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RESEARCH ARTICLE

Colorectal Cancer Screening Among Individuals With a Substance Use Disorder: A Retrospective Cohort Study

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Introduction: There is limited evidence on colorectal cancer screening among individuals with a substance use disorder. This study aims to investigate the association between personal history of a substance use disorder and colorectal cancer colonoscopy screening completion rates.

Methods: This retrospective cohort study analyzed 176,300 patients, of whom 171,973 had no substance use disorder and 4,327 had a substance use disorder diagnosis from electronic health record data (January 1, 2008−December 31, 2022) in a Midwestern healthcare system. Baseline was January 1, 2013, and a 10-year follow-up period ran through December 31, 2022. The outcome was receipt of colonoscopy in the 10-year follow-up period. Patients were aged 50−65 years at baseline, meaning that they were eligible for a colonoscopy through the entirety of the 10-year follow-up period. Covariates included demographics (age, race, and neighborhood SES), health services utilization, psychiatric and physical comorbidities, and prior colonoscopy or fecal occult blood testing. Entropy balancing was used to control for confounding in weighted log-binomial models calculating RR and 95% CIs.

Results: Patients were on average aged 57.1 (±4.5) years, 58.2% were female, 81.0% were White, and 16.9% were of Black race. The most prevalent comorbidities were obesity (29.6%) and hypertension (29.4%), followed by smoking/nicotine dependence (21.0%). The most prevalent psychiatric comorbidity was depression (6.4%), followed by anxiety disorder (4.5%). During the 10-year follow-up period, 40.3% of eligible patients completed a colorectal cancer colonoscopy screening test, and individuals with a substance use disorder diagnosis were significantly less likely to receive a colorectal cancer colonoscopy screening test both prior to and after controlling for confounding (RR=0.73; 95% CI=0.70, 0.77 and RR=0.81; 95% CI=0.74, 0.89, respectively). Results were not modified by sex, race, psychiatric comorbidity, or neighborhood SES.

Conclusions: Personal history of substance use disorder was independently associated with lower screening completion rates. Healthcare professionals should recognize unique barriers among

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individuals with substance use disorder and then address them individually as a multidisciplinary team in the outpatient setting to reduce this health disparity.

INTRODUCTION

In the U.S., colorectal cancer (CRC) is the second leading cause of cancer-related deaths, and more than 52 thousand deaths are expected during 2023.[1] CRC is one of a few cancers doctors can effectively screen and prevent. For the past 20 years, the U.S. Preventive Services Task Force (USPSTF) has definitively recommended screening for CRC in adults aged 50−75 years.[2] The USPSTF currently recommends all adults aged 50−75 years to have CRC screening through a colonoscopy every 10 years, guaiac fecal occult blood test (gFOBT) annually, or fecal immunochemical test (FIT) annually. A 2022 randomized study showed that colonoscopy could reduce the number of CRC cases by 31% and CRC-related deaths by 50%.[3] Despite the established evidence that all 3 CRC screening modalities can reduce CRC-related mortality, only two thirds of eligible adults are up to date with CRC screening in the U.S.[2−7] Identifying barriers to CRC screening is needed to improve utilization of this evidence-based preventive service.

Patient barriers to colonoscopy screening include social factors (i.e., cultural barrier, past experiences of important others, patient−physician relationship), practical factors (i.e., cost, insurance coverage, family or work commitments), and psychological factors (i.e., perceived risk of cancer, knowledge about CRC).[8] Previous studies identified several individual characteristics regarding barriers to a colonoscopy and stool-based tests, including African American race, low SES, BMI of ≥40 kg/m^2, and limited English proficiency.[9,10] Another but less studied individual barrier may be a diagnosis of a substance use disorder (SUD). In fact, previous studies revealed that an SUD diagnosis was inversely associated with preventive medical services receipt.[11,12]

More than 46 million people in the U.S. have an SUD, and nearly 11 million adults aged ≥50 years live with SUDs.[13] Although substances, including opioids and alcohol, are known to increase the risk of developing CRC, little is known about the association between having SUD diagnoses and CRC screening.[14−16] It is critically important for healthcare professionals to consider the following characteristics of individuals with SUDs when discussing CRC screening because those characteristics may prevent them from seeking CRC screening. First, people with SUDs may value immediate rewards more highly than long-term benefits, known as delay discounting. The lack of short-term benefits associated with CRC screening may contribute to individuals not prioritizing screening.[17,18] Second, distrust of healthcare and stigma around SUDs can negatively impact the receipt of preventive services.[19−21] Furthermore, limited social support and financial burdens of care among persons with SUDs can become barriers to seeking CRC screening.[22] This study's aims were to determine whether SUD is a barrier to colonoscopy and represents a health disparity in preventive medicine. The authors hypothesized that patients with SUD diagnoses would have a lower CRC colonoscopy screening rate than patients without SUD. They then determined whether the association between SUD and CRC colonoscopy screening differed by the following subgroups: sex, race, neighborhood SES, and the presence of a comorbid psychiatric disorder.

METHODS

Study Population and Eligibility

Study variables were created from deidentified medical record data and included ICD-9 and ICD-10 diagnostic codes; Current Procedural Terminology (CPT) codes; pharmacy orders; laboratory orders and results; vital signs; provider and clinic type; and demographics. Deidentified medical records are maintained by the Saint Louis University-SSM Healthcare System's Virtual Data Warehouse (VDW). Saint Louis University-SSM is a member site of the Health Care Systems Research Network (www.hcsrn.org); therefore, the VDW was created and is maintained per Health Care Systems Research Network specifications. The VDW includes deidentified medical record data from approximately 5.5 million patients from birth to age >90 years who have utilized SSM healthcare services from January 1, 2008 to the present and is updated monthly. Utilization includes any type of encounter with the healthcare system (outpatient or ambulatory visits, inpatient stays, same-day surgeries, primary care or specialist office visits, virtual encounters, laboratory or procedure only visits). The VDW includes medical record data from academic and

nonacademic ambulatory and inpatient clinical encounters in the SSM healthcare system, which covers rural and urban locations from the St. Louis, Missouri, metropolitan area, mid-Missouri, southern Illinois, Oklahoma City metropolitan area, and southern Wisconsin.

The Saint Louis University IRB reviewed this research using the VDW as exempt because all data are historical and deidentified. Additional details regarding the VDW have been published.[23–25]

The retrospective cohort was created with an intention-to-treat type of design. The fixed index date was defined at January 1, 2013 so that all patients eligible for CRC screening could have had the opportunity for a colonoscopy in the 10-year follow-up period from January 1, 2013 to December 31, 2022. For example, if a patient received a colonoscopy any time prior to index, even prior to the beginning date of the electronic health record data, that is, January 1, 2008, that patient would be eligible for a repeat colonoscopy in follow-up. Patients who were aged 50–65 years at index date were eligible. This age range was selected to ensure that patients remained eligible for colonoscopy in the 10-year follow-up period. The upper age range was set at 65 years at index to ensure that all patients would continue to be eligible for an initial or subsequent colonoscopy screening in the 10 years of follow-up. Patients also had to be regular users of the healthcare system; thus, this study required at least 1 ambulatory clinic visit both in the 2 years prior to index and in follow-up, resulting in 181,887 eligible patients. Ambulatory clinic visits used in eligibility could be any ambulatory visit to primary care physicians or specialists, but those related to emergency department encounters or same-day surgeries were not counted toward eligibility. After removing patients with missing demographic data, the analytic sample contained 176,300 patients, of whom 171,973 had no SUD and 4,327 had an SUD diagnosis at index. The sampling scheme is shown in Appendix Figure 1 (available online). Detailed definitions for all study variables are shown in Appendix Table 1 (available online).

Measures

The primary outcome was a completed colonoscopy in the 10-year follow-up period measured by the presence of at least 1 CPT (45378–45393, 45398); Healthcare Common Procedure Coding System (G0105, G0121); or ICD-9/ICD-10 EM codes (V76.51, Z12.11). FIT or gFOBT tests were not included in outcome ascertainment because these are not specific just to CRC screening. Other indications include anemia, gastrointestinal bleeding, or differentiating between irritable bowel syndrome and inflammatory bowel disease,[26] and it is not possible to ascertain the reason for FIT/gFOBT testing from the available data. Sigmoidoscopy was not included in the outcome definition because of the declining use with the lower evidence for CRC screening in the U.S.[27] Alcohol or drug abuse/dependence was defined as the presence of 1 or more ICD-9/ICD-10 codes for active or in-remission SUD (Appendix Table 1, available online) any time prior to index date (January 1, 2008–January 1, 2013) and at any type of encounter. Covariates were selected on the basis of expected associations with SUD and preventive health behavior from literature review and the authors' clinical experience. Covariates included demographics, health services utilization, psychiatric and physical comorbidities, and prior colonoscopy.

Demographic variables were age at index, self-reported race (White, Black, other), and neighborhood SES (nSES). The nSES was computed by linking a patient's 5-digit home ZIP code to the following variables available from the American Community Survey 5-year estimates: (1) percentage of households with income below poverty level; (2) percentage of households receiving public assistance; (3) percentage of households with annual income below $35,000; (4) percentage of adult males aged 20–64 years not in the labor force; (5) percentage of adults aged ≥25 years with less than high school education; (6) log of median household income; and (7) log of median value of single family homes.[28] Using a principal components analysis on all U.S. ZIP codes and their corresponding 7 measures of nSES, a standardized factor score was assigned to each U.S. ZIP code, where a higher factor score indicates lower nSES. The distribution of factor scores among all U.S. ZIP codes was used to define high nSES (at or below median) versus low nSES (above median).

All nondemographic covariables discussed below were measured from January 1, 2008 to December 31, 2012; could occur at any type of encounter (i.e., anywhere in the record); and were not limited to primary diagnoses. Specific code lists used to define these variables are in Appendix Table 1 (available online). To control for healthy patient bias, the authors measured the total number of well visits in the 5 years prior to index date. CPT and ICD-9/ICD-10 V and Z codes were used for age-group–specific new patient or established patient well visits (Appendix Table 1, available online).[23] Receipt of a prior colonoscopy or FIT/gFOBT before index date was also measured because those who have undergone these tests are likely to have repeat testing. The authors computed the Charlson Comorbidity Index, which is a combination of diagnoses with higher scores indicating greater morbidity and risk for mortality.[29–32] Obesity was measured by BMI ≥30 kg/m^2 or ICD-9/ICD-10 diagnostic code for obesity. Smoking or nicotine dependence was measured by current smoker status in the

social history or ICD-9/ICD-10 diagnostic code. The presence of at least 1 ICD-9/ICD-10 diagnostic code was used to measure hypertension, irritable bowel syndrome, inflammatory bowel disease, and benign neoplasms of the colon.

The authors required at least 2 ambulatory encounters (office/clinic visit to any type of physician, emergency department, same-day surgery) on separate days in the same 12-month period or 1 inpatient stay to define depression, post-traumatic stress disorder (PTSD), obsessive-compulsive disorder, and other anxiety (composite of generalized anxiety disorder, panic disorder, social phobia, and anxiety not otherwise specified). For depression, this diagnostic algorithm has >95% positive predictive value compared with manual chart abstraction.[33] The presence of 2 diagnostic codes for PTSD has an 88.4% agreement with the Structured Clinical Interview for DSM-IV lifetime PTSD diagnosis.[34] Finally, severe mental illness was defined by at least 1 diagnostic code present for either bipolar disorder or schizophrenia.

The authors controlled for pain diagnoses because pain is positively associated with more healthcare utilization.[35,36] They controlled for arthritis, back pain, musculoskeletal pain, neuropathic pain, headache/migraine, fibromyalgia, and chronic pain. With the exception of a single ICD-9/ICD-10 code for chronic pain diagnosis, these pain categories were created from over 900 previously reported ICD-9/ICD-10-CM codes for which an opioid may be prescribed.[37] The authors have successfully used these pain diagnoses in numerous studies of mental illness and prescription opioid use.[38,39]

Statistical Analytic Approach

Entropy balancing (e-balance) was used to control for confounding by balancing covariates between those with and without SUD.[40] E-balance often provides better balance over other common methods (e.g., propensity scores and inverse probability of exposure weighting) because it does not rely on correct specification of propensity score models. e-balance derives weights such that covariate moments (e.g., mean, variance) match across the exposure groups. The WeightIt package in R, Version 4.2.1, was used to calculate e-balance weights.[41] Covariate balance in unweighted and weighted samples was assessed using the standardized mean difference (SMD) percent (SMD%=SMD*100), where good balance is achieved if SMD% is <10%.[42] A meaningful difference is considered an SMD%>10.

All other analyses were performed using SAS, Version 9.4 (SAS Institute, Cary, NC). Covariate differences between those with and without SUD were assessed in unweighted and weighted bivariate analyses using chi-square tests and independent samples *t*-tests. SMD% measured effect size differences in SUD versus no SUD before and after e-balancing. Log-binomial models in unweighted and weighted data estimated crude and adjusted RR and 95% CIs for the relationship between SUD and receipt of colonoscopy in follow-up. Weighted models used robust, sandwich-type variance estimation.[42] Results were also stratified by sex (male versus female), race (only White versus Black because using other race would have small cell sizes), nSES (low versus high), and psychiatric disorder (psychiatric disorder versus no psychiatric disorder). Psychiatric disorders included depression, anxiety, PSTD, obsessive-compulsive disorder, bipolar disorder, or schizophrenia. An interaction term of each of these characteristics and SUD assessed whether RRs were different between strata. E-balance was also conducted within strata to ensure that covariates balanced between SUD and no SUD in each stratum. A sensitivity analysis was conducted using a per-protocol type of approach where patients without SUD at baseline who developed SUD in follow-up were excluded from analyses. A second sensitivity analysis was conducted to see whether testing for effect modification by the presence of any psychiatric disorder changed when comparing severe mental illness (bipolar or schizophrenia) with depression or anxiety with neither.

RESULTS

Overall cohort characteristics are shown in Table 1. Patients were on average aged 57.1 (±4.5) years, 58.2% were female, 81.0% were White, and 16.9% were of Black race. Prior to index date, 13.9% had a colonoscopy, and 1.4% had a prior FIT/gFOBT. The most prevalent comorbidities were obesity (29.6%) and hypertension (29.4%), followed by smoking/nicotine dependence (21.0%). The most prevalent psychiatric comorbidity was depression (6.4%), followed by anxiety disorder (4.5%).

Table 1 also shows cohort characteristics by SUD status. Among eligible patients, 2.5% had an SUD diagnosis at baseline. Patients' mean age was significantly younger in those with than in those without SUD (SMD%= −30.7). Female sex, White race, and high nSES were all more common among those without SUD than among those with SUD (SMD% range= −23 to −40.9). The average number of well visits was meaningfully higher among patients without than among those with SUD (SMD%= −15.9). Prior colonoscopy was meaningfully lower (SMD%= −11.5) in those with SUD than in those without; conversely, prior FIT/gFOBT was meaningfully higher in those with SUD (SMD%=10.9). The mean Charlson Comorbidity Index among those with SUD

Table 1. Baseline Characteristics of Patients Aged 50–65 Years, Overall and by SUD Status (N=176,300)

Covariates, *n* (%) or mean (±SD)	Overall (N=176,300)	No SUD (*n*=171973)	SUD (*n*=4327)	*p*-value	SMD%
Age, mean (±SD)	57.1 (±4.5)	57.1 (±4.5)	55.7 (±4.3)	<0.0001	−30.7
Female sex	102,549 (58.2)	100,877 (58.7)	1,672 (38.6)	<0.0001	−40.9
Race					
White	142,850 (81.0)	139,754 (81.3)	3,096 (71.6)	<0.0001	−23.0
Black	29,743 (16.9)	28,615 (16.6)	1,128 (26.1)		23.2
Other	3,707 (2.1)	3,604 (2.1)	103 (2.4)		1.9
High nSES	111,177 (63.1)	109,044 (63.4)	2,133 (49.3)	<0.0001	−28.7
Number of well visits, mean (±SD)	0.4 (±1.1)	0.4 (±1.0)	0.3 (±0.9)	<0.0001	−15.9
Prior colonoscopy	24,509 (13.9)	24,065 (14.0)	444 (10.3)	<0.0001	−11.5
Prior FIT/gFOBT	2,495 (1.4)	2,367 (1.4)	128 (3.0)	<0.0001	10.9
Charlson Comorbidity Index, mean (±SD)	0.6 (±1.3)	0.6 (±1.3)	1.3 (±1.9)	<0.0001	40.2
Obese	52,211 (29.6)	51,358 (29.9)	853 (19.7)	<0.0001	−23.7
Hypertension	51,862 (29.4)	49,961 (29.1)	1,901 (43.9)	<0.0001	31.3
IBS	2,800 (1.6)	2,738 (1.6)	62 (1.4)	0.408	−1.3
IBD	1,029 (0.6)	989 (0.6)	40 (0.9)	0.003	4.1
Benign neoplasms, colon	4,489 (2.6)	4,374 (2.5)	115 (2.7)	0.637	0.7
Smoke	37,016 (21.0)	34,452 (20.0)	2,564 (59.3)	<0.0001	87.5
Depression	11,352 (6.4)	9,853 (5.7)	1,499 (34.6)	<0.0001	77.2
Anxiety	7,974 (4.5)	7,204 (4.2)	770 (17.8)	<0.0001	44.6
PTSD	360 (0.2)	282 (0.2)	78 (1.8)	<0.0001	16.7
OCD	148 (0.1)	129 (0.1)	19 (0.4)	<0.0001	7.2
Severe mental illness	4,306 (2.4)	3,479 (2.0)	827 (19.1)	<0.0001	57.9
Arthritis	46,983 (26.6)	45,520 (26.5)	1,463 (33.8)	<0.0001	16.1
Back pain	36,406 (20.6)	34,939 (20.3)	1,467 (33.9)	<0.0001	30.9
Muscle pain	36,873 (20.9)	35,635 (20.7)	1,238 (28.6)	<0.0001	18.4
Neuropathy	9,165 (5.2)	8,845 (5.1)	320 (7.4)	<0.0001	9.3
Headache	13,765 (7.8)	13,185 (7.7)	580 (13.4)	<0.0001	18.8
Fibromyalgia	5,969 (3.4)	5,756 (3.4)	213 (4.9)	<0.0001	7.9
Chronic pain	5,198 (2.9)	4,559 (2.7)	639 (14.8)	<0.0001	44.0

FIT, fecal immunochemical test; gFOBT, guaiac fecal occult blood test; IBD, inflammatory bowel disease; IBS, irritable bowel syndrome; nSES, neighborhood SES; OCD, obsessive-compulsive disorder; PTSD, post-traumatic stress disorder.

was nearly twice that among patients without SUD (SMD%=40.2). Obesity (SMD%= −23.7) was more common in those without SUD, and hypertension (SMD%=31.3) was more common in those with SUD. Smoking/nicotine dependence, depression, anxiety disorder, PTSD, and severe mental illness were markedly more prevalent among those with than among those without SUD (SMD% range=16.7–87.5). Arthritis, back pain, muscle pain, headache/migraine, and chronic pain were more common in patients with than in those without SUD (SMD% range=16.1–44.0). After e-balance, all covariates balanced between those with and without SUD (all SMD%<0.1%) (Figure 1)

During the 10-year follow-up period, 40.3% (95% CI=40.1, 40.5) of patients received a CRC colonoscopy screening test (Table 2). In crude analyses, patients with SUDs were significantly less likely to receive a colonoscopy in follow-up (RR=0.73; 95% CI=0.70, 0.77). This relationship remained in weighted analyses after controlling for confounding (weighted RR=0.81; 95% CI=0.74, 0.89).

The results of stratified analyses are shown in Table 3. After controlling for confounding using weighted data, the association between SUD status and CRC colonoscopy screening did not significantly differ by sex, White versus Black race, low versus high nSES, nor psychiatric disorder versus no psychiatric disorder. Although RR was modified by the presence of any psychiatric disorder and nSES in crude analyses, after controlling for confounding, these differences were no longer present.

The first sensitivity analysis excluded patients who developed SUD in follow-up. There were 9,130 patients without an SUD at baseline who developed an SUD prior to the end of follow-up. After excluding these patients, a weighted analysis controlling for confounding showed that patients with an SUD at baseline had a lower risk for colonoscopy than patients without an

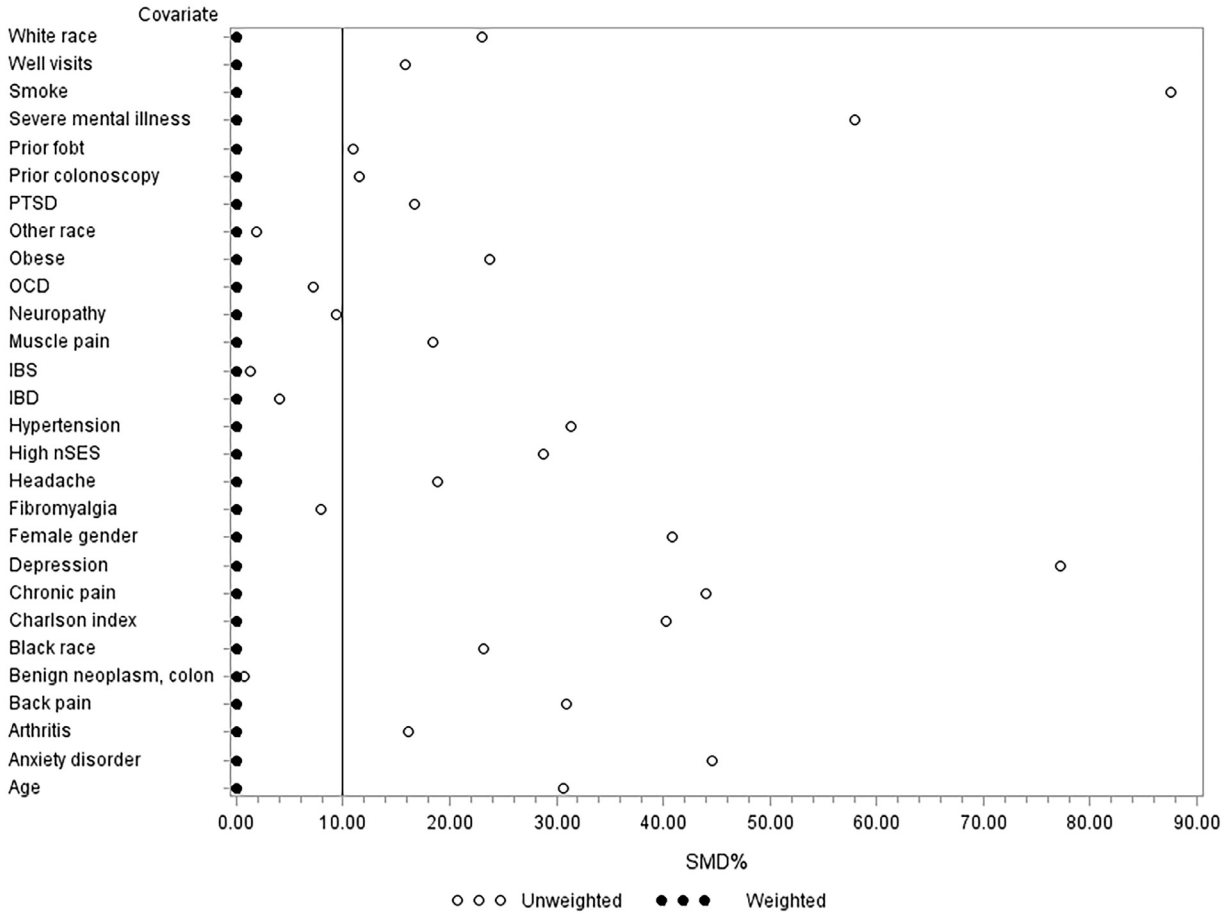

Figure 1. Absolute value of standardized mean difference percent before and after weighting, comparing balance between SUD and no SUD.
SUD, substance use disorder.

SUD (weighted RR=0.79; 95% CI=0.72, 0.87). The second sensitivity analysis testing effect modification by psychiatric disorder status divided the any-psychiatric-disorder stratum into depression or anxiety but no severe mental illness (n=14,638) versus severe mental illness with or without depression or anxiety (n=4,306). Results showed that the relationship of an SUD diagnosis and colonoscopy screening was not modified by this 3-level severity variable (severe mental illness versus depression or anxiety versus neither; interaction p=0.517).

DISCUSSION

During the 10-year follow-up period in a large retrospective cohort study, the authors observed a significant association between an SUD diagnosis and RR of CRC colonoscopy screening completion. Consistent with the

Table 2. Colonoscopy Screening Tests in 10-Year Follow-Up (2013–2022)

SUD status	Total patients	Number of patients, colonoscopy screen	% (95% CI)	Crude RR (95% CI)	Weighted RR (95% CI)
Overall	176,300	71,041	40.3 (40.1, 40.5)	—	—
SUD status					
No	171,973	69,754	40.6 (40.3, 40.8)	1.00	1.00
Yes	4,327	1,287	29.7 (28.4, 31.1)	0.73 (0.70, 0.77)	0.81 (0.74, 0.89)

Note: Results are from log-binomial models, RR (95% CI).
SUD, substance use disorder.

Table 3. Colonoscopy Screening Tests in 10-Year Follow-Up (2013–2022)

Stratification variable	SUD versus no SUD, crude RR (95% CI)	SUD versus no SUD, weighted RR (95% CI)
Sex		
Male	0.70 (0.66, 0.74)	0.88 (0.80, 0.96)
Female	0.76 (0.71, 0.82)	0.77 (0.66, 0.90)
p-value, male versus female RR	*p*=0.084	*p*=0.152
Race		
White	0.75 (0.71, 0.79)	0.79 (0.72, 0.88)
Black	0.69 (0.63, 0.76)	0.89 (0.74, 1.06)
p-value, White versus Black RR	*p*=0.137	*p*=0.333
nSES		
Low	0.69 (0.64, 0.74)	0.77 (0.67, 0.89)
High	0.80 (0.76, 0.85)	0.82 (0.73, 0.92)
p-value, high versus low RR	*p*=0.002	*p*=0.520
Any psychiatric disorder[a]		
No psychiatric disorder	0.80 (0.75, 0.85)	0.80 (0.72, 0.89)
Psychiatric disorder	0.58 (0.54, 0.62)	0.79 (0.72, 0.87)
p-value, psychiatric versus no psychiatric RR	*p*<0.0001	*p*=0.818

Note: Results are from log-binomial models stratified by sex, White versus Black race, nSES, and psychiatric disorder, RR (95% CI).
[a]Any psychiatric disorder: depression, anxiety, PTSD, OCD, or severe mental illness. There were *n*=18,944 patients (10.8%) with any psychiatric disorder and *n*=157,356 (89.2%) without.
OCD, obsessive-compulsive disorder; PTSD, post-traumatic stress disorder; SUD, substance use disorder.

study hypothesis, patients with an SUD were 19% less likely to receive a CRC colonoscopy screening test than those without an SUD. This association was independent of preventive health care (i.e., well visits, prior colonoscopy, prior FIT/gFOBT), adverse health behaviors (i.e., smoking), and numerous physical and psychiatric comorbidities. This may be an underestimate because people with an SUD underutilize health care.[13]

A 2011 retrospective cross-sectional study showed that receipt rates of CRC screening were similar between persons with and without unhealthy substance use, which does not align with the present study's findings.[11] This discrepancy may come from the timing of the 2011 retrospective cross-sectional study (>10 years) and smaller sample size (999.5 vs 176,300). Although the identified association between SUD diagnosis and receipt of CRC screening is modest, the present study's findings indicate that additional research is needed to understand the relationship between SUDs and lower rates of CRC screening.

The association between SUD and CRC screening may be partly explained by SES, psychiatric comorbidity, and stigma. A 2017 study showed that barriers to colonoscopy completion for CRC screening included low SES, which can indicate economic barriers, homelessness, and lack of transportation.[9] Second, mental illness is significantly associated with a lower completion rate of CRC screening, independent of the screening method.[43] Among adults aged ≥18 years, 19.4 million people are estimated to have both an SUD and comorbid mental illness, which emphasizes the importance of improving uptake of CRC screening in this population.[13] Finally, stigma and negative attitudes among healthcare professionals toward patients with SUDs are common and can contribute to suboptimal preventive services, including CRC screening.[21] To increase CRC screening completion rates among patients with SUDs, healthcare professionals need to address the individual-level and social-level barriers hindering the receipt of colonoscopy. Multidisciplinary approach is needed to effectively cater to the complex needs of patients with SUDs by addressing biopsychosocial issues.[44,45] Peer recovery support services and nonclinical assistance by individuals with lived experience can also address those barriers by helping patients with SUDs initiate the treatment and sustain the recovery through relatability, ongoing support, and reducing stigma.[46,47] Future studies are needed to determine whether SUD treatment and remission are followed by increased colonoscopy screening.

There were no differences in the association between SUDs and CRC colonoscopy screening by sex, race, nSES, and psychiatric disorder. Balancing of covariates in weighted analyses may mask a more complicated relationship between covariates (e.g., race and SES). At a minimum, this study did not find evidence supporting targeted intervention to a single race, sex, or economic group. Although previous research has shown that African American race and low SES were barriers to CRC

screening tests, this study's findings indicate that among those with SUDs, there is no difference in screening rates by race and SES.[9] Future studies with a larger sample of patients with SUDs may identify disparities in screening rates by demographic factors.

Despite the high prevalence and substantial social impact of SUDs, preventive services among individuals with SUDs have been understudied. To identify potential health disparities in preventive services among those with SUDs, further research needs to explore other high-value preventive services such as screening for breast cancer and cervical cancer.

Limitations

There are several limitations in this study. First, this study only included a colonoscopy for CRC screening testing, and this study did not include other screening tools such as FIT/gFOBT, computed tomography colonography, and a flexible sigmoidoscopy. Because the USPSTF also recommends those CRC screening tools, it is reasonable to receive CRC screening through a method other than a colonoscopy. Second, this study set a colonoscopy interval as 10 years for all eligible patients, but high-risk adults for CRC require more frequent colonoscopy screening, which might have impacted the findings. Third, data were from a large Midwestern healthcare system, and results may not generalize to other geographic regions. Misclassification of SUDs is a potential limitation. If the authors misclassified patients as not having SUDs when they really had an undiagnosed SUD, this would bias point estimates toward the null. Unmeasured confounding is a risk inherent to retrospective cohort designs. Finally, this study shows only the association between a history of an SUD and lower CRC screening rates, so further study is needed to explore barriers to other forms of cancer screening and identify mechanisms underlying this association.

CONCLUSIONS

A history of an SUD diagnosis was independently associated with lower CRC colonoscopy screening completion rates. Healthcare professionals should recognize unique barriers among individuals with an SUD and then address them individually as a multidisciplinary team in the outpatient setting to reduce this health disparity.

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SUPPLEMENTARY MATERIALS

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