Temporal trends and disparities in gastroenterology care use before, during, and after COVID-19 lockdown

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ABSTRACT

Socioeconomic disparities adversely affected healthcare use during COVID-19 lockdown. However, trends in these disparities post lockdown are unknown. Therefore, our aim was to study temporal trends and factors associated with gastroenterology healthcare access and disparities during and after COVID-19 lockdown. This cohort study consisted of patients receiving outpatient care in the Cleveland Clinic gastroenterology department between March 2020 and June 2020 and corresponding time periods in 2019 and 2021. Patient demographics and socioeconomic factors were extracted and analyzed. There were 47,031 patients (mean age 56.3±17.6 years, 61.9% female and 76.4% white) included. Patients ≥65 years sought healthcare less frequently during and after the lockdown (40.1% vs 34.8% vs 35.2% in 2019, 2020, and 2021 respectively). Missed visits (4.2% vs 10% vs 10.4%), tobacco (11.4% vs 15.9% vs 16.1%), alcohol (38.6% vs 45.5% vs 50.9%), and illicit drug use (3.5% vs 5.8% vs 10.7%) have steadily increased during and after the lockdown compared with prepandemic levels. Factors associated with reduced telehealth use were black race (OR 0.89, 95% CI 0.81 to 0.99), Hispanic race (OR 0.63, 95% CI 0.51 to 0.77)), Medicaid/other public insurance (OR 0.87, 95% CI 0.79 to 0.95)), unemployed status (OR 0.85, 95% CI 0.79 to 0.92)), and non-English/Spanish speakers (OR 0.66, 95% CI 0.46 to 0.94)). In conclusion, socioeconomic and ethnic disparities persist in healthcare use even a year after the onset of the COVID-19 pandemic. There is an alarming increase in missed visits and substance abuse. Therefore, efforts should be targeted on improving healthcare access for these aforementioned vulnerable groups.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ COVID-19 pandemic has adversely influenced existing socioeconomic and ethnic disparities in healthcare use. However, the long-term effects are not known.

WHAT THIS STUDY ADDS

⇒ Older patients sought gastroenterology healthcare less frequently during and after the pandemic lockdown. Substance abuse and missed visit rates continue to increase. Blacks, Hispanics, unemployed patients and patients with public insurance or Medicaid were less likely to use video visits and more likely to miss scheduled appointments.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study identified vulnerable populations with decreased gastroenterology care use due to the COVID-19 pandemic. Future efforts are needed to target and improve access for these vulnerable groups.

INTRODUCTION

Demographic and socioeconomic inequities play a critical role in the access and use of healthcare services. Although these disparities have been long-standing, they first gained official recognition with the landmark Heckler Report in 1985, which reported that 60,000 deaths occurred each year in the USA due to health disparities and also provided recommendations to reduce such health disparities.[1] Since then, there have been several advances in medical technology and community-level interventions that have improved health and reduced disparities. However, the availability of newer and expanded healthcare services has not translated to equitable distribution to all Americans, and disparities have persisted despite garnering increased attention. For instance, a 2019 report found that black people have a life expectancy 4 years less than white people.[2]

In the initial stages of the COVID-19 pandemic, hospitals opted to replace traditional in-person clinic visits with telehealth visits and continued to offer the latter as an increasingly viable alternative to the former even after the lockdown. This shift to telehealth had many potential benefits: not only would telehealth mitigate the spread of COVID-19 by removing interpersonal contact, but also telehealth is positively associated with improved outcomes, ease of use, cost savings, and improved communication among other benefits.[3] Unfortunately, the long-lasting barriers and disparities in the American healthcare system have resulted

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in inequities in using the telehealth at the start of the pandemic.[4–7] However, while these studies have looked at healthcare access disparities during the first surge of COVID-19, they have not examined whether these trends in healthcare access have persisted in 2021, after the country had adequate time to become accustomed to the pandemic landscape. Consequently, the true gravity of these healthcare access disparities has not been accurately measured. Therefore, we aimed to identify the trends in demographic and socioeconomic factors associated with healthcare access before, during, and a year after the onset of the COVID-19 pandemic and factors predictive of telehealth use and missed visits in our gastroenterology department.

MATERIALS AND METHODS

The study cohort consisted of patients scheduled for clinic visits in the Cleveland Clinic Department of Gastroenterology in three distinct time periods: March 9–June 18, 2020, and corresponding time periods in 2019 and 2021. In the early stages of COVID-19 pandemic, a state of emergency was declared on March 9, 2020, and Ohio went into lockdown. A gradual reopening of the state was started on May 1, 2020, with most of the lockdown restrictions lifted by June 18, 2020. The Cleveland Clinic shifted to telehealth, and its outpatient visits became predominantly remote during the lockdown period.[8] Interstate travel was discouraged, limiting in-person visits from out-of-state patients; hence, only Ohio residents were included in this study. Patient groups from corresponding time periods in 2019 and 2021 were included to study the temporal trends in socioeconomic and ethnic disparities. The following data were extracted: age, sex, race (black, white, Hispanic, and other), area of residence, employment status, marital status, primary language, type of insurance (Medicare, Medicaid or other public insurance, commercial, or uninsured), and substance (tobacco, alcohol, or illicit drugs) abuse. All visits, whether completed or missed (no-show/cancellation), and all types of visits—in-person, video, or telephone—were considered for study purposes.

Video visits were defined as those provided using an electronic-based communication network with audiovisual input. Telephone visits consisted of interactions that used audio input only. Patient visits were considered missed visits if the patient did not complete their scheduled appointment due to cancellation or no-show. If a patient had multiple visits during the study period, only their first visit was considered in order to prevent duplicates and minimize bias. During the lockdown, in-person visits were offered only at the provider's discretion. All patients were offered video visits first, and if a patient was unable to schedule a video visit or declined, then a telephone visit was offered. Video visits were conducted through different audiovisual platforms including Epic (Epic Systems Corporation, Verona, Wisconsin, USA) video platform, Amwell (Boston, Massachusetts, USA), or FaceTime (Apple, Cupertino, California, USA). During the 2021 study period, video, telephone and in-person visits were offered at patient and physician discretion. Primary language was determined based on the need for a translator. A proxy median household income for the patients' residential addresses was obtained from US Census 2010 estimates, and patients were grouped into quartiles.[9]

Statistical analysis

Data were presented as mean±SD for continuous variables and n (%) for categorical factors. Independent sample t-test or the non-parametric Kruskal-Wallis test was used to compare continuous variables, and Pearson's χ^2 test was used to compare categorical variables. Univariate analyses was performed to assess the characteristics of patients seen in 2019, 2020, and 2021 and to compare demographics and socioeconomic factors associated with (1) video visit versus other visit types, (2) telephone visits versus other visit types, (3) in-person visits versus other visit types, and (4) completed visits versus missed visits. To identify predictors of each type of visit, multivariate logistic regression modeling was performed to calculate ORs. Input variables were included if they met the cut-off alpha level of ≤0.05 on univariate testing. All statistical analyses were performed using the SPSS software V.24. A p value of <0.05 was considered statistically significant.

RESULTS

During the 2020 COVID-19 lockdown period, 20,059 visits were scheduled, of which 6720 patients had multiple visits. During the corresponding 2019 and 2021 time periods, 20,727 and 26,010 visits were scheduled, respectively. For study purposes, only the patient's initial visit was considered, leading to a total of 17,335 visits in 2019, 13,339 visits in 2020, and 16,357 visits in 2021. Overall, there were a total of 66,796 scheduled visits during the three study periods, of which 19,764 patients had multiple visits, yielding 47,032 visits. The study cohort (women 29,116 (61.9%), mean age 56.3±17.6 years) predominantly had private insurance (61.7%) with a racial distribution as follows: white (76.4%), black (14.5%), Hispanic (3.8%), and other (5.3%). The cohort had an almost equal distribution of employed (39%) and unemployed (38.8%) individuals as well as married (49.6%) and single (49%) individuals. The vast majority spoke English as their primary language (97.9%) with 2.1% requiring translator services for the visits.

Temporal trends

During the pandemic lockdown, there was a decline in total visits scheduled with a gradual improvement thereafter. The majority of visits in 2020 were telephone visits (50%) and video visits (22.7%) with a slow return to in-person visits (76.6%) in 2021 (figure 1). The COVID-19 pandemic led to different trends in various groups seen in

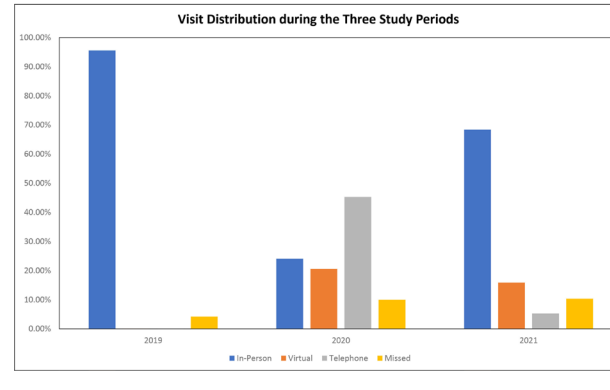

Figure 1 Visit distribution during the three study periods.

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Table 1 Temporal trends in patient characteristics and patient visits

Factor	2019 (n=17,335)	2020 (n=13,339)	2021 (n=16,357)	P value (overall)
Age (years) (mean±SD)	57.9 ± 17.2*†table	55.5±17.6*	55.2±17.8†	<0.001
Age ≥65 years, n (%)	6995 (40.1)*†	4648 (34.8)*	5755 (35.2)†	<0.001
Sex, n (%)				<0.001
Male	6692 (38.6)†	5229 (39.2)‡	5994 (36.6)†	
Female	10,643 (61.4)	8110 (60.8)	10,363 (63.4)	
Race, n (%)				<0.001
White	13,472 (77.8)*†	10,072 (75.6)*‡	12 359 (75.6)†‡	
Black	2362 (13.6)	2094 (15.7)	2345 (14.3)	
Hispanic	638 (3.7)	478 (3.6)	677 (4.1)	
Others	838 (4.8)	683 (5.1)	967 (5.9)	
Type of insurance, n (%)				<0.001
Medicare	3879 (22.9)*†	2762 (21.2)*‡	3033 (18.9)†‡	
Medicaid and other public	2420 (14.3)	2348 (18)	2649 (16.5)	
Private	10,416 (61.6)	7805 (59.8)	10,195 (63.4)	
No insurance	203 (1.2)	136 (1)	200 (1.2)	
Median household income by zip code (by quartile), n (%)				<0.001
Lowest	4107 (23.7)*†	3639 (27.3)*‡	3879 (23.7)†‡	
Second	4410 (25.4)	3334 (25)	4047 (24.7)	
Third	4557 (26.3)	3207 (24)	4082 (25)	
Highest	4260 (24.6)	3158 (23.7)	4348 (26.6)	
Employment status, n (%)				<0.001
Employed	6518 (37.6)*†	5002 (37.6)*‡[1,2]	6582 (40.3)†‡	
Unemployed	6847 (39.5)	5545 (41.7)	6350 (38.8)	
Retired	3718 (21.5)	2440 (18.4)	3039 (18.6)	
Unknown	248 (1.4)	307 (2.3)	381 (2.3)	
Type of visit, n (%)				<0.001
In-person	17 247 (99.5)*†	3664 (27.3%)*‡	12 522 (76.6%)†‡	
Video	38 (0.2)	3029 (22.7%)	2856 (17.5%)	
Phone	50 (0.3)	6666 (50%)	979 (6%)	
Visit status, n (%)				<0.001
Completed	16,600 (95.8)*	11,999 (90)*	14 664 (89.6)‡	
Missed	751 (4.2)	1340 (10)	1693 (10.4)	
Marital status, n (%)				<0.001
Married	8790 (50.7)*†	6272 (47)*‡	7966 (48.7)†‡	
Single	8305 (47.9)	6879 (51.6)	8175 (50)	
Unknown	239 (1.4)	188 (1.4)	216 (1.3)	
H/o tobacco use	1958 (11.4)*†	2094 (15.9)*	2607 (16.1)‡	<0.001
H/o alcohol use	6401 (38.6%)*†	5832 (45.5%)*‡	8016 (50.9%)†‡	<0.001
H/o illicit drug use	579 (3.5)*†	747 (5.8)*‡	1683 (10.7)†‡	<0.001
Primary language, n (%)				<0.001
English	16,916 (97.6)*†	13,009 (97.5)*‡	16,069 (98.2)†‡	
Spanish	180 (1)	180 (1.3)	117 (0.7)	
Other languages	239 (1.4)	150 (1.1)	171 (1)	

Missing values: race=46; insurance=985.
*Significant difference between 2019 and 2020.
†Significant difference between 2020 and 2021.
‡Significant difference between 2019 and 2021.
H/o, history of.

our department. Older patients (age ≥65 years, those with Medicare insurance, and retired) sought healthcare less frequently during and after the lockdown (table 1). Women used healthcare more often than men before, during, and after the lockdown (61.4% vs 60.8% vs 63.4%, p<0.001). The proportion of non-white patients (22.2% vs 24.4% vs 24.4%, p<0.001), patients with Medicaid and other public insurance (14.3% vs 18% vs 16.5%, p<0.001), and single individuals continued to increase during and after the lockdown compared with prepandemic levels. On the other hand, patients with private insurance sought care less frequently during the lockdown but more frequently a year afterwards (61.6% vs 59.8% vs 63.4%, p<0.001). Patients in the lowest quartile of income sought care more

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frequently during the lockdown in contrast to those in the higher quartiles; however, for the highest quartile, visits decreased during the lockdown but have resumed to higher than prepandemic levels (table 1). The number of missed visits and tobacco, alcohol, and illicit drug use have steadily increased during and continue to increase after the pandemic lockdown (table 1).

Predictors of video visits

During the three study periods, 5923 video visits were scheduled and 5352 visits were completed. In 808 visits, the specific type of video platform used was not mentioned. Of the remaining 5115 visits, there were 3848 visits via Zoom, 185 via FaceTime, and 1082 via Amwell scheduled. There were no statistically significant differences between the completed and missed visit rates between the Zoom, FaceTime, and Amwell platforms (completed visits: 3511, 163, and 980, respectively, and missed visits: 337, 22, 102, respectively; p value=0.30).

Compared with patients who had other visits (n=37,911), video visit patients (n=5352) were more likely to be young (51.8 vs 57.3), white (79.7% vs 77%), English-speaking (98.6% vs 97.8%), unemployed (47.1% vs 39.4%), have higher income, and have private insurance (68.5% vs 61.6%) (p<0.05 for all) (table 2). There were no significant differences in gender, marital status, or smoking between the two groups.

On multivariate analysis, for every 1 year increase in age, there was a 2% lower chance of video visits (OR 0.98, 95% CI 0.98 to 0.98, p<0.001). Compared with white subjects, black subjects were 10% (OR 0.9, 95% CI 0.82 to 0.99, p=0.048) and Hispanics 36% less likely to use video visits (OR 0.64, 95% CI 0.53 to 0.78, p<0.001). Patients with Medicaid or other public insurance were 14% less

Table 2 Patient characteristics associated with video visits

Factor	Video (N=5352)	Other visits (N=37,911)	P value	Adjusted OR for video visits (95% CI)	P value
Age (years) (mean±SD)	51.8±17.3	57.3±17.4	<0.001	0.98 (0.98 to 0.98) for every 1 year increase in age	<0.001
Age ≥65 years, n (%)	1462 (27.3)	14,798 (9)	<0.001		
Sex, n (%)					
Male	1972 (36.8)	14,487 (38.2)	0.054		
Female	3380 (63.2)	23,424 (61.8)			
Race, n (%)			<0.001		
White	4265 (79.7)	29,167 (77)		Reference	
Black	645 (12.1)	5348 (14.1)		0.9 (0.82 to 0.99)	0.048
Hispanic	128 (2.4)	1449 (3.8)		0.64 (0.53 to 0.78)	<0.001
Others	310 (5.8)	1910 (5)		1.02 (0.89 to 1.17)	0.74
Type of insurance, n (%)					
Private	3616 (68.5)	22,845 (61.6)	<0.001	Reference	
Medicare	834 (15.8)	8147 (22)		0.92 (0.84 to 1.01)	0.09
Medicaid and other public	775 (14.7)	5658 (15.3)		0.86 (0.78 to 0.94)	0.002
No insurance	57 (1.1%)	447 (1.2)		0.81 (0.61 to 1.08)	0.159
Median household income by zip code (by quartile), n (%)					
Lowest	1146 (21.4)	9160 (24.2)	<0.001	Reference	
Second	1200 (22.4)	9498 (25.1)		0.95 (0.87 to 1.05)	0.37
Third	1541 (28.8)	9641 (25.4)		1.20 (1.09 to 1.32)	<0.001
Highest	1464 (27.4)	9595 (25.83)		1.12 (1.02 to 1.23)	0.015
Employment status, n (%)					
Employed	1850 (34.6)	14,346 (37.9)	<0.001	Reference	
Unemployed	2522 (47.1)	14,933 (39.4)		0.85 (0.79 to 0.92)	<0.001
Retired	827 (15.5)	7882 (20.8)		0.97 (0.88 to 1.08)	0.64
Unknown	158 (2.8)	700 (1.8)		1.06 (0.84 to 1.33)	0.6
Marital status, n (%)					
Married	2608 (48.7)	18,855 (49.7)	0.38		
Single	2668 (49.9)	18,538 (48.9)			
Others	76 (1.4)	517 (1.4)			
H/o tobacco use, n (%)	707 (13.5)	5196 (13.8)	0.52		
H/o alcohol use, n (%)	2515 (49.5)	16,179 (44.4)	<0.001	1.15 (1.08 to 1.22)	<0.001
H/o illicit drug use, n (%)	390 (7.2)	2267 (6.2)	<0.001	1.24 (1.10 to 1.40)	<0.001
Primary language, n (%)					
English	5277 (98.6)	37,078 (97.8)	0.001	Reference	
Spanish	35 (0.7)	378 (1)		0.94 (0.64 to 1.37)	0.75
Other languages	40 (0.7)	455 (1.2)		0.7 (0.5 to 0.99)	0.049

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Table 3 Patient characteristics associated with telephone visits

Factor	Telephone (N=6921)	Other visits (N=36,324)	P value	Adjusted OR for telephone visits (95% CI)	P value
Age (years), mean±SD	56.1±17.2	56.6±17.5	0.03	1.0 (0.99 to 1.002) for every 1 year increase in age	0.76
Age ≥65 years, n (%)	2444 (35.3)	13,816 (38)	<0.001		
Sex, n (%)					
Male	2611 (37.7)	13,848 (38.1)	0.52		
Female	4313 (62.3)	22,491 (61.9)			
Race, n (%)					
White	5299 (76.6)	28,133 (77.5)	0.002	Reference	
Black	1051 (15.2)	4642 (13.6)		0.96 (0.88 to 1.04)	0.36
Hispanic	241 (3.5)	1336 (3.7)		0.79 (0.68 to 0.92)	0.002
Others	327 (4.2)	1893 (5.2)		0.86 (0.76 to 0.98)	0.018
Type of insurance, n (%)					
Private	4010 (59.3)	22,451 (63)	<0.001	Reference	
Medicaid and other public	1228 (18.2)	5205 (14.6)		1.13 (1.04 to 1.22)	0.003
Medicare	1448 (21.4)	7533 (21.2)		1.05 (0.97 to 1.12)	0.19
No insurance	78 (1.2)	426 (1.2)		1.08 (0.84 to 1.37)	0.57
Median household income by zip code (by quartile), n (%)					
Lowest	2020 (29.2)	8301 (22.85)	<0.001	Reference	
Second	1696 (24.5)	9002 (24.8)		0.79 (0.73 to 0.86)	<0.001
Third	1582 (22.8)	9600 (26.4)		0.72 (0.66 to 0.78)	<0.001
Highest	1626 (23.5)	9433 (26)		0.76 (0.71 to 0.82)	<0.001
Employment status, n (%)					
Employed	2467 (35.9)	14,401 (39.6)	<0.001	Reference	
Unemployed	2965 (43.1)	13,818 (38)		1.17 (1.1 to 1.25)	<0.001
Retired	1249 (18.2)	7460 (20.5)		0.97 (0.89 to 1.06)	0.58
Unknown	198 (2.9)	654 (1.8%)		1.47 (1.22 to 1.77)	<0.001
Marital status					
Married	3293 (47.6)	18,170 (50)	0.001	Reference	
Single	3528 (51%)	17,678 (48.6)		1.02 (0.97 to 1.08)	0.44
Others	103 (1.5%)	490 (1.3)		1.08 (0.86 to 1.35)	0.51
H/o tobacco use	1086 (15.9)	4817 (13.4)	<0.001	1.11 (1.03 to 1.2)	0.004
H/o alcohol use	2971 (44.85)	15 723 (45)	0.16		
H/o illicit drug use	432 (6.5)	2225 (6.4)	0.84		
Primary language					
English	6755 (97.6)	35,600 (98)	0.002	Reference	
Spanish	92 (1.3)	321 (0.9)		1.40 (1.08 to 1.81)	0.009
Other languages	77 (1.1)	418 (1.2)		0.89 (0.69 to 1.16)	0.4

likely to use video visits compared with those with private insurance (OR 0.86, 95% CI 0.78 to 0.94, p=0.002). Patients requiring translators for 'other languages' were 30% less likely to use video visits compared with English speakers (OR 0.7, 95% CI 0.5 to 0.99, p=0.049). Alcohol use and illicit drug use were associated with increased usage of video visits (table 2).

Predictors of telephone visits

A total of 6921 patients completed a telephone visit and 36,324 patients had other visits. On comparing patients who had telephone visits to others, the former was more likely to be young (56.1 vs 56.6 years), black (15.2% vs 13.6%), unemployed (43.1% vs 38%), single (51% vs 48.6%), smoke (15.9% vs (13.4%), have Medicare (21.4% vs 21.2%), Medicaid or public insurance (18.2% vs 14.6%), have lower median household income (lowest quartile 29.2% vs 22.85%), and need a Spanish translator (1.3% vs 0.9%) (p<0.05 for all values) (table 3). On multivariate analysis, Hispanics were 21% (OR 0.79, 95% CI 0.68 to 0.92, p=0.002) and others were 14% (OR 0.86, 95% CI 0.76 to 0.98, p=0.018) less likely than white subjects to use telephone visits. Those with Medicaid or other public insurance were 13% more likely to use telephone visits than those with private insurance (OR1.13, 95% CI 1.04 to 1.22, p=0.003). Patients in the second, third, and highest quartiles of household income were 21%, 28%, and 24% less likely to use telephone visits than the lowest quartile (OR 0.79, 95% CI 0.73 to 0.86; OR 0.72, 95% CI 0.66 to 0.78; OR 0.76, 95% CI 0.71 to 0.82, respectively; p<0.001). Unemployed status, smoking, and Spanish-speaking status were also significant predictors of telephone visits (table 3).

Predictors of in-person visits

On comparing patients who had in-person visits (n=30,987) to other visits (n=12,276), those who used

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Table 4 Patient characteristics associated with in-person visits

Factor	In-person visits (N=30,987)	Other visits (N=12,276)	P value	Adjusted OR In-person visits (95% CI)	P value
Age (years), mean±SD	57.5±17.4	54.3±17.4	<0.001	1.01 (1.008 to 1.012) for every 1 year increase in age	<0.001
Age ≥65 years, n (%)	12 354 (39.9)	3906 (31.8)	<0.001		
Sex, n (%)			0.055		
Male	11,876 (38.3)	4583 (37.3)			
Female	19,111 (61.7)	7693 (62.7)			
Race, n (%)			<0.001		
White	23,868 (77.1)	9564 (78)		Reference	
Black	4297 (13.9)	1696 (13.8)		1.08 (1.008 to 1.15)	0.029
Hispanic	1208 (3.9)	369 (3.0)		1.43 (1.26 to 1.63)	<0.001
Others	1583 (5.1)	637 (5.2)		1.09 (0.98 to 1.21)	0.093
Type of insurance					
Private	18,835 (62.1)	7626 (63.3)	<0.001	Reference	
Medicare	6699 (22.1)	2282 (18.9)		1.001 (0.94 to 1.06)	0.96
Medicaid and other public	4430 (14.6)	2003 (16.6)		0.99 (0.93 to 1.06)	0.87
No insurance	369 (1.2)	135 (1.1)		1.07 (0.88 to 1.31)	0.5
Median household Income by zip code (by quartile), n (%)					
Lowest	7155 (23.1)	3166 (25.8)	<0.001	Reference	
Second	7802 (25.2)	2896 (23.6)		1.19 (1.11 to 1.27)	<0.001
Third	8059 (26)	3123 (25.4)		1.13 (1.06 to 1.21)	<0.001
Highest	7969 (25.7)	3090 (25.2)		1.14 (1.07 to 1.22)	<0.001
Employment status, n (%)					
Employed	11,879 (38.3)	4989 (40.8)	<0.001	Reference	
Unemployed	11,968 (38.6)	4815 (39.4)		0.96 (0.91 to 1.02)	0.19
Retired	6633 (21.4)	2076 (17)		1.03 (0.96 to 1.11)	0.35
Unknown	502 (1.6)	350 (2.9)		0.74 (0.62 to 0.87)	<0.001
Marital status					
Married	15,562 (50.2)	5901 (48.1)	<0.001	Reference	
Single	15,010 (48.4)	6196 (50.5)		0.94 (0.90 to 0.98)	0.012
Others	414 (1.3)	179 (1.5)		0.88 (0.73 to 1.07)	0.21
H/o tobacco use	4110 (13.3)	1793 (14.9)	<0.001	0.93 (0.86 to 0.99)	0.041
H/o alcohol use	13,208 (44.3)	5486 (46.9)	<0.001	0.89 (0.86 to 0.94)	<0.001
H/o illicit drug use	1835 (6.1)	822 (7)	<0.001	0.94 (0.86 to 1.03)	0.24
Primary language					
English	30,323 (97.9)	12,032 (98)	0.036	Reference	
Spanish	286 (0.9)	127 (1)		0.73 (0.58 to 0.93)	0.01
Other languages	378 (1.2)	117 (1)		1.26 (1.005 to 1.58)	0.045

in-person visits were more likely to be older (57.5 vs 54.3), retired (21.4% vs 17%), have Medicare insurance (22.1% vs 18.9%), higher median household income, married (50.2% vs 48.1%) and less likely to report substance abuse (table 4). On multivariate analysis, black and Hispanic subjects were 8% (OR 1.08, 95% CI 1.008 to 1.15, p=0.029) and 43% (OR 1.43, CI 1.26 to 1.63, p<0.001) more likely than white subjects to use in-person visits. Compared with English-speaking patients, patients who needed a translator for other languages were 26% more likely to use in-person visits (OR 1.26, 95% CI 1.005 to 1.58, p=0.045). Patients in the second, third, and highest quartiles of household income were 19%, 13%, and 14% more likely to use in-person visits than the lowest quartile, respectively. Older age was also a significant predictor of in-person visits (table 4). Tobacco and alcohol use and single and Spanish-speaking status were less frequently associated with in-person visits (table 4).

Predictors of missed visits

Of the 47,032 total visits, 3768 were missed. Those who missed visits were more likely to be young (52.9 vs 56.6), belong to a non-white race (34.3% vs 32.7%), single (57.1% vs 49%), unemployed (52% vs 38.8%), in the lower two quartiles of household income (lowest to highest: missed: 34.6%/29%/17.6%/18.8% vs completed: 23.9%/24.7%/25.8%/25.6%), have Medicaid and other public insurance (26.8% vs 15.2%), report substance abuse (tobacco: 20.4% vs 13.8%; illicit drug: 9.7% vs 6.4%), and need a translator than those who completed visits (3.4% vs 2.1%, p<0.05 for all) (table 5). On multivariate analysis, black subjects, Hispanic subjects, and those of other races were 42%, 34%, and 44% more likely than white subjects to miss visits, respectively. Those with Medicaid insurance were 35% more likely to miss visits than those with private insurance (OR 1.35, 95% CI 1.23 to 1.48, p<0.001). Patients in the third, and highest quartiles of

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Table 5 Patient characteristics associated with missed visits

Factor	Missed (N=3768)	Completed (N=43,263)	P value	Adjusted OR for missed visits (95% CI)	P value
Age (years), mean±SD	52.9±17.8	56.6±17.5	<0.001	0.99 (0.98 to 0.99) for every 1 year increase in age	<0.001
Age ≥65 years, n (%)	1098 (29.1)	16,260 (37.6)	<0.001		
Sex, n (%)			0.46		
Male	1456 (38.6)	16,459 (38)			
Female	2312 (61.4)	26,804 (62)			
Race, n (%)			<0.001		
White	2471 (65.7)	33,432 (77.3)		Reference	
Black	808 (21.5)	5993 (13.9)		1.42 (1.29 to 1.57)	<0.001
Hispanic	216 (5.7%)	1577 (3.6)		1.34 (1.13 to 1.57)	<0.001
Others	268 (7.1%)	2220 (5.1)		1.44 (1.25 to 1.66)	<0.001
Type of insurance, n (%)					
Private	1955 (53.3)	26 461 (62.4)	<0.001	Reference	
Medicare	693 (18.9)	8981 (21.2)		1.05 (0.95 to 1.16)	0.29
Medicaid and other public	984 (26.8)	6433 (15.2)		1.35 (1.23 to 1.48)	<0.001
No insurance	35 (1)	504 (1.2)		1.04 (0.73 to 1.47)	0.81
Median household income by zip code (by quartile), n (%)					
Lowest	1304 (34.6)	10,321 (23.9)	<0.001	Reference	
Second	1093 (29)	10,698 (24.7)		1.02 (0.92 to 1.12)	0.64
Third	664 (17.6)	11,182 (25.8%)		0.64 (0.58 to 0.72)	<0.001
Highest	707 (18.8%)	11,059 (25.6%)		0.71 (0.63 to 0.79)	<0.001
Employment status, n (%)					
Employed	1234 (32.8)	16,868 (39)	<0.001	Reference	
Unemployed	1959 (52)	16.783 (38.8)		1.45 (1.33 to 1.58)	<0.001
Retired	488 (13)	8709 (20.2)		0.99 (0.88 to 1.13)	0.99
Unknown	84 (2.2)	852 (2)		0.98 (0.73 to 1.30)	0.88
Marital status					
Married	1565 (41.5)	21,463 (49.6)	<0.001	Reference	
Single	2153 (57.1)	21,206 (49)		1.09 (1.01 to 1.17)	0.023
Others	50 (1.3)	593 (1.4)		0.94 (0.68 to 1.29)	0.71
H/o tobacco use	756 (20.4)	5903 (13.8)	<0.001	1.23 (1.12 to 1.35)	<0.001
H/o alcohol use	1555 (43.2)	18,694 (45)	0.074		
H/o illicit drug use	352 (9.7)	2657 (6.4)	<0.001	1.14 (1.01 to 1.29)	0.03
Primary language					
English	3639 (96.6)	42 355 (97.9)	<0.001	Reference	
Spanish	64 (1.7%)	413 (1.0)		1.20 (0.89 to 1.63)	0.21
Other	65 (1.7)	495 (1.1)		1.37 (1.03 to 1.82)	0.028

median household income were 36%, and 29% less likely to miss visits than the lowest quartile, respectively. Lastly, unemployed status, single marital status, smoking and illicit drug use, and need of a translator for other languages were significant predictors of missed visits (table 5).

DISCUSSION

In this large retrospective cohort study of over 47,000 patients seen in the department of gastroenterology at a tertiary care center, we observed that COVID-19 has exacerbated the pre-existing inequities in healthcare access and use. Older patients (age ≥65 years, those with Medicare insurance, and retired individuals) sought healthcare less frequently during and after the pandemic lockdown. Substance abuse and missed visit rates have steadily increased in the pandemic. On further analysis, we saw new patterns: although patients belonging to vulnerable groups (ethnic and socioeconomic minorities) were more likely to have scheduled visits during the pandemic lockdown, they missed appointments more often and were also less likely to use video visits. Conversely, groups traditionally considered to be socioeconomically advantaged (white, employed, patients with private insurance and higher household incomes) sought less care during the lockdown but resumed visits post lockdown and were more likely have completed visits and used video visits.

Our analysis found concerning patterns in elderly (age 65+) patients' and the overlapping group of patients with Medicare's reduced healthcare access since the COVID-19 onset, which is persisting even after resumption of in-person visits. There are potential explanations for this phenomenon. One issue is delaying or avoidance of medical care due to concerns about both the risk of COVID-19 infection and its severe nature in the elderly.[10] Another is that elderly patients may be at a disadvantage in a transitioned-healthcare system that has focused on increased usage of

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telehealth. Hospitals have used telehealth at exponentially higher rates as a result of the pandemic,[11] and elderly patients have responded poorly to this shift. In fact, a similar study by Darrat *et al* also found increasing age to be inversely proportional to the likelihood of completing a video visit.[4] The pandemic may have exacerbated the societal issue of the digital divide, in which elderly individuals are left behind in a world that becomes increasingly dependent on technology. Prior research has shown this same issue, in that older patients take longer amounts of time to familiarize themselves with technology in healthcare settings.[12] Regardless of telehealth use our data demonstrates an even more pressing issue: despite the elderly's overall lack of healthcare access during the pandemic, increasing age was associated with a higher likelihood of an in-person visit, which can potentially increase the risk of exposure to COVID-19. These trends require attention when coupled with the fact that older age is associated with increased hospitalization rate due to COVID-19.[13] Simply put, the healthcare system must make more concerted efforts to integrate elderly patients into telehealth.

This study found an alarming upward trend in substance abuse since the onset of the pandemic. Increased alcohol usage has been a well-documented by-product of COVID-19.[13] A 2021 systematic review by Roberts *et al* found an increase in usage of cannabis, opioids, and stimulants during the pandemic and a strong correlation to mental health issues.[14] A large European survey also found an overall increase in tobacco and cannabis use during the pandemic.[15] The major concern is that these substance abuse trends persisted and worsened well over a year since the onset of the pandemic. With the rise of more COVID-19 variants, such as Delta and Omicron, Americans may continue to turn to substance abuse to cope with this extended period of pandemic-related mental health damage.

Our findings suggest that non-white patients, patients with Medicaid and public insurance, unemployed patients, and those of the lowest quartile of household income are a vulnerable group in this pandemic landscape, with decreased telehealth use and increased missed visit rates. There are several studies in the current literature which have also found decreased telehealth use rates among non-white subjects, Medicaid or Medicare insurance, and single status individuals.[5–7 16] This decrease in telehealth use can also be attributed to the aforementioned digital divide. The so-called 'racial digital divide' is multilayered and goes beyond owning a telephone and having internet service, for instance. A 2016 Pew Research Center study showed that a much greater percentage of black and Hispanic subjects would like training to become comfortable with usage of technology compared with white subjects.[17] Our finding that non-white subjects were more likely to have missed visits is not new; for instance, Shuja *et al* showed that African–Americans patients had higher no-show rates than their white counterparts.[18] In a prepandemic systematic review, characteristics associated with no-show visits were younger age, lower socioeconomic status, lack of private insurance, and high lead time to an appointment.[19] Actually, telehealth may actually mitigate some healthcare disparities by promoting equal access to care for those with transportation or social support barriers. Providing technology training resources to benefit the underserved populations could potentially be a solution.

One final overarching theme is that the proportion of missed visits is steadily rising. The current literature shows conflicting trends; for instance, studies have found that COVID-19 had no impact on the rate of no-shows[20] or that COVID-19 no-show rates were lower than those pre-COVID-19,[21] while other research has shown significant increases in no-show rates during COVID-19.[22] On top of that, many prior clinical studies have shown that the variables associated with no-shows can go much farther beyond the factors that our analysis looked at. Some of these more complex variables include environmental factors, such as weather and commute distance for a patient; the time between a visit and scheduling date; and a patient's prior history of no-show.[23 24] Although our analysis did not identify which type of visits were associated with no-shows and cancellations, a study by Alkilani *et al* found that telehealth visits during the pandemic were associated with significantly fewer no-show and cancellation rates than in-person visits.[25] Thus, increased effort towards breaking down the aforementioned digital divide could hold several benefits: the resulting increased usage of telehealth could result in mitigating the spread of COVID-19 and also increasing the percentage of completed visits.

Though this study is the first to report on long-term disparities in gastroenterology care during the COVID-19 era, it has some limitations. Several factors which may impact access to healthcare, such as distance from patient residence to clinic, access to high speed internet, presence of disabilities and transportation needs, reason for the visit, appointment wait time, adequacy of insurance, and environmental factors were not assessed in this study. Nevertheless, this study was able to identify the healthcare access disparities that COVID-19 may have instigated or exacerbated and also whether these disparities have continued after the lockdown has been lifted. On top of that, rather than solely looking at telehealth use, this study looked at all different types of visits: in-person, video and telephone visits, and missed visits. Considering that telehealth will likely play an increasing role in American healthcare for many years to come, we were able to see which demographic groups will need increased assistance in using the telehealth and also identify which patients are having missed visits in the pandemic landscape. Lastly, despite being a single center study, the study population included a large, diverse sample size drawn from a tertiary care hospital as well as several community centers for the state of Ohio and hence is representative of the Midwestern population. However, these results may not be generalizable to practices that serve populations with different demographic and socioeconomic conditions.

In conclusion, the current study identified several alarming trends that are persisting amidst the pandemic: the elderly are seeking less care; socioeconomic and ethnic minorities are facing barriers in telehealth use and have higher missed visit rates, and substance abuse is peaking among other trends. There are several potential solutions to each of these problems; however, recognition is the first step. Future research efforts could involve performing a wider-scale study that is generalizable to the whole country. As of now, healthcare professionals may use this study's

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findings to determine which underserved populations would need increased medical outreach and resources in the pandemic landscape.

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