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Mental Illness is not associated with Adherence to Colorectal Cancer Screening: Results from the California Health Interview Survey

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Abstract

Background—Colorectal cancer is the second leading cause of cancer-specific death in the United States. Evidence suggests people with mental illness are less likely to receive preventive health services, including cancer screening. We hypothesized that mental illness is a risk factor for nonadherence to colorectal cancer screening guidelines.

Methods—We analyzed results of the 2007 California Health Interview Survey to test whether mental illness is a risk factor for non-adherence to colorectal cancer screening recommendations among individuals age 50 or older ($N = 15,535$). This cross-sectional dataset is representative of California. Screening was defined as either fecal occult blood testing during the preceding year, sigmoidoscopy, or colonoscopy during the preceding 5 years. Mental illness was identified using the Kessler K6 screening tool. Associations were evaluated using weighted multivariate logistic regressions.

Results—Mental illness was not associated with colorectal cancer screening adherence (OR, 0.89; 95% CI, 0.63-1.25). Risk factors for nonadherence included being female (OR, 1.25; 95% CI, 1.09-1.44); delaying accessing health care during the previous year (OR; 1.89; 95% CI, 1.56-2.29).

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Conclusions—Unlike previous studies, this study did not find a relationship between mental illness and colorectal cancer screening adherence. This could be due to differences in study populations. State-specific health care policies involving care coordination for individuals with mental illness could also influence colorectal cancer screening adherence in California.

Keywords

Cancer Screening; health disparities; vulnerable populations

Introduction

In the United States, colorectal cancer (CRC) is the third most common cancer diagnosed in men and women and the second leading cause of cancer-specific death.¹ Since 2002, the U.S. Preventive Services Task Force has recommended CRC screening as an essential prevention tool to decrease the incidence, morbidity, and mortality rates of CRC.² Despite evidence that early detection of invasive disease via colonoscopy reduces mortality, a majority of U.S. adults do not receive regular risk-appropriate screening, or have never been screened.^{3,4} At the population level, lack of health insurance and awareness of the importance of CRC screening have been identified as primary barriers to CRC screening.⁵

People living with serious mental illness in the United States have an increased risk of a range of chronic conditions.^{6,7} Individuals with mental illness encounter numerous barriers to accessing health care, which could negatively influence adherence to CRC screening guidelines among this population.⁸ These barriers include limitations in training of health care professionals related to assisting patients with mental illness^{9,10} and limited access to primary and preventive health services.¹¹

Resulting from limited access to health care, individuals with mental illness are less likely than other groups to obtain screening for a range of cancers.¹² One study reported that veterans with mental disorders were less likely to receive CRC screenings compared to those without.¹³ Another study of mental health consumers in California reported that cancer screening services were underused, particularly for CRC.¹⁴ Whether these findings are generalizable is unclear and limited research has been conducted on this topic using population-based data.

Because of the known health disparities, guidelines have specified the need for improving the monitoring of physical health conditions for people with serious mental illness.¹⁵ Monitoring can facilitate illness prevention by detecting a disease's warning signs, and can also be an avenue to self-management of chronic disease. Further, the Affordable Care Act has emphasized precisely this type of prevention for vulnerable populations. The present study analyzed population-based data from the 2007 wave of the California Health Interview Survey (CHIS)¹⁶ to evaluate whether having a mental illness was associated with a decreased likelihood of obtaining CRC screening. We hypothesized that having a mental illness would be associated with lower levels of CRC screening.

Methods

Data Source

This cross-sectional observational study analyzed data drawn from the 2007 CHIS.¹⁶ CHIS is a population-based telephone survey conducted in California every other year since 2001, and covers topics related to access to health care, health status, and health behaviors. The 2007 wave included interviews with more than 48,000 adults from every county in California. CHIS investigators weighted respondents to align the sample's demographic characteristics with state data from the 2000 Census and to adjust for the likelihood of having a telephone.¹⁶ The adult interview completion rate for 2007 was 52.8% (landline) and 52% (cell phone) for adults, which is comparable to response rates of other scientific telephone surveys in California.¹⁶ Eligible households included houses, apartments, and mobile homes occupied by individuals, families, multiple families, extended families, or multiple unrelated individuals if fewer than 9. Individuals living in households without telephone service, group quarters, criminal justice or other institutions, transient or temporary arrangements, or military barracks and those experiencing homelessness were not eligible.¹⁶

Study Population

The present study includes respondents, age 50 or older who had received a recommendation from their doctor to be screened for CRC during the previous 5 years. Our rationale follows the American College of Gastroenterology guidelines for CRC screening, which indicate that CRC screening is only necessary for people age 50 or older.¹⁷

Independent and Control Variables

Our independent variable of interest was having a mental illness, identified using the Kessler K6, which the CHIS uses to screen for mental illness among survey respondents.¹⁸ The K6 has been used in many epidemiological studies to identify serious mental illness, defined as having a diagnosable mental, behavioral, or emotional disorder meeting *DSM-IV* criteria other than a substance abuse disorder that resulted in serious impairment, with a global assessment of functioning less than 60 in the past 12 months. The Substance Abuse and Mental Health Services Administration recommends using the K6 to screen for mental illness in primary and specialty health care settings, and is also used to allocate funds to community mental health settings.¹⁹ As in previous studies¹⁸ participants with a K6 score 13 were coded as having a mental illness.

Mandelblatt's model of equitable access to cancer services²⁰ guided our selection of control variables. This model uses the principles of Andersen's²¹ and Aday, Andersen, and Fleming's²² behavioral model and suggests that patient-level factors such as age and comorbidity, and provider-level characteristics such as use of practice guidelines can influence cancer screening outcomes.

Demographic characteristics included gender, age, race/ethnicity, and educational attainment. As in previous CRC screening adherence studies,²³ age was categorized into three levels: 50–65, 66–74, and 75–85. To accurately depict California's racial and ethnic

composition, our race/ethnicity variable included: non-Hispanic white, Hispanic, black, Asian or Pacific Islander, and other. As in previous studies²³ we classified education as less than high school, high school diploma, bachelor's degree, and more than college. We also controlled for self-rated health, which was dichotomized as excellent, very good, or good as one category and fair or poor as the other category.

The equitable access to cancer care model specifies an individual's access to health care as a key predictor for using cancer-screening services. We included four variables that represent an individual's access to care: (1) whether an individual has difficulty understanding written instructions from a doctor; (2) whether an individual has difficulty understanding prescription instructions; (3) whether an individual has delayed health care for any reason; and (4) insurance stability. The CHIS 2007 asks respondents whether they have difficulty understanding instructions from their doctor or understanding prescription instructions. Response options were "Yes," "No," and "I don't receive instructions from my doctor," or "I don't get prescription instructions." As in previous studies,²³ we excluded respondents who reported that they don't receive instructions from their doctor or don't receive prescription instructions for ease of interpretability. Yes-or-no responses were also recorded for delaying accessing health services for any reason and respondents' insurance status during the previous year. Selection of study participants is detailed in Figure 1.

Dependent Variable

Our dependent variable was adherence to CRC screening guidelines. CHIS 2007 respondents were asked three questions related to their adherence to CRC screening, which ascertained whether a respondent had a colonoscopy, sigmoidoscopy, or a blood stool test during the previous 5 years. Using these three questions, the CHIS 2007 created a dichotomous variable indicating whether respondents did or did not adhere to CRC screening recommendations.

Statistical Analysis

Descriptive statistics were used to describe the study population and prevalence of CRC screening adherence. Differences between study participants with and without mental illness were calculated using Rao-Scott Chi squares to account for sample weights. Weighted logistic regression analyses were then used to model the association between having mental illness and CRC screening adherence, while adjusting for demographic characteristics, health literacy, health access, and self-rated health. We include results from a partially adjusted model that included having a mental illness, sex, age, and race/ethnicity, and from a fully adjusted model which included all covariates described above. Estimates were obtained using sample weights included in the CHIS public use files. Finally, a sensitivity analysis was conducted to determine whether higher cutoff points of the K6 scale were associated with colorectal cancer screening adherence.

Because our a priori analysis only included CHIS 2007 participants age 50 or older who had received a recommendation for CRC screening, we also conducted a post hoc analysis among all CHIS participants age 50 or older to determine whether mental illness was associated with CRC screening using a broader study population. In our post-hoc analysis, a

recommendation for CRC screening was considered a covariate in the weighted logistic regression model. We report odd ratios (OR) and 95% confidence intervals (CI). *P*-values were two-sided and statistical significance was set at .05. Data cleaning was conducted using SPSS version 21.²⁴ All analyses were conducted using SAS version 9.4 with the *procsurveyfreq* and *procsurveylogistic* procedures.²⁵

Results

Among the 51,048 respondents in the 2007 CHIS, 22,081 were not recommended by their physician to get CRC screening. Of the 17,576 that received recommendations to undergo CRC screening by their health care provider, 16,166 were age 50 or older. After excluding patients who did not receive instructions or prescriptions from their health care provider, 15,355 respondents were included in the analysis.

Descriptive Results

Demographic comparisons of participants with and without mental illness, who are age 50 and older, and have received recommendations for CRC screening are shown in Table 1. Six percent of the study sample had K6-score of 13, indicating presence of a mental illness. CRC screening adherence was reported by 78% of the participants. A higher proportion of individuals who screened positive for mental illness reported being female (66% vs 52% Rao-Scott $\chi^2 = 17.91$, $p < 0.0001$); having a high school education (53% vs 48%; Rao-Scott $\chi^2 = 44.60$, $p < 0.0001$) or less than a high school education (24% vs 16%; Rao-Scott $\chi^2 = 44.60$, $p < 0.0001$); poor self-rated health (55% vs 21%; Rao-Scott $\chi^2 = 131.6$; $p < 0.0001$); difficulty understanding prescription instructions (14% vs 6%; Rao-Scott $\chi^2 = 31.23$; $p < 0.0001$), delaying receiving health care in the past year (34% vs 14%; Rao-Scott $\chi^2 = 77.09$; $p < 0.0001$), and being uninsured in the past year (10% vs 4%; Rao-Scott $\chi^2 = 24.87$; $p < 0.0001$). A lower proportion of individuals who screened positive for mental illness reported being non-Hispanic white (61% vs 69% Rao-Scott $\chi^2 = 24.79$ $p < 0.0001$); and reported being 75-85 (6% vs 16% Rao-Scott $\chi^2 = 138.02$, $p < 0.0001$);

Factors associated with CRC Screening among Participants who Received Screening Recommendations

Table 2 shows the results for the factors associated with CRC in the CHIS 2007. Comparison of factors from partially adjusted vs fully adjusted model show that the OR for having a mental illness was not significant in either model, (OR, 0.97; 95% CI, 0.70-1.37 vs OR, 0.89; 95% CI, 0.63-1.25). In both the partially and fully adjusted models, being female was a risk factor for non-adherence (OR, 1.27; 95%CI, 1.11-1.45 vs OR, 1.25; 95% CI, 1.09-1.44). In both the partially and fully adjusted models, being age 66-74 vs 50-65 increased likelihood screening adherence (OR, 0.46; 95% CI, 0.37-0.55 vs OR, 0.51 95% CI, 0.42-0.62), as did being 75-85 vs 50-65 (OR, 0.39; 95% CI, 0.32-0.47 vs OR, 0.51; 95% CI, 0.42-0.62). In the fully adjusted model, delaying care for any reason in the past year was a risk factor for non-adherence (OR, 1.89; 95% CI, 1.56-2.29), whereas having insurance stability (OR, 0.51; 95% CI, (0.37-0.70), and poor self-rated health (OR, 0.80; 95% CI, 0.66-0.96) increased odds of adherence. Odds ratios and 95% Confidence intervals are reported in Table 2.

Sensitivity Analysis

We also tested the association between higher levels of mental illness using different cutoff points on the Kessler K6 scale. These cutoff points were selected based on the distribution of the K6 in the study sample, depicted in Figure 2. The sensitivity analysis revealed similar trends using different cutoff scores. Thus, we do not report these results in detail.

Factors Associated with CRC Screening Adherence in all CHIS Participants Age 50 or Older

We also evaluated whether mental illness was associated with CRC screening adherence in a post hoc analysis of all CHIS respondents age 50 or older. Six percent of this study population screened positive for mental illness, while 63% adhered to CRC screening. Among CHIS respondents age 50 and older, those who screened positive for a mental illness included a higher proportion of females (67% vs 53%; Rao-scott $\chi^2 = 44.3$; $p < 0.0001$); persons age 50-65 (80% vs 63%; Rao-scott $\chi^2 = 133.7$; $p < 0.0001$); persons who have completed less than high school or less (77% vs 64%; Rao-scott $\chi^2 = 50.1$; $p < 0.0001$); persons reporting poor self-rated health (58% vs 24%; Rao-scott $\chi^2 = 323.4$; $p < 0.0001$); persons who reporting delaying care in the last year (34 vs 12%; Rao-scott $\chi^2 = 211.9$; $p < 0.0001$); and persons who reported having insurance instability (15% vs 10%; Rao-scott $\chi^2 = 19.69$; $p < 0.0001$). A lower proportion of individuals that screened positive for mental illness were non-Hispanic white (58% vs 61%; Rao-scott $\chi^2 = 34.89$; $p < 0.0001$) and individuals reporting easy understanding prescription instructions (86.0% vs 90.2%; Rao-scott $\chi^2 = 19.65$; $p < 0.0001$). Individuals who screened positive for mental illness were not recommended to get CRC screening at a rate that differed significantly from the general population. These descriptive results are presented in Table 3.

Table 3 shows the results for the factors associated with CRC in our post-hoc study population. Comparison of factors from partially adjusted vs fully adjusted model show that the OR for having a mental illness was not significant in either model, (OR, 1.05; 95% CI, 0.86-1.28 vs OR, 0.95; 95% CI, 0.63-1.25). In both the partially and fully adjusted models, factors that increased likelihood of CRC screening adherence included being age 66-74 vs 50-65 increased likelihood of screening adherence (OR, 0.48; 95% CI, 0.43-0.54 vs OR, 0.55; 95% CI, 0.49-0.62), as did being 75-85 vs 50-65 (OR, 0.45; 95% CI, 0.42-0.50 vs OR, 0.53; 95% CI, 0.48-0.58); and being Black (OR, 0.79; 95% CI, 0.63-0.96 vs OR, 0.77; 95% CI, 0.62-0.96);

Risk factors for not adhering to CRC screening guidelines specific to the partially adjusted model included being Hispanic, relative to Non-Hispanic White (OR, 1.21; 95% CI, 1.07-1.37); and being Asian or Pacific Islander (OR, 1.17 95% CI, 1.01-1.34).

Risk factors specific to the fully adjusted model included not having the experience of receiving prescription instructions (OR, 2.42; 95% CI, 1.77-3.34), delaying accessing health care for any reason (OR, 1.65; 95% CI, 1.42-1.91). Factors that increased likelihood of screening adherence included having more than bachelor's degree (OR, 0.69; 95% CI, 0.58-0.83); having poor self-rated health (OR, 0.85; 95% CI, 0.75-0.96); feeling that it is easy to understand written instructions from a doctor (OR, 0.79, 95% CI, 0.66-0.95) having

insurance stability (OR, 0.41; 95% CI, 0.34-0.50), and having received a recommendation for screening during the previous 5 years (OR, 0.27; 95% CI, 0.25-0.30). These results are detailed in Table 4.

Discussion

Improving access to preventive health care among adults with mental illness is a public health priority. The purpose of this analysis was to evaluate the independent effect of having mental illness, defined using the K6,¹⁸ on the use of CRC screening services at the population level in California. We hypothesized that having a mental illness would increase risk for nonadherence to CRC screening services. Because our a priori analysis revealed that mental illness was not associated with adherence to CRC screening guidelines among survey respondents who had received a screening recommendation from their health care provider, we conducted a post hoc analysis to understand the independent effects of having mental illness on CRC screening adherence among all CHIS 2007 respondents age 50 or older. Our post hoc analysis also revealed no significant association between having mental illness and adherence to CRC screening guidelines.

These results are inconsistent with previous research, which has documented disparities in access to preventive services and cancer screening among adults with mental illness.^{13, 14} Further, our tables 1 and 3 revealed that, compared to those without mental illness, a higher proportion of those with mental illness have other risk factors that are known to impact utilization of health services including insurance instability, lower levels of education, and difficulty understanding instructions from their health care provider. Relevant to our analysis, a previous study reported on use of screening services among a clinical sample of adults with mental illness in one county in California. This study reported that only 50% of participants received CRC screening services at the recommended rate. Another study reported that having a mental illness decreased likelihood of adhering to CRC screening guidelines within the U.S. Department of Veterans Affairs population.¹³ Results from the present study could differ from those of previous research due difference in composition of study population and sample. Consumers of public mental health services and consumers of VA services could face barriers to using cancer screening services that are less prevalent at the population level. Barriers could include the need to prioritize mental health diagnoses over preventive care, managing social comorbidities that often accompany mental illness, such as homelessness, along with and limited information related to cancer screening and follow up.

The present study's use of data representative of California's population could have also caused our results to differ from previous studies. For example, other research has reported that K6-defined mental illness is a risk factor for non-adherence to screening for other types of cancers using nationally representative data.²⁶ Our results might differ from national trends due to state-specific differences in health care policy and service delivery. California's Mental Health Services Act (MHSA) was implemented during 2005, which could have created a health services landscape for individuals with mental illness in California that differs from that of other states. This legislation prioritized improving the coordination of mental health services and implementing integrated physical and mental health care. The

implementation of the MHSA could have affected the relationship between mental illness and colorectal cancer screening in our study. Future studies should examine this relationship in different policy environments that might exist in other states.

Although we did not find support for our study hypotheses, our analyses revealed other factors associated with nonadherence to CRC screening guidelines, including being female who have received a screening recommendation, being between 50 and 65 years old, delaying health one's care, and insurance instability. These findings are consistent with prior literature²⁷ and suggest a need for enhanced outreach among members of these study subgroups. Poor self-rated health was associated with increased odds of screening adherence, which could indicate a perceived need for health care services, including cancer screening.

Our post hoc analysis revealed that having low health literacy was an additional risk factor for CRC screening nonadherence. Specifically, having difficulty understanding written instructions from a doctor and never receiving prescription instructions were risk-factors for non-adherence. Our post hoc analysis also revealed that having a college degree or higher increased likelihood of screening adherence. Taken together, these findings support previous work¹⁷ suggesting the need for enhanced outreach by health care providers for patients with lower levels of health literacy and education to increase adherence to CRC screening guidelines.

Finally, post hoc analyses also revealed that self-identifying as Black or African American was associated with increased odds to adhering to CRC screening recommendations. The American College of Gastroenterology¹⁷ has specified that CRC screening for black men and women should begin at age 45, compared to age 50 among other racial groups. This finding could indicate that targeted outreach among black individuals is occurring in California.

Limitations and Strengths

Random-digit-dialing surveys have inherent limitations. Self-reported data could lead to overestimation of use of CRC screening services and to other inaccuracies in survey responses. It is also possible that CRC screening adherence varies by type of mental illness. The K6 is a reliable metric for assessing mental illness and functioning, but does not diagnose specific psychiatric disorders. Therefore, our approach precluded us from understanding whether CRC screening adherence varies by psychiatric diagnosis. Further, even though the K6 has yielded national and state-level estimates of serious mental illness which have informed the funding of block grants for community mental health services, it is used to screen for serious mental illness within the past 12 months. This fact introduces the issue of time ordering with our dependent variable, which assesses for CRC screening within the last five years. It is possible that individuals who screened positive for mental illness had received a recommendation for CRC screening before they began experiencing symptoms. Another potential limitation is the possibility of selection bias. It is possible that persons with the most serious mental illness did not complete this survey, which could have distorted the extent to which persons with serious mental illness adhere to CRC screening guidelines. Further, the CHIS does not include homeless individuals, who are at increased risk for a

range of mental and physical health vulnerabilities and experience limited access to primary and preventive services. The nature of secondary data analysis also limited which variables we were able to include in our statistical models. The 2007 CHIS did not allow us to examine whether respondents were receiving mental health services, which could influence use of other types of health care such as CRC screening. Finally, these results might not be generalizable to the U.S. population.

However this study has a number of strengths. Our study is among the first few to investigate the association between having serious psychological distress and adherence to CRC screening services using a population-based approach. Our weighted statistical models were theoretically informed and adjusted for known risk and protective factors related to accessing cancer-screening services.

Conclusion

Because of the high mortality associated with colon cancer, understanding disparities in access to cancer screening services is an important topic that warrants further research. To achieve an enhanced understanding of CRC screening adherence among adults with mental illness, future studies should investigate the relationship between mental illness and CRC screening adherence using nationally representative data. Because state-specific health care policies could influence use of CRC services among individuals with mental illness, future studies should also evaluate the comparative effectiveness of population-based interventions designed to reduce a broad spectrum of health disparities, including disparities in screening adherence. The Affordable Care Act is an example of an initiative that provides states with some autonomy to tailor their health service delivery systems. This legislation could provide an ideal opportunity to understand how these policies affect disparities in cancer screening by psychiatric diagnosis over time. This could be accomplished through analysis of administrative data from mental health systems that document both psychiatric diagnosis and use of CRC screening services.

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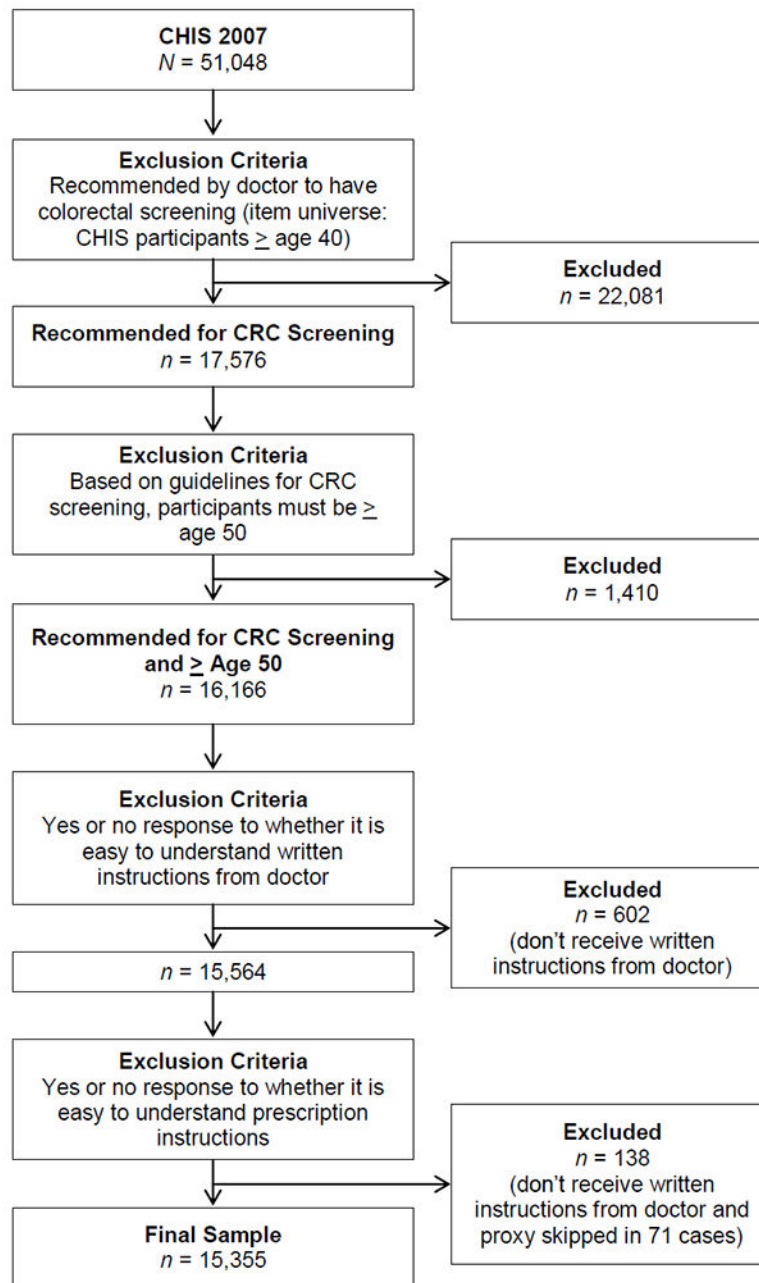


Figure 1.
Study population flow chart

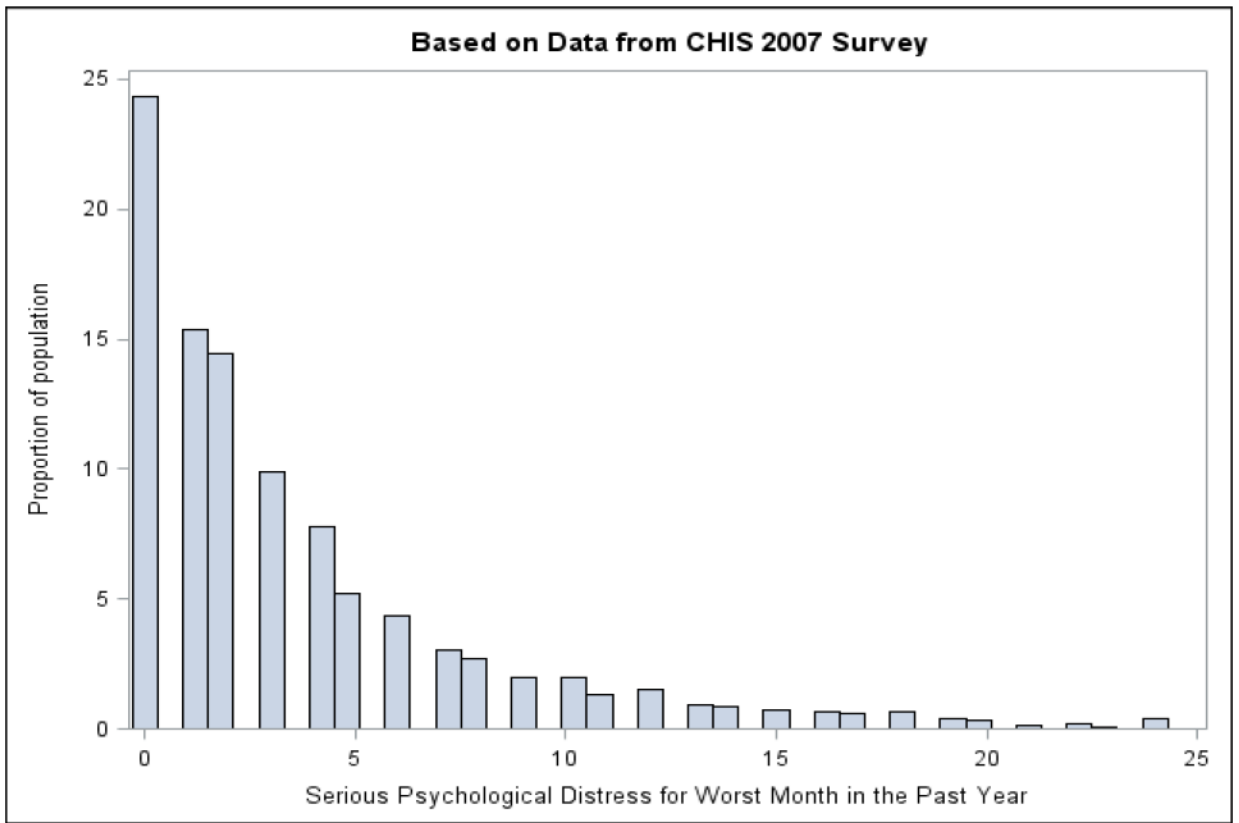


Figure 2.
Histogram representing respondents' K6 scores.

Table 1 Characteristics of CHIS 2007 Respondents Age 50-85 Recommended for CRC Screening by Health Care Provider (N = 15,355)

Variable	Total (N = 15,355)		K6 positive (n = 941)		K6 negative (n = 14,414)		Rao-Scott χ^2	df	P
	n	%	n	%	n	%			
Mental illness									
K6 positive	941	6.1	-	-	-	-	-	-	-
K6 negative	14,414	94.0	-	-	-	-	-	-	-
Sex							17.91	1	<0.0001
Male	6,076	46.8	263	33.8	5,813	47.7			
Female	9,279	53.1	678	66.2	8,601	52.3			
Age							138.02	2	<0.0001
50-65	8,811	65.9	752	83.4	8,059	64.8			
66-74	3,545	18.8	113	10.1	3,432	19.4			
75-85	2,999	15.2	76	6.4	2,923	15.8			
Race and ethnicity							24.79	4	<0.0001
non-Hispanic white	12,229	69.0	676	61.3	11,553	69.5			
Hispanic	1,247	14.6	125	21.4	1,122	14.2			
Asian or Pacific Islander	785	9.3	32	5.6	753	9.6			
Black	636	4.9	49	6.9	587	4.8			
Other	455	2.9	59	4.8	399	1.8			
CRC screening adherence							1.00	2	0.319
Adherent	12,275	78.1	719	24.6	11,556	21.7			
Nonadherent	3,080	21.8	222	75.4	2,858	78.3			
Education							44.60	3	<0.0001
Less than high school	904	10.0	114	17.8	790	9.9			
High school graduate	7,433	48.2	554	56.4	6,879	47.7			
Bachelor's degree	3,566	21.8	146	14.2	3,420	22.2			

Variable	Total (N = 15,355)		K6 positive (n = 941)		K6 negative (n = 14,414)		Rao-Scott χ^2	df	P
	n	%	n	%	n	%			
More than bachelor's degree	3,452	19.7	127	11.6	3,325	20.2			
Self-rated health							131.60	1	<0.0001
Good	12,173	76.8	439	44.4	11,734	79.0			
Poor	3,182	23.1	502	55.5	2,680	21.0			
Understand prescription instructions							31.23	1	<0.0001
Easy	14,437	93.2	823	85.7	13,614	93.8			
Difficult	918	6.7	118	14.3	800	6.2			
Delayed care during previous year							77.09	1	<0.0001
Delayed	2,201	14.3	339	34.6	1,862	13.7			
Not delayed	13,154	85.7	602	65.3	12,552	86.3			
Insurance status during previous year							24.87	1	<0.0001
Insured for entire year	14,796	95.5	846	90.4	13,950	95.8			
Uninsured at any point	559	4.4	95	9.5	464	4.1			

Abbreviations: CHIS, California Health Interview Survey; CRC, colorectal cancer.

^aWeighted to account for complex survey design and accurately represent California population. Percentages may not sum to 100 due to rounding error.

Table 2

Adherence to CRC Screening among CHIS 2007 Respondents Age 50-85 Recommended for CRC Screening by Health Care Provider

	Partially Adjusted			Fully Adjusted		
	OR	95% CI	P	OR	95% CI	P
K6 positive	0.97	0.70-1.37	0.890	0.89	0.63-1.25	0.489
Female	1.27	1.11-1.45	0.0006	1.25	1.09-1.44	0.0017
Age						
66-74	0.46	0.37-0.55	<0.0001	0.51	0.42-0.62	<0.0001
75-85	0.39	0.32-0.47	<0.0001	0.45	0.38-0.55	<0.0001
Race and ethnicity						
Hispanic	1.14	0.91-1.43	0.258	1.18	0.93-1.49	0.173
Asian or Pacific Islander	1.14	0.86-1.51	0.376	1.20	0.90-1.60	0.211
Black	1.03	0.73-1.46	0.870	0.99	0.91-1.38	0.945
Other	1.21	1.11-1.45	0.333	1.21	0.82-1.78	0.330
Education						
High school graduate				1.05	0.80-1.38	0.713
Bachelor's degree				1.20	0.89-1.64	0.237
More than bachelor's degree				0.83	0.62-1.12	0.227
Poor self-rated health				0.80	0.66-0.96	0.017
Easy to understand written doctor's instructions				0.83	0.68-1.02	0.077
Easy to understand prescription instructions				1.21	0.94-1.62	0.195
Delayed care during previous year				1.89	1.56-2.29	<0.001
Insured during entire previous year				0.51	0.37-0.70	<0.001

Abbreviations: CHIS, California Health Interview Survey; CI, confidence interval; CRC, colorectal cancer; OR, odds ratio.

^aSample included only those recommended for CRC screening during the previous 5 years. Current screening was defined as fecal occult blood test during previous year or sigmoidoscopy or colonoscopy during the previous 5 years. Reference categories were K6 negative, male, age 50-65, non-Hispanic white, good self-rated health; difficult to understanding written doctor's instructions; difficult to understand prescription instructions; uninsured at any point during the previous year; and less than high school.

Table 3

Characteristics of CHIS 2007 Respondents Age 50-85 (N = 30,266)

Variable	Total (N = 30,266)		K6 positive (n = 1881)		K6 negative (n = 28,385)		Rao-Scott χ^2	df	P
	n	%	n	%	n	%			
Mental illness									
K6 positive	1,881	6.0	-	-	-	-	-	-	-
K6 negative	28,385	93.9	-	-	-	-	-	-	-
CRC screening recommended in the last 5 years							0.006	1	0.94
Yes	16,095	53.2	908	50.1	15122	50.0			
No	14,171	46.8	973	49.7	13263	50.0			
CRC screening adherence							3.50	1	0.062
Adherent	19,948	62.8	1126	59.0	18,822	63.1			
Nonadherent	10,318	37.2	755	41.0	9,563	37.0			
Sex							44.43	1	<0.0001
Male	11,753	46.3	541	32.7	11,212	47.2			
Female	18,513	53.7	1340	67.3	17,173	52.8			
Age							133.68	2	<0.0001
50-65	16,716	64.3	1,433	80.8	15,283	63.2			
66-74	6,557	17.6	238	10.7	6,319	18.0			
75-85	6,993	18.1	210	8.41	6,783	18.7			
Race and ethnicity							34.89	4	<0.0001
non-Hispanic white	22,644	60.7	1,289	57.7	21,355	60.9			
Hispanic	3,198	19.8	2284	23.5	2,914	19.5			
Asian or Pacific Islander	2,089	11.9	97	7.8	1,992	12.1			
Black	1,350	5.5	94	5.8	1,256	5.5			
Other	985	2.1	117	5.1	868	2.0			
Education							50.08	3	<0.0001
Less than high school	2,781	16.9	310	24.4	2,471	16.4			
High school graduate	15,439	48.4	1100	53.4	14,339	48.1			

Variable	Total (N = 30,266)		K6 positive (n = 1881)		K6 negative (n = 28,385)		Rao-Scott χ^2	df	P
	n	%	n	%	n	%			
Bachelor's degree	6,458	19.3	266	12.9	6,192	19.7			
More than bachelor's degree	5,588	15.4	205	9.3	5,383	15.7			
Self-rated health							323.41	1	<0.0001
Good	23,382	74.0	830	41.7	22,552	76.1			
Poor	6,884	26.0	1,051	58.3	5,833	23.9			
Understand prescription instructions									
Easy	27,592	8.2	1,628	86.0	25,964	90.2	19.65	2	<0.0001
Difficult	2,066	90.0	237	14.0	1,829	7.9			
Do not receive prescription instructions	608	1.8	16	.95	592	1.9			
Delayed care during previous year							211.94	1	<0.0001
Delayed	4,171	13.5	672	34.4	3,499	12.1			
Not delayed	26,095	86.5	1209	65.6	24,886	87.1			
Insurance status during previous year									
Insured for entire year	28,116	90.1	1616	85.2	26,500	90.4	19.69	1	<0.0001
Uninsured at any point	2,150	9.9	265	14.8	1,885	9.6			

Abbreviations: CHIS, California Health Interview Survey; CRC, colorectal cancer.

^aWeighted to account for complex survey design and accurately represent California population. Weighted Percentages may not sum to 100 due to rounding error

Table 4

Adherence to CRC Screening among CHIS 2007 Respondents Age 50-85

	Partially Adjusted			Fully Adjusted		
	OR	95% CI	P	OR	95% CI	P
K6 positive	1.05	0.86-1.28	0.597	0.95	0.77-1.17	0.640
Female	1.07	0.98-1.17	0.121	1.07	0.98-1.17	0.137
Age						
66-74	0.48	0.43-0.54	<0.0001	0.55	0.49-0.62	<0.001
75-85	0.45	0.42-0.50	<0.0001	0.53	0.48-0.58	<0.001
Race and ethnicity						
Hispanic	1.21	1.07-1.37	0.0035	1.03	0.91-1.18	0.662
Asian or Pacific Islander	1.17	1.01-1.34	0.033	1.12	0.97-1.29	0.129
Black	0.79	0.63-0.96	0.0187	0.77	0.62-0.96	0.019
Other	1.21	0.94-1.56	0.1392	1.17	0.91-1.49	0.219
Education						
High school graduate				0.86	0.74-1.00	0.056
Bachelor's degree				0.87	0.73-1.04	0.115
More than bachelor's degree				0.69	0.58-0.83	<0.0001
Poor self-rated health				0.85	0.75-0.96	0.009
Easy to understand written doctor's instructions				0.79	0.66-0.95	<0.001
Do not receive written doctor's instructions				1.19	0.94-1.50	0.153
Easy to understand prescription instructions				0.95	0.78-1.17	0.630
Do not receive prescription instructions				2.42	1.77-3.34	<0.001
Delayed care during previous year				1.65	1.42-1.91	<0.001
Insured during entire previous year				0.41	0.34-0.50	<0.001
Recommended for CRC Screening during previous 5 years				0.27	0.25-0.30	<0.001

Abbreviations: CHIS, California Health Interview Survey; CI, confidence interval; CRC, colorectal cancer; OR odds ratio.

^a Sample included all CHIS participants age 50 and older. Reference categories were K6 negative, male, age 50-65, non-Hispanic white, good self-rated health; difficult to understand written doctor's instructions; difficult to understand prescription instructions; uninsured at any point during the previous year; and less than high school.