and January 1 - June 30, 2021). These time frames were chosen to avoid the period between mid-March and April of 2020 when elective and non-essential surgical procedures, including colonoscopies, were delayed [8]. Data was retrieved from Albany Medical Center (AMC) medical records (Fig. 1).

Colonoscopies for patients ages 40 through 85 years old were included in the study in accordance with United States Preventive Services Task Force (USPSTF) screening and surveillance age

recommendations [9]. Inmates, pregnant women, and patients younger than 40 years old and older than 85 years old were excluded from the study.

The indications for colonoscopy were classified as: screening, surveillance, evaluation for a symptom, follow-up for a positive alternative CRC screening test, and other. For this study, screening and surveillance colonoscopies were further classified as:

Screening:

- First-time screening, patient at average risk of CRC.
- First-time screening, patient with family history of CRC or advanced adenoma before age 60.
- Follow-up screening, patient at average risk of CRC.
- Follow-up screening, patient with family history of CRC or advanced adenoma before age 60.

Surveillance:

- Follow-up, patient with personal history of polyps.
- Follow-up, patient with personal history of polyps and family history.
- Follow-up, patient with personal history of CRC.
- Patient with Lynch Syndrome (HNPCC) or Familial adenomatous polyposis (FAP).
- Patient with inflammatory bowel disease (IBD).

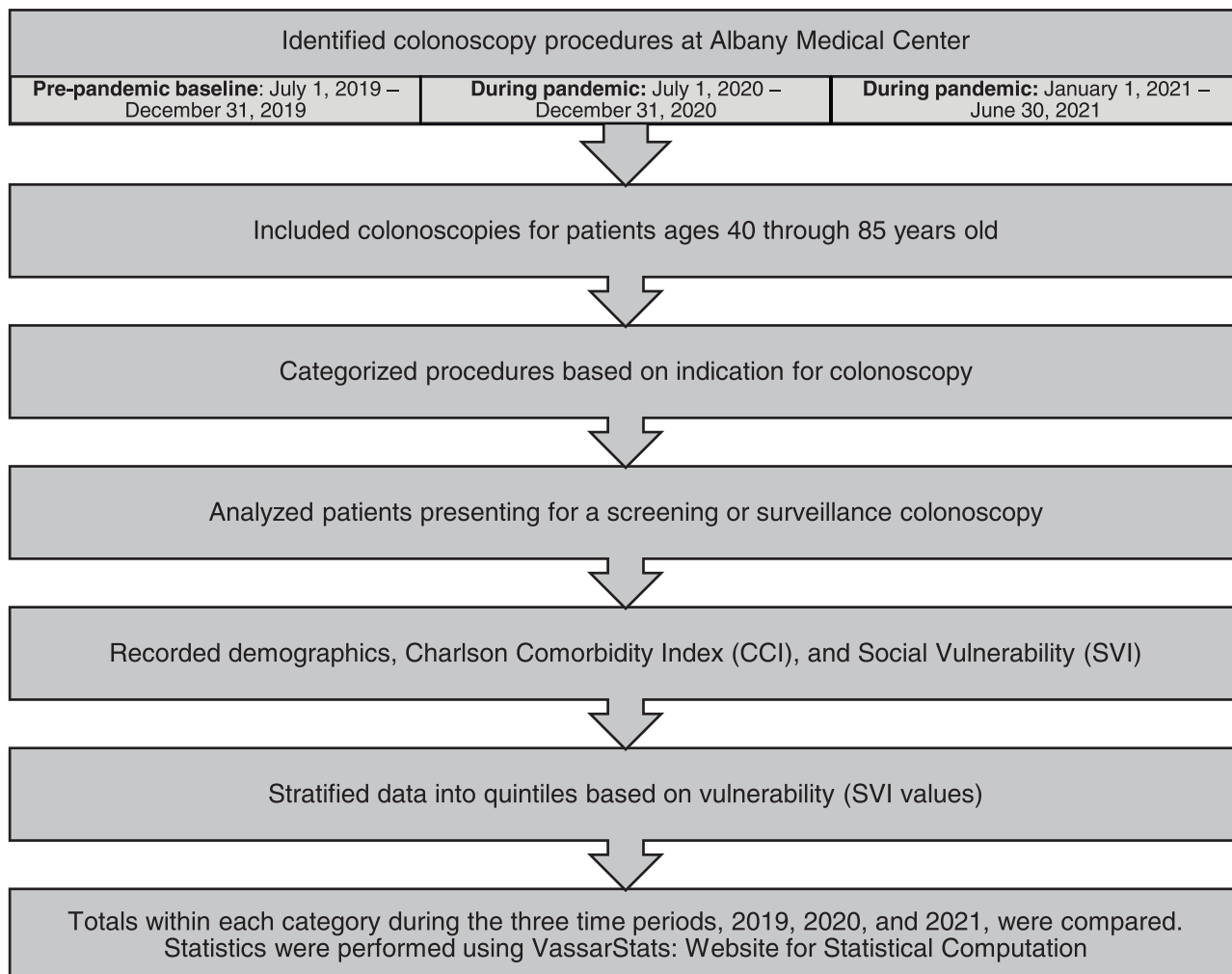


Fig. 1. Methods flowchart.

Age, race, procedure date and indication, family CRC history, Social Vulnerability Index (SVI) and Charlson Comorbidity Index (CCI) was recorded from each screening and surveillance colonoscopy patient's AMC medical record. Gender was characterized as male and female and race as Asian, Black, Hispanic, White, other. CCI is a method for predicting mortality based on the risk of patients' comorbid conditions. Different conditions are assigned points and summed to provide a final CCI score. A higher CCI score indicates a worse prognosis.

The CDC's SVI ranks US Census tracts on 15 social factors, including poverty, lack of vehicle access, and crowded housing [10]. Based on their home address, patients were assigned an SVI score on a scale from 0 to 1, 0 indicating the least vulnerable and 1 the most. These numerical scores were categorized into quintiles, 0–0.2 as low social vulnerability, 0.2–0.4 as low medium, 0.4–0.6 as medium, 0.6–0.8 as medium high, and 0.8–1 as high.

After finalizing data collection, totals within each category during the three time periods, 2019, 2020, and 2021, were compared. Statistics were performed using VassarStats. Chi-square tests were done for

categorical variables including patient demographics, colonoscopy indications, and SVI quintiles, with significance level $p = 0.05$. Analysis of Variance (ANOVA) was used for continuous variables, including age, SVI and CCI. When comparing populations before versus during the pandemic, the 2019 total was compared to the average total between 2020 and 2021. This helped gauge the overall impact of the pandemic thus far.

3. Results

3.1. Overall trends

The total numbers of colonoscopies identified in the 6-month intervals were 2387 in 2019, 2585 in 2020, and 2123 in 2021. Of these, 1039 (44%), 1142 (44%), and 806 (38%) were for screening and surveillance in 2019, 2020, and 2021 respectively ($p < 0.001$). This was an average 6% drop in screening and surveillance colonoscopies during the pandemic, most prominently in 2021. During the pandemic, the total

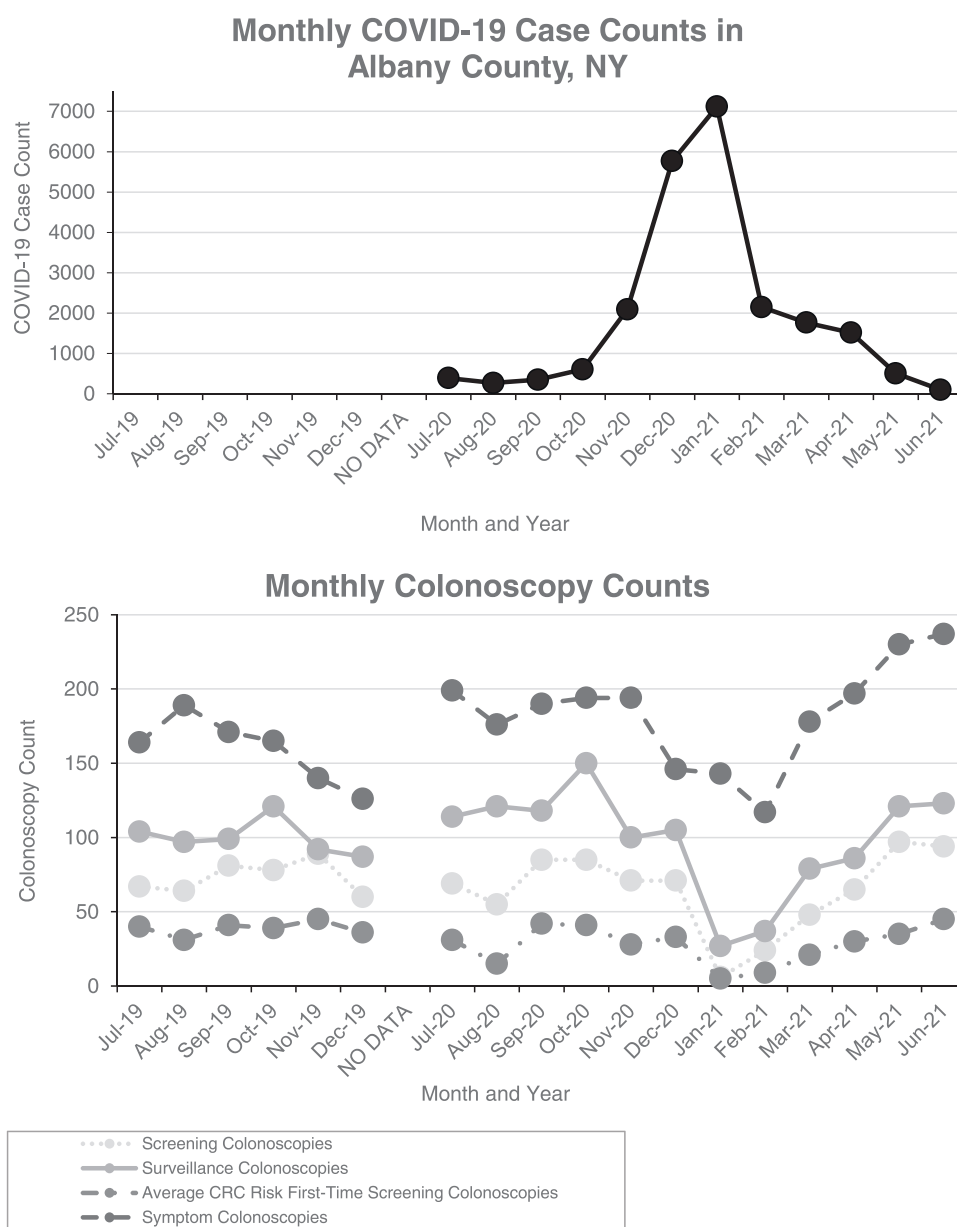


Fig. 2. Monthly COVID-19 Case and Colonoscopy Procedure Count Trends. Monthly COVID-19 case counts compared with total colonoscopy procedures performed for select indications.

number of screening colonoscopies decreased by 13% and surveillance colonoscopies by 2 %. Screening colonoscopies decreased by 11% more than surveillance colonoscopies.

The majority of colonoscopy service utilization each year was for evaluation of patients with a reported symptom, such as abdominal pain, 955 (40 %) in 2019, 1099 (43 %) in 2020 and 1102 (52 %) in 2021. The number of colonoscopies performed for a symptomatic indication increased by 15 % during the pandemic.

Comparing monthly screening and surveillance colonoscopy totals with COVID-19 cases reported in Albany County, New York, there was a dramatic decrease in colonoscopies performed during peaks in COVID cases. This was especially true in January, 2021 during the peak of COVID-19 cases following the 2020 holidays (Fig. 2).

The number of symptom-indicated colonoscopies did not decrease as significantly during this time and there was a rebound increase above previous baseline following the decline.

The total number of patients presenting for each screening or surveillance indication in each time frame is displayed in Table 1.

Indications that significantly changed from 2019 baseline are described below. There was no significant change in the counts of other indications, including positive alternative CRC screening method, such as Cologuard or Fecal Immunochemical Test (FIT).

3.2. Average CRC risk first-time screening

The number of patients at average CRC risk presenting for first-time screening decreased from a baseline of 232 in 2019–190 in 2020 and

Table 1

Colonoscopy indication totals with Chi-square P-values. Total number of colonoscopies performed for each screening and surveillance indication by year.

Indication	2019 Total	2020 Total	2021 Total	p-value
All Colonoscopies	2387 (100 %)	2585 (100 %)	2123 (100 %)	NA
Screening and Surveillance	1039 (44 %)	1142 (44 %)	806 (38)	< 0.001
Screening	439 (18 %)	434 (16 %)	333 (16 %)	0.05
Screening: average colorectal cancer, risk first-time	232 (10 %)	190 (7 %)	145 (7 %)	< 0.001
Screening: average colorectal cancer risk, subsequent	152 (6 %)	158 (6 %)	111 (5 %)	0.24
Screening: family history of CRC (1st degree relative or advanced adenoma diagnosed at age <60), first-time	22 (1 %)	36 (1 %)	36 (2 %)	0.07
Screening: family history of CRC (1st degree relative or advanced adenoma diagnosed at age <60), subsequent	33 (1 %)	50 (2 %)	41 (2 %)	0.25
Surveillance	600 (25 %)	708 (27 %)	473 (22 %)	< 0.001
Surveillance: personal history of polyps	423 (18 %)	469 (18 %)	356 (17 %)	0.46
Surveillance: personal history of polyps with family history of CRC (1st degree relative or advanced adenoma diagnosed at age <60)	69 (3 %)	113 (4 %)	43 (2 %)	< 0.001
Surveillance: personal history of CRC	49 (2 %)	63 (2 %)	49 (2 %)	0.65
Surveillance: family history of Lynch syndrome (hereditary nonpolyposis colorectal cancer)	3 (0%)	8 (0%)	3 (0%)	0.27
Surveillance: family history of familial adenomatous polyposis, or other predisposing genetic disorders (i.e., Peutz-Jeghers Syndrome)	1 (0 %)	3 (0 %)	0 (0 %)	0.23
Surveillance: inflammatory bowel disease	55 (2 %)	52 (2 %)	22 (1 %)	0.004

145 in 2021 (Fig. 3).

This was a 28 % reduction in the number of patients at average CRC risk presenting for first-time screening during, compared to before, the pandemic.

3.3. CRC family history screening and surveillance

During the pandemic, an increased proportion of patients presenting for screening and surveillance had family history of CRC or advanced adenoma before age 60 years: 18 % in 2019 versus 28 % in 2020 and 20 % in 2021. This was a 24 % increase in the number of patients presenting with a family history of CRC or advanced adenoma. There was no decline in the number of patients with a family history of CRC or advanced adenoma presenting for first-time screening. There was a significant increase from 2019 baseline in patients presenting in 2020 for follow-up surveillance colonoscopy for a personal history of polyps and family history of CRC or advanced adenoma, with a subsequent decrease in 2021.

3.4. Inflammatory bowel disease surveillance

There was a significant decrease in the number of patients with IBD presenting for surveillance during the pandemic compared to before the pandemic, 55 in 2019 versus 52 and 22 in 2020 and 2021 respectively. This was a 33 % reduction in IBD patients presenting for colonoscopy during the pandemic.

3.5. Social vulnerability index

Of all patients at average CRC risk presenting for first-time screening, the number of patients from high vulnerability communities decreased from 39 in 2019–16 in 2020 and 22 in 2021. There was an average 51 % decrease in the totals during the pandemic compared to before the pandemic (Fig. 4).

The number of screening and surveillance patients from a high vulnerability SVI decreased from 106 in 2019–67 in 2020 and 77 in

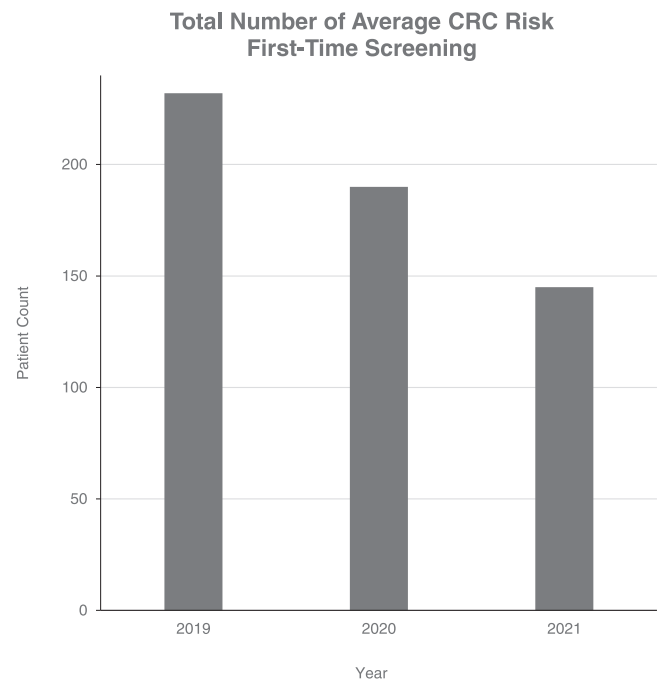


Fig. 3. Total Number of Patients at Average CRC Risk Presenting for First-Time Colonoscopy. Number of average CRC risk patients presenting for their first colonoscopy during the pandemic (2020 and 2021) compared to before the pandemic (2019).

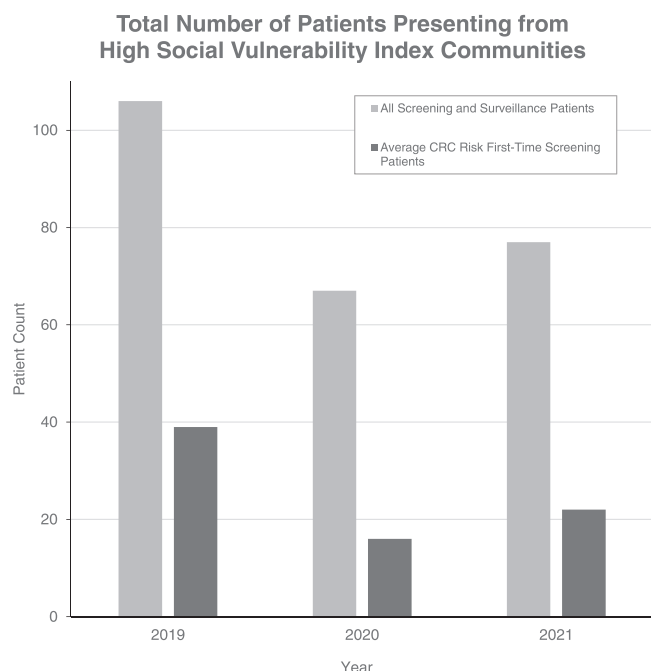


Fig. 4. Total Number of Patients from High Social Vulnerability Communities Presenting for Screening or Surveillance Colonoscopy. Number of patients presenting from high social vulnerability communities during the pandemic (2020 and 2021) compared to before the pandemic (2019).

2021 (Fig. 4).

There was an average 32 % decrease in the total of patients from high social vulnerability communities during the pandemic compared to before the pandemic.

3.6. Patient demographics

There was no change in the distribution of total screening and surveillance patients across 5-year age intervals before versus during pandemic. The number of patients presenting for average CRC risk first-time screening ages 45–49 years was minimal and did not significantly change across the years, 18 presented 2019, 9 in 2020 and 16 in 2021 ($p = 0.12$). There was no difference in race or gender of screening and surveillance patients between the years.

3.7. Patient comorbidities

Of all colonoscopy patients, there was an increase in the mean CCI from 3.8 (2019) to 4.0 (2020) to 4.1 (2021) ($p = 0.004$). The average screening and surveillance patient CCI value increased during the pandemic, from 3.6 in 2019, to 3.9 in 2020 and 4.0 in 2021 ($p = 0.004$). There was no significant change in average CCI among average-risk first-time screeners.

4. Discussion

This study highlights the disruption that the COVID-19 pandemic caused in CRC preventive screening and surveillance, most markedly for patients from high SVI communities at average risk of CRC presenting for a first-time screening colonoscopy and patients with IBD presenting for surveillance. The decrease in colonoscopy screening and surveillance during the pandemic persisted even after the end of the elective procedure ban, which is consistent with recent studies that have reported similar decreases without a compensatory increase back to baseline [11]. These findings suggest that the healthcare system was not prepared to manage the impact of COVID-19 on delivery of preventive

healthcare. Throughout the pandemic healthcare personnel (providers, technicians, office staff, etc.) were infected or had to isolate following a COVID-19 exposure, resulting in limited staff availability and rescheduling of colonoscopy procedures for at least 2 weeks. This could partially explain the large drop in colonoscopy procedures during the times when COVID-19 case counts peaked (i.e., winter 2020–2021). In contrast with screening and surveillance colonoscopies, the number of patients presenting for a symptom-indicated colonoscopy did not decrease as dramatically during the COVID-19 peaks and had a larger increase above previous baseline following these time periods. This indicates symptomatic patients delayed colonoscopy procedures but still eventually presented.

According to the CDC, almost 30 % of adults ages 50 y to 75 y (approximately 28 million Americans) were not up-to-date with their CRC screening in 2020 [12]. It has been reported that one or more neoplastic lesions are found in 37.5 % colonoscopies done on asymptomatic patients, suggesting a likelihood of missed lesions in the general population [13]. It is possible that asymptomatic patients were deterred from interacting with the healthcare setting after weighing the risk of contracting COVID-19. Furthermore, this study showed no evidence of an increase in the number of patients presenting following a positive alternative at-home CRC screening test during the pandemic, which suggests that these tests were not being used to their full potential. Without proper measures to correct the reduction in screening and surveillance over the pandemic, the volume of patients overdue on cancer screening will continue to rise and colonoscopy findings will likely be more progressed.

The decline in first-time screening during the pandemic may be a result of fewer primary care visits during the pandemic [14]. Referrals for gastroenterology consults and CRC screening are often given during these appointments. Additionally, there were few patients presenting for first-time screening aged 45–49 during all three time periods, indicating a delay in adherence to the new USPSTF guidelines, negating the 6.2 % increase of life-years gained from initiating colonoscopic screening at age 45 (vs. age 50). [15] Further, patients with IBD presenting for surveillance colonoscopies significantly decreased during the pandemic. Given these patients' increased risk for CRC, it is critical that these patients return to clinic promptly. Patients with a family history of CRC or advanced adenoma were more likely to adhere to screening and surveillance guidelines during the pandemic, which could reflect a deeper emotional association and understanding of CRC in these patients, motivating them to return to the clinic.

Fewer high SVI patients presenting for screening and surveillance suggests increased barriers and infrastructure problems exist within the healthcare system for preventive care. This brings to light health inequities that have always been entrenched in our system but worsened during the pandemic. Other studies have also found a shift towards higher socioeconomic status patients that underwent colonoscopy during the pandemic [11]. This disproportionate effect on vulnerable populations will increase health inequity in the US, especially if these trends persist after the pandemic [8]. Although disparities in CRC colonoscopy screening and surveillance did not change in terms of race and gender before versus during the pandemic, the preexisting disparities do remain and have not improved [11].

Neglecting vulnerable populations by not providing support needed to diagnose and prevent disease during the pandemic could account for future exacerbations in health disparities. An estimated 4500 additional colon cancer deaths in the next decade are predicted due to pandemic-related delays in diagnosis and treatment [16]. Past CRC prevention approaches have been effective, but the pandemic has revealed their susceptibility to poor adherence in the face of overriding priorities. If the pandemic and these trends continue, the backlog of missed procedures will persist for the foreseeable future. With increased scheduling difficulties and limited time and resources, some patients will drop off and be lost to follow-up. Thus, healthcare facilities should be prepared for an increasing number of requested colonoscopies and CRC in vulnerable

individuals and a plan is needed to maintain preventive care while healthcare resources are limited.

Based on this study's findings, quality improvement measures can be identified and implemented to focus on accessibility and adherence to colonoscopy screening for populations identified to be adversely affected by the pandemic. Gastroenterology clinics should collaborate with primary care providers to ensure referral of patients who need first-time screening but are not established in the GI outpatient clinics. A proposed solution is to offer open access colonoscopies to negate the requirement for a referral and/or gastrointestinal appointment. Community outreach in vulnerable communities promoting the importance of routine colonoscopy screening, in addition to alternative screening method options, could be impactful in raising awareness and education. Targeting the younger population and promoting the updated screening guidelines will help increase awareness of when to start CRC screening. Alternative screening methods should be advertised as an easy and remote alternative for screening, especially when patients are hesitant to enter medical facilities. Telehealth can be used to identify high-risk patients in need of colonoscopies and for follow-up appointments to decrease clinic time and increase efficiency. Health officials must account for the complex and multifactorial basis for the disparities in CRC screening and surveillance. Reducing social vulnerability can decrease human suffering and economic loss [10]. To reduce the impact from future pandemics, public health strategies to promote CRC screening should be emphasized in communities at high risk with low compliance. Increased accessibility and adherence to CRC screening recommendations is also essential for patients eligible for first-time screening in vulnerable communities [8].

The unpredictable nature of the COVID-19 pandemic and the resultant expedited guidelines created a challenge selecting appropriate time periods for this analysis. Nevertheless, our study has several strengths, including the examination of multiple parameters on a large and diverse population. The analysis delved deeper into the specifics of populations that had colonoscopies during the COVID-19 pandemic compared to other similar studies. Although colonoscopies are an important screening and surveillance tool, this study did not include data on other beneficial CRC screening methods. It is possible that the population of patients utilizing alternative testing was not accurately represented. The conclusions regarding vulnerable populations assume that the groups did not receive alternative testing. Keeping these limitations in mind, the identification of patterns within certain vulnerable groups could have major implications for future of CRC prevention if they hold at other healthcare facilities, including private practices or the nation. A national scale study is needed to address this issue.

Authorship contribution statement

All authors contributed to the study conception and design. Planning and conducting the study, collecting and interpreting the data and drafting the manuscript were performed by Helena Randle and Alicia Gorin. Interpreting the data and drafting the manuscript were performed by Nihita Manem, Paul Feustel, Angela Antonikowski, Micheal Tadros.

All authors read and approved the final manuscript.

Conflict of Interest

The authors declare that they have no conflict of interests.

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