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The effect of marriage on utilization of colorectal endoscopy exam in the United States

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Abstract

Purpose—This study examines the association between marriage and colorectal endoscopy exam, and whether this association varies by gender and financial benefits of marriage including improved access to health insurance and pooled family income.

Methods—Representative survey data of the non-institutionalized United States population were used from the 2000, 2005, and 2008 National Health Interview Survey. Analyses targeted persons 50–85 years of age without a personal history of cancer and with complete information on all study variables ($n = 21,760$). Multivariate logistic regression was used to model marital status differences in the probability of undergoing a colorectal endoscopy exam with interaction effects used to model variation over time by gender, health insurance, and poverty level.

Results—Married persons were more likely than unmarried persons to report ever having undergone a colorectal endoscopy exam (odds ratio [OR], 1.21; 95% confidence interval [CI], 1.12–1.29), and the difference between married and unmarried persons in the probability of undergoing a colorectal endoscopy exam remained stable over time. Married persons were more likely than unmarried persons to report having undergone a colorectal endoscopy exam within the past 10 years (OR, 1.49; 95% CI, 1.15–1.95). For each survey year, married men were significantly more likely than women and unmarried men to report having undergone a colorectal endoscopy exam. For example, in 2008, 56% of married men reported having undergone a colorectal endoscopy exam, compared to 49% of unmarried men, 52% of married women, and

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50% of unmarried women. Among persons with health insurance, married persons were significantly more likely than unmarried persons to have undergone a colorectal endoscopy exam. Among persons who were poor, there was no difference by marital status in the likelihood of having undergone a colorectal endoscopy exam. However, among persons who were not poor, married persons were more likely than unmarried persons to have undergone a colorectal endoscopy exam.

Conclusion—Given that colorectal endoscopy exams are a potentially life-saving procedure, persistently higher uptake of colorectal endoscopy for married persons over time may be an important health promoting benefit of marriage. Therefore, clinicians and policy makers should focus on improving the use of cancer prevention services among unmarried persons.

Keywords

colorectal cancer; endoscopy; marital status; health services

INTRODUCTION

Married persons have a consistent survival advantage over unmarried persons, with a particular advantage for married men [1–3]. One explanation for this advantage is that healthier persons are more likely to get married and remain remarried [4]. Another view argues that marriage confers specific benefits for individuals such as social support, pooled assets, access to spousal health insurance, and shared household labor [5–9]. However, there is some evidence to suggest that the relationship between marriage and health changes over time concurrent with changes in social norms about marriage, gender roles, or economic climate [10–12].

Recent evidence has emerged specifically linking marriage with improved cancer survival [13–15] and early stage of cancer diagnosis [16], which may be related to the social and economic benefits conferred by marriage, such as higher levels of income, health insurance, and earlier or more frequent screening [17–19]. There is a well-established literature on the benefits of marriage on health-promoting behaviors such as preventive screening [8–9, 13–15], but limited evidence to support the hypothesis that married persons are more likely than unmarried persons to be screened for cancer. The evidence that does exist suggests that spouses may positively influence each other to be screened [8, 21–22]. To our knowledge, no nationally representative study of the United States population exists examining the role of marital status and cancer screening, nor is there evidence on whether the effect of marriage on cancer screening changed over time. This gap is particularly critical because financial resources are needed in the United States to seek colorectal cancer screening, which can be expensive, even for persons with health insurance.

Therefore, this study will use nationally representative data to examine the association between marriage and colorectal endoscopy exam, and whether this association varies over time by gender and financial benefits of marriage including improved access to health insurance and pooled family income. We hypothesize that married persons will be more likely to undergo colorectal endoscopy exam, and that this relationship should be stable or grow larger over time. We also expect differences to be greater by gender and financial resources that are associated with marriage such as income and health insurance. Therefore, the greatest likelihood of colorectal endoscopy use will be among married men (compared to women or unmarried men), non-poor married (compared to unmarried or the married poor), and insured married (compared to uninsured or insured unmarried).

METHODS

Data

The National Health Interview Survey (NHIS) is a cross-sectional, multistage, area probability survey of the civilian non-institutionalized population residing in the United States conducted by the National Center for Health Statistics with response rates regularly exceeding 90% [23]. Periodically, the NHIS includes supplemental information on cancer screening, and our study used pooled data from the years 2000, 2005, and 2008, when the supplemental data on cancer was collected. The NHIS was chosen over other sources of individual-level data, such as the Behavioral Risk Factor Surveillance System (BRFSS), because the sample design and scope of the NHIS make it the leading source of information on colorectal cancer screening prevalence at the national level [24]. Survey respondents who had been diagnosed with colorectal cancer or whose records were missing information on personal history of colorectal cancer were excluded from the study. Colorectal cancer screening is clinically recommended for people aged 50 years or older, and the maximum age recorded by the NHIS is 85 years. The final analytical sample included persons 50–85 years of age without a personal history of cancer and with complete information on all study variables ($n = 21,760$); the sample size breakout for each survey year was: 2000 ($n=7,393$), 2005 ($n=7,753$), 2008 ($n=6,614$).

Measures

The main outcome measure in this study was whether a respondent reported ever having undergone a colorectal endoscopy exam. This measure was chosen over any CRC test because colorectal endoscopy is a resource intensive screening (e.g. requires significant investment of time and money) that is more likely to vary by marital status compared to home-based fecal occult blood tests. The NHIS Cancer Control supplement ascertained the occurrence of colorectal endoscopy by asking adults whether they had ever had a sigmoidoscopy, colonoscopy, or proctoscopy. All three types of endoscopy were grouped together because respondents were asked about the type of endoscopy for their most recent procedure and they may have inaccurately recalled the type of exam. Respondents were also asked about the timing of the most recent exam, which was categorized as within 10 years versus 10 years or more. This outcome variable was used to demonstrate whether married persons were more likely than unmarried persons to comply with diagnostic screening recommendations for colonoscopy. Small sample sizes restricted the possibility of assessing five-year recommendations for sigmoidoscopy.

The major predictor variable was marital status, measured dichotomously as married versus not married (divorced, separated, widowed, single, cohabiting). Control variables critical to understanding the probability of using colorectal endoscopy testing included gender, years of age (50–59, 60–69, 70 and older), race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic/Latino, other race/ethnicity), education (less than high school, high school, more than high school), family income-to-poverty ratio, current health insurance coverage, and affirmatively reporting access to a usual source of health care. The family income-to-poverty ratio was categorized as poor (annual income less than 100% of the federal poverty threshold) versus not poor (annual income 100% or more of the federal poverty threshold).

Analytic Strategy

STATA SE/12 (STATA Corporation, College Station, TX) was used to adjust for survey weighting and clustering. Multivariate logistic regression was used to model both outcome variables: ever having undergone a colorectal endoscopy exam and reporting that the endoscopy exam occurred within the past 10 years. The predictor variable was modeled as married versus not married. Analyses using more detailed categories of married, divorced/

separated, widowed, and never married produced substantively similar results; therefore, the binary version of marital status was used to amplify the statistical power of the calculations and to simplify the presentation of the results. The results of the regression analyses using the range of categories for marital status (widowed, divorced, separated, never married) can be found in the technical appendix. Regression results are adjusted for age, gender, race/ethnicity, education, poverty status, health insurance, and access to a usual source of health care. Interaction effects were calculated for marital status with gender, health insurance, and poverty level and estimated using multivariate logistic regression and two-tailed level of significance at $t > 1.96$ ($p < .05$). Trend analyses were presented as predicted probabilities based on multivariate logistic regression estimates, with 95% confidence interval error bars to show statistical significance using the delta method to calculate standard errors.

RESULTS

Table 1 shows the multivariate odds from the pooled sample data of ever having undergone a colorectal endoscopy exam. Married persons were more likely than unmarried persons to report ever having undergone a colorectal endoscopy exam (odds ratio [OR], 1.21; 95% confidence interval [CI], 1.12–1.29), net of other contributing factors. Table 1 also shows the multivariate odds of reporting having undergone a colorectal endoscopy exam within the past 10 years. Married persons were more likely than unmarried persons to report having undergone a colorectal endoscopy exam within the past 10 years (OR, 1.49; 95% CI, 1.15–1.95), net of other contributing factors. Notably, the only factors that were statistically significant predictors of having undergone a colorectal exam within the past 10 years were having a usual source of care and non-Hispanic African American race/ethnicity.

Table 2 presents the interaction effects for gender, poverty status and health insurance from the pooled multivariate logistic regression of ever undergoing a colorectal endoscopy exam. The first interaction shown is for marital status and gender. Compared to unmarried men, married men (OR = 1.35) and women (OR = 1.16) had a significantly higher likelihood of undergoing colorectal endoscopy exam while unmarried women were not significantly different compared to unmarried men. For poverty and marital status, married persons that were not poor were significantly more likely (OR = 1.26), unmarried poor person were significantly less likely (OR = 0.83), and married poor persons were no more likely to undergo an endoscopy exam. For health insurance and marital status, persons that were married and insured were more likely (OR = 1.23), and the unmarried uninsured (OR = 0.54) and the married uninsured (OR = 0.47) were significantly less likely to undergo endoscopy exam.

Figure 1 shows the multivariate adjusted probabilities from the interaction of marital status and survey year. Over the study period, the difference between married and unmarried persons in the probability of undergoing a colorectal endoscopy exam remained stable. Married persons were significantly more likely than unmarried persons to report ever having undergone a colorectal endoscopy exam. In 2000, there was a 4% difference by marital status in the probability of having undergone a colorectal endoscopy exam. By 2008, 54% of married persons reported having undergone a colorectal endoscopy exam, compared to 49% of unmarried persons.

Figure 2 shows the multivariate adjusted probabilities from the three-way interaction of marital status, gender, and survey year. Tables showing the odds ratios and statistical significance values of the three way interaction effects between survey year, gender, insurance, and poverty can be found in the technical appendix. For each survey year, married men were more likely than women and unmarried men to report having undergone a colorectal endoscopy exam, net of contributing factors. For example, in 2008, 56% of

married men reported having undergone a colorectal endoscopy exam, compared to 49% of unmarried men, 52% of married women, and 50% of unmarried women. However, there is not a statistically significant difference in the probabilities of colorectal endoscopy exam between unmarried men, married women, and unmarried women. The effect of marriage on the probability of having undergone a colorectal endoscopy exam has not changed over time with married men 7% more likely than unmarried men to have the exam and married women 2% more likely than unmarried women.

Figure 3 shows the multivariate adjusted probabilities from the three-way interaction of marital status, health insurance, and survey year. Regardless of marital status, persons with health insurance were far more likely than those without health insurance to report a colorectal endoscopy exam. Among persons with health insurance, married persons were significantly more likely than unmarried persons to have undergone a colorectal endoscopy exam, but the effect did not change over time. For example, among persons with health insurance, 55% of married persons in 2008 reported having undergone a colorectal endoscopy exam, compared to 51% of unmarried persons. Among persons without current health insurance, there is no statistically significant difference in the likelihood of ever having undergone a colorectal endoscopy exam.

Figure 4 shows the multivariate adjusted probabilities from the three-way interaction of marital status, poverty status, and survey year. Regardless of marital status, persons who were poor were less likely than those who were not poor to have undergone a colorectal endoscopy exam. Among persons who were poor, there was no difference by marital status in the likelihood of having undergone a colorectal endoscopy exam. However, among persons who were not poor, married persons were more likely than unmarried persons to have undergone a colorectal endoscopy exam, and this difference was stable over time. For example, in 2008, 56% of married persons who were not poor reported having undergone a colorectal endoscopy exam, compared to 51% of unmarried persons who were not poor.

DISCUSSION

Our study was the first to use nationally representative data to track the trend in the association between marital status and colorectal endoscopy use. Our first hypothesis was that married persons would be more likely than unmarried persons to have undergone colorectal endoscopy exam. Prior literature on screening and other health-promoting behaviors [8–9, 20–21] has consistently found that married persons are more likely to be screened than unmarried persons, and our study provides additional support to the hypothesis that marriage may confer an advantage for health promoting behaviors such as cancer screening. Our study also adds to the literature on cancer screening by identifying that married persons were more likely than unmarried persons to have undergone a colorectal endoscopy exam within the past 10 years. Clinical recommendations minimally recommend a colonoscopy every 10 years, and more frequent exams depending on clinical history or type of endoscopy exam.

Another new finding in our study was the persistent difference in the association between marital status and colorectal endoscopy exams over time. We hypothesized that the relationship between marriage and screening would be steady or increase over time. We discovered that the trend for the association between marriage and screening was stable over time, and that the gap between married and unmarried did not grow over time. Despite social and economic changes over that period such as economic fluctuations and changing gender roles [10–12], marriage appears to be a social status that consistently confers health-promoting behavioral advantages, which may partly explain why previous literature has consistently found that married persons have better health than unmarried persons [1–3].

Future research using data with a longer study period may be better able to capture variations in this association; perhaps the trend between marriage and screening was larger in prior generations and shrank over time, or perhaps in the coming years the gap will shrink.

We hypothesized that married men would have the highest use of colorectal endoscopy exam compared to women and unmarried men. Our hypothesis was confirmed. We found that men benefit more from marriage than women in the likelihood of having undergone a colorectal endoscopy exam, and that the benefit of marriage for men appears to have remained stable over the eight-year study period. This finding is consistent with other literature that has shown the health benefits of marriage differ between men and women, although these prior studies had largely been based on clinical trial data [25–28], while our study was based on data from a large, representative survey of the United States population. The theory put forth to explain the greater benefit of marriage for men than women in screening rests on the assumption that women's role in the family may be the health gatekeeper that monitors health and ensures that family members, in this case husbands, receive appropriate health care. Likewise, married men might be more compliant with screening recommendations not only because of encouragement from their wife, but also from a social obligation to be productive members of the family, which requires them to remain healthy [9, 29]. However, these perceived roles may shift over time with the continuing pattern of persons opting to remain single rather than marry [10–12, 13, 29]. Therefore, continued monitoring of the trends in screening by marital status and gender is warranted, and studies based on other populations is especially encouraged given that gender roles can vary considerably by culture.

We also hypothesized that non-poor married (compared to unmarried or the married poor), and insured married (compared to uninsured or insured unmarried) would have higher utilization of colorectal endoscopy exams. Prior literature had suggested that the health promoting benefits of marriage are conferred in part because married persons are able to easily share financial resources such as participation in a spousal health insurance plan and pooling incomes [5–9]. Our hypotheses were confirmed because we found the highest use of colorectal endoscopy exam among married persons with health insurance and married persons that were not poor. This finding extends the current literature because these hypotheses had not previously been formally tested, and adds to the understanding of the mechanism for the positive health impact of marriage [1–3]. However, we also found that among persons who either were poor or did not have current health insurance, there was no difference in the probability of colorectal endoscopy exam by marital status. This finding suggests that lacking health insurance and being poor are major barriers to accessing health care that marital status alone is not able to overcome. However, marriage is beneficial if one has health insurance or has a household income above the poverty level. Therefore, future studies may benefit from examining other mechanisms of the marriage benefit to health such as social control. There is a limited research literature that has examined this hypothesis and those studies have indicated that spouses, particularly wives, are an important social influence on getting screened [25–28].

The findings should be interpreted within the context that our study tracked trends in colorectal endoscopy exam reports using cross-sectional data. We used NHIS data because it is the standard for identifying the overall prevalence of screening behaviors in the United States [24]. However, prospective cohort data that can track changes over time in marital status and endoscopy use would strengthen the findings. We are not aware of a nationally representative source of prospective cohort data in the United States that tracks colorectal endoscopy use. Another limitation of our findings is that the data we used did not include information on social support or marriage quality, both of which could modify the

relationship between marriage and endoscopy use. For example, it is possible that endoscopy use is higher among more supportive marriages than among marriages with lower levels of reported social support [18]. However, data on social support or marital quality were not collected in the NHIS. Future studies that have data on social support or marital quality could provide important insights, provided that these studies also included information on other benefits of marriage such as health insurance and household income. The final limitation is that family history of colorectal cancer is an important factor in determining the timing of colorectal cancer screening, but information on family history was not collected by the NHIS in 2008. However, further sensitivity analyses of our results using family history for 2000 and 2005 found no substantive differences in the results.

In conclusion, our study using nationally representative survey data from the United States found that marriage confers a benefit for colorectal screening, married persons were more likely than unmarried persons to have undergone a colorectal endoscopy exam within the past 10 years, the trend for the association between marriage and screening was stable over time, and men benefited more from marriage than women in the likelihood of having undergone a colorectal endoscopy exam. We also discovered that the highest use of colorectal endoscopy exam was among married persons with health insurance and married persons that were not poor, although lacking health insurance and being poor are major barriers to accessing health care that marital status alone is not able to overcome. Given that the clinical literature indicates that colorectal endoscopy exams are a potentially life-saving procedure [30–32], persistently higher uptake of colorectal endoscopy for married persons over time may be an important health promoting benefit of marriage and may partly explain why married persons are consistently found to have better health profiles than unmarried persons [1–3]. Therefore, clinicians and policy makers should focus on improving the use of cancer prevention services among unmarried persons.

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TECHNICAL APPENDIX

Appendix Table 1

Multivariate logistic regression-adjusted odds ratios of ever undergoing a colorectal endoscopy exam among persons 50 years of age and older without any personal history of cancer: NHIS 2000, 2005 & 2008, N = 21,760

	OR	95% CI
Marital Status		
Married	1.00	
Widowed	0.83	0.75, 0.92
Divorced/Separated	0.87	0.79, 0.96
Never Married	0.79	0.70, 0.89
Survey Year		
2000	1.00	
2005	1.56	1.43, 1.69
2008	2.01	1.83, 2.20
Age		
50-59	1.00	
60-69	1.93	1.78, 2.10
70+	2.04	1.85, 2.25
Gender		
Male	1.00	
Female	0.92	0.86, 0.98
Ethnicity		
Non-Hispanic White	1.00	
Non-Hispanic Black	0.96	0.86, 1.07
Hispanic/Latino	0.71	0.61, 0.82
Other race/ethnicity	0.65	0.56, 0.76
Education		
< High School	1.00	
High School	1.31	1.18, 1.46
> High School	1.91	1.71, 2.12
Poverty		
Not Poor	1.00	
Near Poor	0.82	0.74, 0.90
Poor	0.65	0.58, 0.73
Currently insured		
Yes	1.00	
No	0.45	0.38, 0.54
Have usual source of care		

	OR	95% CI
No	1.00	
Yes	2.61	0.11, 0.17

This table demonstrates that married persons are more likely than other marital statuses (widowed, divorced, separated, never married) to undergo a colorectal endoscopy exam.

Appendix Table 2

Interaction effects for survey year, gender, poverty status, and health insurance from multivariate logistic regression of ever undergoing a colorectal endoscopy exam

	OR	t
Married × Survey Year		
Unmarried 2000 (reference)	1.00	
Unmarried 2005	1.60	8.61
Unmarried 2008	1.96	10.60
Married 2000	1.21	3.12
Married 2005	1.85	11.17
Married 2008	2.45	14.92
Married × Gender × Survey Year		
Unmarried Male 2000 (reference)	1.00	
Unmarried Male 2005	1.54	4.42
Unmarried Male 2008	1.86	6.12
Unmarried Female 2000	1.00	0.11
Unmarried Female 2005	1.63	5.75
Unmarried Female 2008	2.01	7.59
Married Male 2000	1.32	2.94
Married Male 2005	1.92	7.37
Married Male 2008	2.72	11.00
Married Female 2000	1.11	1.08
Married Female 2005	1.81	6.55
Married Female 2008	2.21	8.26
Married × Poor × Survey Year		
Unmarried Not Poor 2000 (reference)	1.00	
Unmarried Not Poor 2005	1.60	6.38
Unmarried Not Poor 2008	2.01	8.47
Unmarried Poor 2000	0.85	-1.81
Unmarried Poor 2005	1.37	3.81
Unmarried Poor 2008	1.61	5.05
Married Not Poor 2000	1.22	2.77
Married Not Poor 2005	1.94	9.53
Married Not Poor 2008	2.68	13.85
Married Poor 2000	1.11	0.98

	OR	t
Married Poor 2005	1.45	3.39
Married Poor 2008	1.45	3.06
Married $\times$ Uninsured $\times$ Survey Year		
Unmarried Uninsured 2000 (reference)	1.00	
Unmarried Uninsured 2005	1.60	8.28
Unmarried Uninsured 2008	1.95	10.24
Unmarried Insured 2000	0.53	-3.81
Unmarried Insured 2005	0.85	-1.22
Unmarried Insured 2008	1.08	0.33
Married Uninsured 2000	1.20	2.97
Married Uninsured 2005	1.89	11.24
Married Uninsured 2008	2.51	14.96
Married Insured 2000	0.80	-1.20
Married Insured 2005	0.66	-2.03
Married Insured 2008	0.77	-1.19

^a Analyses performed for persons 50 years of age and older without any personal history of cancer and adjusted for sample weights, clustering, age, gender, race/ethnicity, education, poverty, health insurance, and usual source of care.

^b The family income-to-poverty ratio was categorized as poor (annual income less than 100% of the federal poverty threshold) versus not poor (annual income 100% or more of the federal poverty threshold).

^c Source: National Health Interview Survey 2000, 2005, and 2008, (n = 21,760)

This table presents the interaction effects for survey year, gender, poverty status and health insurance from the multivariate adjusted logistic regression of ever undergoing a colorectal endoscopy exam. Unmarried persons in the year 2000 were used as the reference group in the first interaction effect shown in the table, and significantly different than unmarried persons in 2005 and 2008 and married persons from years 2000-2008. Next, a three-way interaction effect is shown between marital status, gender, and survey year with unmarried men in the year 2000 as the reference group. Married and unmarried women in the year 2000 are not significantly different than unmarried men in 2000; otherwise, all other groups are different than the reference group. A three-way interaction effect is shown between marital status, poverty status, and survey year with unmarried persons in the year 2000 that are not poor as the reference group. The unmarried poor and married poor in the year 2000 are not significantly different than persons in the year 2000 that are not poor and unmarried; otherwise all other groups are different than the reference group. Finally, a three-way interaction effect is shown between marital status, health insurance status, and survey year with unmarried persons in the year 2000 without health insurance as the reference group. The uninsured, unmarried in 2005 and 2008 as well as the married insured from 2000-2008 are not significantly different than unmarried persons in the year 2000 without health insurance.

Fig. 1. Multivariate Regression-Adjusted Trend in the Probability of Ever Undergoing a Colorectal Endoscopy Exam by Marital Status: National Health Interview Survey 2000, 2005, & 2008, N = 21,760^a

^a Adjusted for sample weights, clustering, age, gender, race/ethnicity, education, poverty, health insurance, and usual source of care. Error bars shown are 95% confidence intervals of the estimated probability.

Fig. 2.
 Multivariate Regression-Adjusted Probability of Ever Undergoing a Colorectal Endoscopy Exam by Marital Status and Gender: National Health Interview Survey 2000, 2005, & 2008, N = 21,760^a
^a Adjusted for sample weights, clustering, age, gender, race/ethnicity, education, poverty, health insurance, and usual source of care. Error bars shown are 95% confidence intervals of the estimated probability.

Fig. 3. Multivariate Regression-Adjusted Trend in the Probability of Ever Undergoing a Colorectal Endoscopy Exam by Marital Status and Health Insurance: National Health Interview Survey 2000, 2005, & 2008, N = 21,760^a

^a Adjusted for sample weights, clustering, age, gender, race/ethnicity, education, poverty, health insurance, and usual source of care. Error bars shown are 95% confidence intervals of the estimated probability.

Fig. 4. Multivariate Regression-Adjusted Trend in the Probability of Ever Undergoing a Colorectal Endoscopy Exam by Marital Status and Poverty Status^{a b}: National Health Interview Survey 2000, 2005, & 2008, N = 21,760

^a Adjusted for sample weights, clustering, age, gender, race/ethnicity, education, poverty, health insurance, and usual source of care.

^b The family income-to-poverty ratio was categorized as poor (annual income less than 100% of the federal poverty threshold) versus not poor (annual income 100% or more of the federal poverty threshold).

Table 1

Multivariate logistic regression-adjusted odds ratios of undergoing a colorectal endoscopy exam among persons 50 years of age and older without a personal history of cancer: National Health Interview Survey 2000, 2005, & 2008^a

	Ever Had a Colorectal Endoscopy Exam (n = 21,760)		Colorectal Endoscopy Exam Within the Past 10 Years (n = 3,536)	
	OR	95% CI	OR	95% CI
Marital Status				
Not Married	1.00		1.00	
Married	1.21	1.12, 1.29	1.49	1.15, 1.95
Survey Year				
2000	1.00		1.00	
2005	1.56	1.43, 1.69	3.40	2.13, 5.45
2008	2.01	1.83, 2.20	3.69	2.29, 5.95
Age				
50–59	1.00		1.00	
60–69	1.93	1.78, 2.10	0.96	0.71, 1.29
70+	2.03	1.86, 2.22	0.79	0.58, 1.08
Gender				
Male	1.00		1.00	
Female	0.92	0.86, 0.98	0.82	0.64, 1.06
Ethnicity				
Non-Hispanic White	1.00		1.00	
Non-Hispanic Black	0.96	0.86, 1.07	1.69	1.09, 2.62
Hispanic/Latino	0.71	0.61, 0.82	1.21	0.73, 2.01
Other race/ethnicity	0.65	0.56, 0.76	1.58	0.90, 2.77
Education				
< High School	1.00		1.00	
High School	1.31	1.18, 1.46	1.24	0.85, 1.79
> High School	1.91	1.71, 2.12	0.96	0.67, 1.38
Family Income to Poverty Ratio ^b				
Not Poor	1.00		1.00	
Poor	0.76	0.70, 0.83	1.05	0.78, 1.41
Currently insured				
Yes	1.00		1.00	
No	0.45	0.38, 0.54	0.57	0.32, 1.00
Have usual source of care				
No	1.00		1.00	
Yes	2.60	2.21, 3.07	2.18	1.30, 3.66

^aAdjusted for survey weights and clustering effects

^bThe family income-to-poverty ratio was categorized as poor (annual income less than 100% of the federal poverty threshold) versus not poor (annual income 100% or more of the federal poverty threshold).

Table 2

Interaction effects for gender, poverty status, and health insurance from multivariate logistic regression of ever undergoing a colorectal endoscopy exam

	Odds Ratio	t-value
Married × Gender		
Unmarried Male (reference)	1.00	
Unmarried Female	1.05	0.95
Married Male	1.35	5.77
Married Female	1.16	2.78
Married × Poor		
Unmarried Not Poor (reference)	1.00	
Unmarried Poor	0.83	−3.42
Married Not Poor	1.26	5.66
Married Poor	0.89	−1.69
Married × Uninsured		
Unmarried Insured (reference)	1.00	
Unmarried Uninsured	0.54	−4.89
Married Insured	1.23	5.64
Married Uninsured	0.47	−5.87

^aMultivariate logistic regression of ever undergoing a colorectal endoscopy exam among persons 50 years of age and older without any personal history of cancer adjusted for sample weights, clustering, age, gender, race/ethnicity, education, poverty, health insurance, and usual source of care.

^bThe family income-to-poverty ratio was categorized as poor (annual income less than 100% of the federal poverty threshold) versus not poor (annual income 100% or more of the federal poverty threshold).

^cSource: National Health Interview Survey 2000, 2005, and 2008, (n = 21,760)