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Limited English proficiency and reported receipt of colorectal cancer screening among adults 45–75 in 2019 and 2021

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ABSTRACT

Introduction: Substantial barriers to screening exist for medically underserved populations, especially adults with limited English proficiency (LEP). We examined the proportion of US adults aged 45–75 up-to-date with colorectal cancer (CRC) screening by LEP after 2018. The American Cancer Society began recommending CRC screening for adults 45–49 in 2018.

Methods: We analyzed cross-sectional data of adults 45–75 years old participating in the 2019 or 2021 National Health Interview Survey (N = 25,611). Adults were considered up-to-date with screening if they reported any stool test within 1 year, stool-DNA testing within 3 years, or colonoscopy within 10 years. Adults who interviewed in a language other than English were considered to have LEP. Adults not up-to-date with screening were asked if a healthcare professional (HCP) recommended screening, and if so which test(s). Regression models conducted in 2022–2023 evaluated receipt of screening, adjusting for sociodemographics, year, and healthcare access.

Results: Overall, 54.0 % (95 % CI 53.1–54.9 %) of participants were up-to-date with screening (9.4 % aged 45–49 vs 75.5 % aged 65–75); prevalence increased from 2019 (52.9 %) to 2021(55.2 %). Adults with LEP (vs English proficiency) were less likely to be up-to-date with screening (31.6 % vs. 56.8 %, [aPR 0.86 (0.77–0.96)]). Among adults not up-to-date, 15.0 % reported their HCP recommended screening (8.4 % among adults with LEP).

Conclusions: Nearly half of US adults were not up-to-date with CRC screening in 2019 and 2021 and few reported being recommended screening. Adults with LEP and those 45–49 were least likely to be screened suggesting targeted interventions are needed for these populations.

1. Introduction

Colorectal cancer (CRC) is the third most commonly diagnosed cancer and the second leading cause of cancer death among U.S. adults (U.S. Cancer Statistics Working Group, 2021). CRC screening can meaningfully reduce CRC mortality by preventing an estimated 23–27 deaths from CRC per 1000 individuals screened (Davidson et al., 2021). Unfortunately, between 2010 and 2018, only 63 percent of adults aged 50–75 were up-to-date with CRC screening (Santiago-Rodríguez et al., 2023).

Language barriers pose a significant challenge to accessing healthcare. In the United States, 25.7 million people are estimated to have limited English proficiency (LEP), 62 % of which identify as Hispanic and 22 % identify as Asian (Pillai and Artiga, 2023). Adults with LEP are known to have less access to health care services (Ponce et al., 2006; Gulati and Hur, 2022), lower quality of care (Karliner et al., 2012; John-Baptiste et al., 2004; Lindholm et al., 2012), and report worse dissatisfaction with care (Pippins et al., 2007; Weech-Maldonado et al., 2003). In 2015, 34 % of US adults with LEP reported ever having a screening colonoscopy (Cataneo et al., 2022), while 43 % were up-to-date with CRC screening as of 2016 compared to 61 % of those without LEP (Ramirez et al., 2023). Adults with LEP may be less likely to be screened due to difficulty communicating with their clinicians (Berdahl and Kirby, 2019) and less access to preventive healthcare (Ramirez et al., 2023; DuBard and Gizlice, 2008).

To reduce CRC morbidity and mortality, the American Cancer

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Society (ACS) updated its guidelines in 2018 to lower the recommended age to begin CRC screening from 50 to 45 years of age (Wolf et al., 2018). This was because CRC rose by 22 % among adults less than 50 between 2000 and 2013, while rates declined in adults 50 to 75, the age group for which CRC screening has been recommended since 2000 (Siegel et al., 2017). For similar reasons, in 2021 the United States Preventative Tasks Force (USPSTF) expanded its CRC screening recommendations to include adults 45–49 in addition to those 50–75 years old (Davidson et al., 2021). Per both sets of guidelines, any of several modalities may be utilized for CRC screening, including colonoscopies, sigmoidoscopies, stool tests, and CT colonography.

To identify populations who may benefit from targeted interventions to increase CRC screening, we use National Health Interview Survey (NHIS) data from 2019 and 2021 to determine the proportion of U.S. adults aged 45–75 up-to-date with CRC screening by limited English proficiency (LEP). We also aimed to examine reported receipt of a recommendation for CRC screening among those not screened.

2. Methods

We analyzed cross-sectional data from the 2019 and 2021 National Health Interview Survey (NHIS) to identify the proportion of US adults up-to-date with CRC screening. NHIS is a nationally representative household survey of non-institutionalized persons and is administered by the National Center for Health Statistics (NCHS). It was redesigned in 2019 and is structured to have an annual core of questions about chronic conditions, disabilities, healthcare access, health-related behaviors, and demographics. Additionally, a rotating core of questions addresses specialty topics like preventive services; the preventive services module is administered biennially (National Center for Health Statistics, 2019). Our sample included adults aged 45–75 without a history of CRC who responded to a question on whether or not they have ever had a colonoscopy or sigmoidoscopy (Supplemental figure describes our sample flow). The data from NHIS is publicly available and de-identified; this study was acknowledged as non-human subjects research by the Beth Israel Deaconess Medical Center Institutional Review Board. Based on the ACS and USPSTF CRC screening guidelines, we considered participants to be up-to-date with CRC screening if they reported 1) any stool test within 1 year, 2) stool-DNA test within 3 years, or 3) a screening colonoscopy within 10 years; we excluded adults who reported having a colonoscopy for non-routine reasons in the past 10 years. However, in sensitivity analyses we examined receipt of screening including these individuals. The guidelines also consider adults who undergo screening sigmoidoscopy or CT colonography within 5 years to be up-to-date; but NHIS does not assess whether sigmoidoscopies or CT colonographies are done for screening or diagnostic purposes. Therefore, we excluded participants who reported these tests in the past 5 years from our sample. Less than 4 % of our cohort was excluded for this reason.

Among adults who were not up-to-date with screening, we examined if the participant reported that their healthcare professional had recommended CRC screening in the past 12 months. If so, participants were asked to report if they were colonoscopy-only, stool-based test only, both colonoscopy and stool-based test, and other. NHIS assesses the language of interview as “English only, Spanish only, English and Spanish, or other”. Similar to prior studies (Shi et al., 2009; Holman et al., 2023; Cataneo et al., 2023), we categorized participants’ level of English proficiency based on their language of interview. If their language of interview was other than English only, participants were considered to have LEP. However, in sensitivity analyses we re-defined LEP as the language of interview being “Spanish only” or “other”. We also considered other factors previously shown to be associated with CRC screening (Shapiro et al., 2021; Wools et al., 2016), including participant age (45–49, 50–64, 65–75), gender (female/male), race/ethnicity (White, Hispanic, non-Hispanic Black, non-Hispanic Asian, other), education (less than high school, high school, some college, Bachelors or higher), marital status (yes/no), income-to-poverty ratio (<100 % federal poverty line (FPL), 100–199 % FPL, >200 % FPL), health insurance coverage (Any Private [includes those with private and other insurances such as Medicare], Medicaid/dual, Medicare only, uninsured, other), NCHS 2013 urban–rural county classification (Ingram and Franco, 2013) (nonmetro, medium/small metro, suburban, large central), region (South, West, Midwest, Northeast), time in the United States (born in US, born but less than 10 years, born but greater than 10 years), usual place of care (yes/no), and time since last doctor visit (never or greater than 3 years, greater than 1 year but less than or equal to 3 years, or a visit within the last year).

2.1. Statistical analysis

All analyses were performed in 2022–2023 using survey procedures in Stata version 18 (StataCorp LLC, College Station, TX) and estimates were weighted to account for NHIS complex survey design. Significance was set at $p < 0.05$. Differences in demographic composition of adults up-to-date with CRC screening (vs not up-to-date) were examined through weighted χ^2 tests. Weighted multivariable prevalence ratios were modeled through Poisson regression models with robust variance to assess the association between LEP and being up-to-date with CRC screening, controlling for the covariates described above. However, time in the US was excluded from the final model as it was highly correlated with LEP status. Missingness rates were less than 3 % for all covariates. A complete case analysis was performed for our final analytic models. In secondary analyses, we examined differences in up-to-date prevalence between 2019 and 2021 among adults with LEP and among adults aged 45–49 to see if screening increased with more time since publication of guidelines that encouraged screening in this group through weighted χ^2 tests.

Among adults not up-to-date with CRC screening, we used weighted χ^2 tests for unadjusted analyses and weighted Poisson regression models to examine the association between demographic characteristics including LEP and reporting a clinician recommended screening. Among adults who were recommended screening, we described which tests were recommended and explored if recommendations differed by survey year using weighted χ^2 tests. We also explored whether recommendations for screening increased among adults aged 45–49 between 2019 and 2021.

3. Results

3.1. Demographics

Our sample included 25,611 adults aged 45–75 years representing 96 million US adults. Their mean age was 58.9 years (±0.07); 51.2 % were female and 6.8 % had LEP (Table 1). The majority of those with LEP identified as Hispanic (84.5 %), while those with English proficiency were mostly non-Hispanic white (71.9 %). Larger proportions of those with English proficiency compared to LEP had private insurance (64.7 % versus 36.3 %) and had a bachelors or higher education (35.3 % versus 9.2 %).

3.2. Up-to-date with CRC screening

Overall, 54.0 % (95 % CI 53.1, 54.9) of adults aged 45–75 reported being up-to-date with CRC screening (including 63.3 % of adults 50–75), and prevalence increased from 2019 to 2021 (from 52.9 % to 55.2 %; aPR 1.03; 95 % CI 1.002, 1.05, Table 2). Among adults with LEP, 31.6 % reported being up-to-date with CRC screening (including 40.5 % of adults aged 50–75), compared to 55.6 % of adults with English proficiency (aPR 0.86; CI 0.77, 0.96). Results were similar (aPR 0.82; CI 0.73, 0.93) when redefined English proficiency to include those who interviewed in Spanish and English (n = 244) in addition to those who interviewed in English only. Adults 45–49 were much less likely to report being up-to-date with CRC screening than older adults (9.4 % vs

Table 1
Weighted descriptive characteristics of sample adults by English proficiency, 2019 and 2021 National Health Interview Study.

Characteristics		Overall (n = 25,611)	LEP W % (n = 1,155)	EP W % (n = 24,456)	P-value
Overall (weighted N)		96,191,480	6,524,264	89,667,216	
Year:	2019	50.2	52.8	50.0	0.19
	2021	49.7	47.2	50.0	
Age:	45–49	17.4	24.1	16.9	**<0.001**
	50–64	53.9	56.1	53.7	
	65–75	28.7	19.8	29.4	
Female		51.2	54.2	51.0	0.07
Race/ethnicity:	Hispanic	13.7	84.5	8.5	**<0.001**[a]
	Non-Hispanic black	11.2	0.5	12.0	
	Non-Hispanic Asian	5.8	11.3	5.4	
	Other	2.0	0	2.1	
	Non-Hispanic white	67.2	3.7	71.9	
Education	Less than high school	11.5	54.6	8.4	**<0.001**
	High School	27.6	25.1	27.8	
	Some college	27.4	11.1	28.6	
	Bachelor's or higher	33.5	9.2	35.3	
Married		64.9	68.6	64.7	**0.03**
% Federal Poverty Level	<100 %	9.0	23.9	8.0	**<0.001**
	100–199 %	15.7	35.4	14.3	
	>=200 %	75.2	40.7	77.8	
Health Insurance:	Any private	62.8	36.3	64.7	**<0.001**
	Medicaid/dual eligible	9.9	20.7	9.1	**<0.001**
	Medicare only	12.5	8.6	12.8	
	Uninsured	8.4	30.2	6.9	
	Other	6.5	4.2	6.6	
Urban/ Rural:	Nonmetro	14.8	4.7	15.6	**<0.001**
	Medium/small	30.9	19.9	31.7	
	Suburban	25.4	15.0	26.2	
	Large central	28.9	60.4	26.6	
Region:	South	37.9	38.0	37.9	**<0.001**
	West	22.6	41.2	21.3	
	Midwest	20.9	5.6	22.0	
	Northeast	18.6	15.2	18.9	
Time in United States:	Born in US	80.3	6.1	85.4	**<0.001**
	Not born, but ≥10 years	18.2	83.6	13.7	
	Not born, but <10 years	1.5	10.3	0.9	
Has a usual place of care		93.6	86.8	94.1	**<0.001**
Time since last doctor visit:	Visit in >3 years or never	3.9	8.0	3.7	**<0.001**
	Visit in >1 year but ≤3 years	9.3	15.0	8.8	
	Visit within last year	86.8	76.9	87.5	

EP, English Proficiency; LEP, Limited English Proficiency; W%, weighted percentage.
Boldface indicates statistical significance ($p < 0.05$).
[a] p-value derived with excluding "Other" race.

75.5 % of adults 65–75; aPR 0.14; CI 0.13, 0.16), and there was no significant increase in reporting being up-to-date with CRC screening among adults 45–49 between 2019 and 2021. In sensitivity analyses, where we included adults who reported a diagnostic colonoscopy within 10 years as up-to-date with screening, we found that reported receipt of screening increased slightly to 58 % and the predictors of screening remained largely the same (Supplemental Table 1).

3.3. Screening modalities

Fig. 1 shows the prevalence of being up-to-date by year and LEP status, as well as by type of modality used. While reported rates of stool-based testing increased between 2019 and 2021 for both groups, the rate more than doubled for adults with LEP (from 4.9 % to 11.6 %). The highest reported screening modality was colonoscopy for both years and groups. However, those with LEP compared to those with English proficiency had much lower reported rates of colonoscopies in both 2019 (23.4 % vs 48.8 %, $p < 0.001$) and 2021 (23.8 % vs 46.9 %, $p < 0.001$). Among adults with LEP, the prevalence of being up-to-date with CRC screening significantly increased from 28.3 % in 2019 to 35.4 % in 2021 ($p = 0.03$).

3.4. Healthcare professional recommendations

Among adults that reported not being up-to-date with CRC screening (n = 10,647), 15.0 % reported that their healthcare professional recommended CRC screening, and prevalence decreased from 16.5 % in 2019 to 13.5 % in 2021. Adults aged 45–49 and 50–64 (vs adults aged 65–75), females (vs males), and Hispanics and non-Hispanic Asians (vs non-Hispanic Whites) were less likely to report a recommendation for screening (Table 3). In a subgroup analysis among adults aged 45–49, we observed no significant increase in reported receipt of a screening recommendation between 2019 and 2021.

Among the 15 % of adults (n = 1,746) who reported not being up-to-date with CRC screening but reported that their healthcare professional recommended CRC screening, 68 % reported being recommended a colonoscopy only, followed by 18 % who were recommended stool-based tests only, 5 % who were recommended both, and 9 % who were recommended another form of screening. In an exploratory analysis, these proportions did not differ statistically by survey year.

4. Discussion

In this analysis of nationally representative data for adults aged 45 to 75 years old, only 54.0 % of adults were up-to-date with CRC screening. Among adults 50–75, 63.3 % reported being up-to-date with CRC screening, similar to the overall rate in this age range from 2010 to 2018 (Santiago-Rodríguez et al., 2023). Despite new guidelines recommending CRC screening for adults 45–49, only 9.4 % of adults 45–49 were up-to-date, and adults with LEP were also particularly at risk for not

Table 2
Characteristics associated with up-to-date colon cancer screening among sample adults, NHIS 2019 and 2021.

Characteristics		Prevalence (weighted %)	Adjusted Prevalence Ratio (95 % CI)
Year:	2019	52.9	Ref
	2021	55.2	1.03 (1.002, 1.05)
Language status:	Limited English Proficiency	31.6	0.86 (0.77, 0.96)
	English proficiency	55.6	Ref
Age:	45–49	9.4	0.14 (0.13, 0.16)
	50–64	56.8	0.81 (0.79, 0.82)
	65–75	75.5	Ref
Gender:	Female	55.1	1.01 (0.98, 1.03)
	Male	52.9	Ref
Race/ethnicity:	Hispanic	37.7	0.93 (0.88, 0.99)
	Non-Hispanic black	53.6	1.06 (1.02 1.10)
	Non-Hispanic Asian	43.4	0.81 (0.75, 0.87)
	Other	43.1	0.88 (0.79, 0.99)
	Non-Hispanic white	58.5	Ref
Education:	Less than high school	39.5	0.84 (0.79, 0.89)
	High School	50.4	0.89 (0.87, 0.92)
	Some college	55.6	0.94 (0.92, 0.97)
	Bachelor's or higher	60.5	Ref.
Marital status:	Yes	57.1	1.12 (1.09, 1.14)
	No	48.2	Ref.
% Federal Poverty Level:	< 100 %	37.4	0.86 (0.80, 0.92)
	100—199 %	44.9	0.93 (0.89, 0.97)
	>= 200 %	57.8	Ref.
Health Insurance:	Any private	55.9	Ref
	Medicaid/dual eligible	40.3	0.87 (0.82, 0.92)
	Medicare only	74.1	0.98 (0.95, 1.003)
	Uninsured	17.7	0.58 (0.51, 0.65)
	Other	63.9	1.06 (1.02, 1.10)
Urban/rural:	Nonmetro	52.2	0.94 (0.90, 0.99)
	Medium/small	54.4	0.98 (0.95, 1.01)
	Suburban	56.9	0.99 (0.96, 1.02)
	Large central	51.9	Ref
Region:	South	52.9	0.95 (0.91, 0.98)
	West	52.2	1.00 (0.96, 1.04)
	Midwest	55.6	0.97 (0.94, 1.01)
	Northeast	58.5	Ref
Usual place of care:	Yes	56.4	1.60 (1.44, 1.81)
	No	17.7	Ref
Time since last doctor visit:	Visit in > 3 years or never	7.7	0.23 (0.19, 0.29)
	Visit in > 1 year but ≤ 3 years	29.4	0.64 (0.60, 0.69)
	Visit within last year	58.7	Ref

NHIS = National Health Interview Survey.

meeting current guidelines. However, reporting being up-to-date with CRC screening through stool-based testing significantly increased among adults with LEP between 2019 and 2021, which slightly decreased the disparity in receipt of CRC screening between those with LEP and those with English proficiency. Concerningly, regardless of age or LEP, only 15.0 % of adults not up-to-date with CRC screening reported receiving a recommendation for screening, and most reported being recommended only colonoscopies, even though data suggest that being offered multiple CRC screening modalities may reduce disparities (Inadomi et al., 2012; Jih et al., 2018).

Among adults with LEP in our sample, 85 % identified as Hispanic. This is higher than the national average (Pillai and Artiga, 2023), and likely due to NHIS only formally being offered in English and Spanish. In the US, most Hispanics identify as Mexican (60 %), although this varies substantially by US region (Moslimani et al., 2023). Overall, 28 % of Hispanics are estimated to have LEP (Pillai and Artiga, 2023). A national survey by Pew Research Center found while 27 % of Hispanics are Spanish dominant (defined as more proficient in Spanish than English), approximately a third are English dominant, and another third are bilingual (equally proficient) (Funk and Lopez, 2022). Notably, disparities in experiences and outcomes based on race/ethnicity and LEP can vary significantly. For instance, among individuals with LEP, Hispanics demonstrate the highest uninsurance rates at 37 %, while Asian Americans, the second largest LEP racial/ethnic group, exhibit an uninsured rate of 10 % (Pillai and Artiga, 2023).

Prior studies found CRC screening to range from 34 to 43 percent in adults with LEP between 2014 and 2016 (Cataneo et al., 2022; Ramirez et al., 2023). Similarly, we found 31.6 % of adults 45–75 with LEP (40.5 % of those aged 50–75 with LEP) to be up-to-date with CRC screening, suggesting that screening has not risen in adults with LEP in the past 7 years. Adults with LEP experience several barriers to health care, including lower rates of health insurance coverage (Ramirez et al., 2023; Lu and Myerson, 2020) and challenges accessing health care services (Ramirez et al., 2023; DuBard and Gizlice, 2008; Cheng et al., 2007). Additionally, some studies have found patient-provider language concordance to impact screening rates, although findings have been mixed (Eamranond et al., 2011; Jih et al., 2015). During the height of the COVID-19 pandemic, many procedures including colonoscopies were unavailable. Star and colleagues studied the pandemic's effect on CRC screening by examining reported past-year screening in 2019 and 2021 among adults aged 50–75 (Star et al., 2023). They found that prior-year screening remained constant between 2019 and 2021 because while participants reported fewer colonoscopies in 2021, they reported receiving more stool-based screening. Our work adds to this literature as we also found an increase in stool-based testing among adults with LEP. Notably, this increase appears to have mitigated the up-to-date screening disparity seen in this population, highlighting the role this modality may play in reducing health inequities. Increased trainings to encourage clinicians to offer stool-based testing as a screening option will be important moving forward, as will more population outreach to increase access to this screening modality.

Additionally, many adults with LEP seek care at federally qualified health centers (FQHCs), a critical safety-net system that serves a predominately racial/ethnic minority population where an estimated 25 % of patients are reported to be best served in a language other than English (Health Resources & Services Administration, 2024). While screening rates at FQHCs are historically below national averages (Colorectal cancer screening, 2018), work has shown that mailed FIT programs can be an effective way to increase screening at FQHCs (Gupta et al., 2023; Gupta et al., 2020; Issaka et al., 2019). However, the benefits of screening may only be achieved if those who screen positive on stool-testing undergo follow-up colonoscopy. Concerningly, minority populations such as Latino adults have been less likely to receive a referral for endoscopy after a positive stool-based screening (Heintzman et al., 2022), and rates of follow-up colonoscopy completion at FQHCs are low, ranging from 18 to 57 % (Bharti et al., 2019; Coronado et al., 2021; Liss et al., 2016). This is likely due in part to unique challenges FQHCs face compared to integrated health systems, such as coordinating care with external gastrointestinal specialists (Liss et al., 2016; Escaron et al., 2022). To avoid perpetuating disparities, it must be ensured that appropriate infrastructure is in place to support follow up after screening. One promising strategy is the use of patient navigation programs (Issaka et al., 2019; Selby et al., 2017), but it is also important to monitor colonoscopy capacity to ensure it can meet demand (Gupta et al., 2020). For instance, it may be important to prioritize scheduling diagnostic colonoscopies over screening colonoscopies depending on institutional demand and availability.

Despite the ACS recommending adults 45–49 to be screened beginning in 2018 and the UPSTF following suit in 2021, less than a tenth of

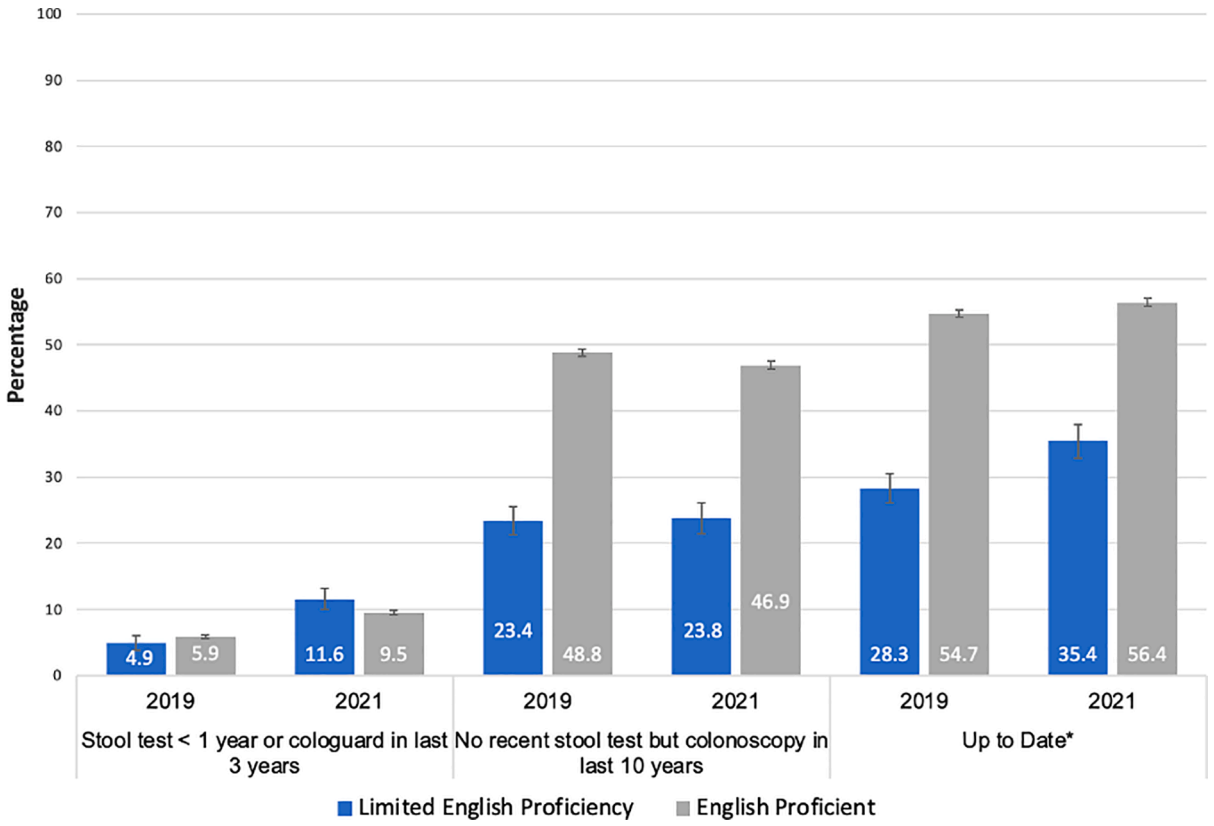

Fig. 1. Percentage of adults 45–75 years old with colorectal cancer screening by modality, 2019 and 2021 National Health Interview Survey. *Up to Date defined as having had any stool test within 1 year, stool-DNA testing within 3 years, or colonoscopy within 10 years.

adults aged 45–49 years were reportedly up-to-date, and rates did not change significantly between 2019 and 2021. While a gap between publication of guidelines and their dissemination is to be expected, other factors may also contribute to low rates of CRC screening in this population (Grimshaw et al., 2012; Grol and Grimshaw, 2003). For instance, adults 45–49 more so than those over 50 may face social and practical barriers to colonoscopies, such as difficulty taking time off work and scheduling childcare (Hyams et al., 2022). Stool-based testing could prove helpful in overcoming these barriers, but adults would still require scheduling a follow-up colonoscopy following a positive stool-based test. Additionally, insurance coverage for CRC screening without cost sharing in this age group has been sporadic. Some insurance providers, such as Cigna expanded coverage to adults 45–49 in 2018 (Roundtable, 2018), while others such as UnitedHealth did not start coverage until late 2021 (UnitedHealthcare, 2021). Laws pertaining to insurance coverage for CRC screening also vary by jurisdiction. Federally, the Affordable Care Act mandates that private insurances, expanded Medicaid, and Medicare must cover preventive services recommended by USPSTF (Fox and Shaw, 2015), thus requiring new plans as of May 2022 to cover CRC screening for adults 45–49. However, a recent ruling in 2023 invalidated that requirement for USPSTF recommendations made since 2010, including the expansion of CRC screening (Gluck and Gostin, 2023). Some states, such as Connecticut, have enacted their own laws that require health insurance policies to cover CRC screening in accordance with recommendations by the ACS (State of Conneticut, 2001). Lack of adequate insurance coverage for CRC screening without cost-sharing may disproportionately impact populations already at higher-risk for not meeting guideline-directed care. Insurance benefits will be an important barrier to monitor in this age-group moving forward.

Only 15 percent of adults who were not up-to-date with CRC screening reported that their health care professional recommended CRC screening, which is notable given clinician recommendation is one of the strongest predictors of CRC screening (Gilbert and Kanarek, 2005; Brawarsky et al., 2004). This rate may be even lower amongst FQHCs (Wolf et al., 2006), likely due to high patient loads with medically complex patients, often with LEP (Martinez-Gutierrez et al., 2013). Colonoscopies were the most recommended modality, while stool-based tests made up less than a quarter of recommended tests, and few adults reported being recommended multiple modalities. This is consistent with prior research that has shown healthcare professionals prefer colonoscopies due to preference for visual inspection and concern regarding the sensitivity/specificity of stool-based tests (Finney Rutten et al., 2022; Zhu et al., 2022). However, it is important to incorporate patient preferences into CRC recommendations as adults who are given a choice of modalities have higher rates of screening completion (Inadomi et al., 2012). Furthermore, shared decision making has been shown to reduce health inequalities (Durand et al., 2014) and is an emphasized component of the updated ACS guidelines (Volk et al., 2018). Decision aids (DAs) are one method to facilitate shared-decision making and have been linked to higher rates of CRC screening completion (Reuland et al., 2017; Miller et al., 2018). However, while at least one CRC screening DA is already available in nine languages (Patient education, 2023), the utilization and efficacy of DAs among adults with LEP has been understudied (Enard et al., 2016; Volk et al., 2016). Adapting DAs for this demographic requires both consideration of cultural and linguistic factors (Ko et al., 2014; Reuland et al., 2012).

4.1. Limitations

There are several limitations to the current study. While the ACS guidelines were updated in 2018, the USPSTF guidelines were not updated until 2021; thus, our analyses are unlikely to detect practice changes resulting from the updated USPSTF guidelines. Our measurement of LEP, although used in other population studies assessing the effect of LEP on healthcare utilization, is not a validated measure of

Table 3
Characteristics associated with receiving recommendation for colorectal cancer screening among sample adults not up-to-date, NHIS 2019 and 2021 (n = 10,547, weighted n = 42,892,120).

Characteristics		Prevalence (weighted %)	Adjusted Prevalence Ratio (95 % CI)
Year:	2019	16.5	Ref
	2021	13.5	0.84 (0.76, 0.92)
Language status:	Limited English proficiency	8.4	0.89 (0.64, 1.24)
	English proficiency	15.7	Ref
Age:	45–49	4.7	0.30 (0.24, 0.38)
	50–64	21.0	1.40 (1.20, 1.63)
	65–75	18.3	Ref
Gender:	Female	14.9	0.89 (0.82, 0.99)
	Male	15.1	Ref
Race/ethnicity:	Hispanic	9.6	0.78 (0.64, 0.96)
	Non-Hispanic black	14.9	0.90 (0.75, 1.09)
	Non-Hispanic Asian	8.3	0.50 (0.39, 0.66)
	Other	12.2	0.74 (0.47, 1.15)
	Non-Hispanic white	17.5	Ref
Education:	Less than high school	9.9	0.72 (0.58, 0.89)
	High School	15.2	0.95 (0.83, 1.09)
	Some college	17.2	1.03 (0.91, 1.18)
	Bachelor's or higher	15.4	Ref.
Marital Status:	Yes	15.3	1.04 (0.94, 1.15)
	No	14.7	Ref.
% Federal Poverty Level:	< 100 %	13.4	1.10 (0.91, 1.32)
	100—199 %	12.6	1.00 (0.86, 1.16)
	>= 200 %	15.9	Ref.
Health Insurance:	Any private	16.5	Ref
	Medicaid/dual eligible	13.6	0.83 (0.69, 1.00)
	Medicare only	20.2	1.20 (0.97, 1.48)
	Uninsured	5.5	0.53 (0.41, 0.69)
	Other	21.3	1.13 (0.93, 1.37)
Urban/Rural:	Nonmetro	15.8	0.97 (0.82, 1.15)
	Medium/small	14.6	0.97 (0.84, 1.12)
	Suburban	17.3	1.09 (0.94, 1.28)
	Large central	13.3	Ref
Region:	South	14.4	0.95 (0.91, 0.98)
	West	12.8	1.00 (0.96, 1.04)
	Midwest	17.2	0.97 (0.94, 1.01)
	Northeast	17.0	Ref
Usual place of care:	Yes	16.4	1.88 (1.39, 2.55)
	No	4.4	Ref
Time since last doctor visit:	Visit in >3 years or never	1.7	0.13 (0.07, 0.24)
	Visit in >1 year but ≤3 years	6.1	0.39 (0.30, 0.50)
	Visit within last year	18.0	Ref

NHIS = National Health Interview Survey.

language skills. We were unable to determine if adults received routine screening through sigmoidoscopies or CT colonography since NHIS did not assess reasons for receipt of these tests. Additionally, we relied on self-reported data for determination on screening status and health care professional recommendations, which is subject to recall bias; however prior studies examining the association of LEP with receipt of CRC screening were also based on self-report. The ACS and USPSTF CRC screening guidelines target an average-risk population, so its recommendations exclude those with inflammatory bowel disease and other high-risk conditions. The NHIS does not collect information history of inflammatory bowel disease or family history of CRC; however, in primary analyses, we excluded those who reported receiving a colonoscopy for non-routine purposes.

4.2. Conclusion

Our results highlight that limited English proficiency is a significant barrier to CRC screening, but stool-based testing may narrow the gap. Most adults with LEP are Hispanic and may benefit from improved language-accessible health care services in primary care settings, including tailored decision aids and patient navigators. Very few adults aged 45–49 were up-to-date with screening within the first several years of updated ACS guidelines. Despite guidelines recommending multiple screening modalities and shared decision-making, few adults who had not been recently screened reported a clinician recommendation for screening and those that did report a recommendation were rarely offered a choice of screening modality. To increase screening prevalence, especially among adults aged 45–49 or with LEP, healthcare providers should offer more than one CRC screening test so that patients may choose the best test for themselves based on their preferences.

CRediT authorship contribution statement

Jennifer E. Bayly: Writing – original draft, Formal analysis, Data curation, Conceptualization. **Shrunjal Trivedi:** Writing – review & editing, Software. **Kenneth J. Mukamal:** Writing – review & editing, Methodology. **Roger B. Davis:** Writing – review & editing. **Mara A. Schonberg:** Writing – review & editing, Supervision, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

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