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Up-to-date Colonoscopy Use in Asian and Hispanic Subgroups in New York City, 2003–2016

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Abstract

Background: Colorectal cancer screening uptake in the US overall has increased, but racial/ethnic disparities persist and data on colonoscopy uptake by racial/ethnic subgroups are lacking. We sought to better characterize these trends and to identify predictors of colonoscopy uptake, particularly among Asian and Hispanic subgroups.

Study: We used data from the New York City Community Health Survey to generate estimates of up-to-date colonoscopy use in Asian and Hispanic subgroups across six time periods spanning 2003–2016. For each subgroup, we calculated the percent change in colonoscopy uptake over the study period and the difference in uptake compared to non-Hispanic Whites in 2015–16. We also used multivariable logistic regression to identify predictors of colonoscopy uptake.

Results: All racial and ethnic subgroups with reliable estimates saw a net increase in colonoscopy uptake between 2003 and 2016. In 2015–2016, compared to non-Hispanic Whites, Puerto Ricans, Dominicans, and Central/South Americans had higher colonoscopy uptake while Chinese, Asian Indians, and Mexicans had lower uptake. On multivariable analysis, age, marital status, insurance status, primary care provider, receipt of flu vaccine, frequency of exercise, and smoking status were the most consistent predictors of colonoscopy uptake (≥4 time periods).

Conclusions: We found significant variation in colonoscopy uptake among Asian and Hispanic subgroups. We also identified numerous demographic, socioeconomic, and health-related predictors of colonoscopy uptake. These findings highlight the importance of examining health

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disparities through the lens of disaggregated racial/ethnic subgroups and have the potential to inform future public health interventions.

Keywords

Colorectal cancer screening; colonoscopy; racial/ethnic disparities; New York City

INTRODUCTION

Colorectal cancer is the third most common malignancy among both men and women in the United States and the second leading cause of cancer-related death in American adults[1]. Current guidelines from the US Preventative Services Task Force recommend colonoscopy every 10 years as one method of screening[2], which has been shown to reduce both colorectal cancer incidence and mortality through the removal of precancerous polyps[3, 4]. Although compliance with colorectal cancer screening has increased over time, lower uptake among racial and ethnic minority groups remains well-documented nationally[5, 6]. For instance, a 2016 analysis of data from the National Health Interview Survey (NHIS) demonstrated that utilization of colorectal cancer screening was higher in non-Hispanic White adults compared to non-Hispanic Black, non-Hispanic Asian, and Hispanic adults[7].

In an effort to address these racial/ethnic disparities and increase overall colonoscopy uptake among New Yorkers, the New York City Department of Health and Mental Hygiene formed the New York Citywide Colorectal Cancer Control Coalition (C5) in 2003. Following the implementation of these initiatives, C5 reported that racial and ethnic disparities in colonoscopy uptake had disappeared in New York City by 2014[8]. Similarly, findings from the 2016 Behavioral Risk Factor Surveillance System reported that while non-Hispanic Black and Hispanic adults had lower compliance with screening than non-Hispanic White adults in New York state, this gap had dramatically narrowed compared to previous years; the report did not include data for the non-Hispanic Asian population[9].

Although there is fairly robust data on the temporal trends in colorectal cancer screening disparities between broad racial and ethnic groups, few studies have examined colonoscopy uptake in disaggregated ethnic subgroups. Data from the Medical Expenditure Panel Survey (MEPS) (1999–2005) showed that colorectal cancer screening uptake varied among Hispanic adults by country of origin (Dominican Republic, Mexico, Puerto Rico, Cuba)[10]. Similarly, studies conducted using data from the California Health Interview Survey (CHIS) and MEPS demonstrated that screening uptake varied among non-Hispanic Asian and Native Hawaiian/Pacific Islander ethnic subgroups[11–13]. Previous analysis of 2014 New York City Community Health Survey (NYCCHS) data also revealed variation in colonoscopy uptake among disaggregated Asian and Hispanic subgroups[14]. We sought to better characterize these trends, particularly among Asian and Hispanic subgroups, and to further describe predictors of colonoscopy uptake using data from the 2003–16 NYCCHS. We hypothesized that these data may uncover findings that are obscured in analyses of aggregated racial and ethnic groups and have the potential to inform future targeted screening interventions.

MATERIALS AND METHODS

We obtained data from the NYCCHS, an annual phone survey conducted by the Department of Health and Mental Hygiene[15]. This cross-sectional survey is used to generate estimates of chronic disease burden and to identify associated risk factors among adults in all five boroughs (Brooklyn, Bronx, Manhattan, Queens, Staten Island). It is conducted in multiple languages, including English, Spanish, Russian, and Mandarin and Cantonese Chinese. Survey results are weighted to ensure that estimates are representative of the entire New York City adult population. For this study, we analyzed responses from participants aged 50 years or older.

We calculated estimates of up-to-date colonoscopy use for each of 13 racial and ethnic groups over six pre-determined time periods (2003–05, 2006–08, 2009–10, 2011–12, 2013–14, and 2015–16), with particular attention to disaggregated Asian and Hispanic subpopulations. Up-to-date colonoscopy was defined as colonoscopy within the past 10 years. For each subgroup, we calculated the absolute change in proportion of individuals with up-to-date colonoscopy over the study period (2003–16) as well as the absolute difference in proportion of individuals with up-to-date colonoscopy in 2015–16 compared to the non-Hispanic White population. We followed the NYCCHS reporting guidelines for data reliability[16].

We also examined the association between colonoscopy uptake and a number of demographic (age, sex, race and ethnicity, birthplace, home language, borough of residence), socioeconomic (level of education, marital status, number of children in the household, employment status, household income, insurance status), and health-related factors (presence of a primary care provider, diabetes, self-rated general health, receipt of annual flu vaccine, amount of fruits/vegetables consumed, number of sugar-sweetened beverages consumed, body mass index (BMI), exercise in the last 30 days, and smoking status). Household income was imputed for respondents with missing data.

To identify predictors of up-to-date colonoscopy, we performed univariable logistic regression to calculate the odds ratio and confidence interval for each variable. Age, sex, and other variables with $P < 0.10$ on univariable regression were entered into a multivariable logistic regression model to identify independent predictors of colonoscopy utilization. The final models were refined by backward stepwise selection until all retained variables had $P < 0.05$. Racial and ethnic subgroups were combined into aggregated categories for regression models. Statistical analysis was performed using SAS Enterprise Guide, version 4.2, software (SAS Institute, Inc., Cary, North Carolina) to accommodate the complex survey design. Survey results were weighted to adjust for the probability of selection as well as a post-stratification weight. Multi-year weights were also included for the combination of multiple years of data. This study (18–00012) was approved by the NYU Grossman School of Medicine Institutional Review Board.

RESULTS

Consistent with the Department of Health and Mental Hygiene's reporting guidelines for data reliability, we describe only results with reliable estimates in the following sections. Table 1 provides all estimates, including potentially imprecise ones, for up-to-date colonoscopy use over time and by racial and ethnic subgroup. Comparing 2016 to 2003, colonoscopy uptake increased 13.89% (from 54.27% to 68.16%) among non-Hispanic Whites and 23.93% (from 47.20% to 71.13%) among non-Hispanic Blacks. Among Asian subgroups, Chinese participants had the highest colonoscopy use in three out of six time periods (2006–08, 2011–12, and 2013–14) while Asian Indians had the lowest uptake in both time periods for which estimates were reliable (2011–12 and 2015–16). Chinese participants had a net increase in colonoscopy use from 2003 to 2016 (+23.05%), but still trailed non-Hispanic Whites in 2015–16 (−3.80%). Asian Indian individuals also trailed non-Hispanic Whites in 2015–16 (−15.95%), while the Other Asian subgroup had 9.81% higher uptake. Among Hispanic subgroups, Cubans had the highest colonoscopy use in both time periods for which estimates were reliable (2006–08 and 2011–12). Dominican participants had the highest uptake starting in 2013, while Mexicans had the lowest uptake in 2015–16. Puerto Ricans, Dominicans, Central/South Americans, and Other Hispanics had net increases in colonoscopy use from 2003 to 2016 (+24.90%,+28.67%, +30.82%, and +23.46%, respectively). While Puerto Ricans, Dominicans, and Central/South Americans had higher uptake compared to non-Hispanic Whites in 2015–16 (+3.28%, +4.77%, and +2.28%, respectively), uptake among Mexicans and Other Hispanics remained lower (−35.96% and −0.26%, respectively). Table 2 shows weighted frequencies of colonoscopy use by various patient characteristics.

On univariable analysis (Table 3), age ≥ 65 years was associated with increased up-to-date colonoscopy use in all time periods. Female sex was associated with decreased colonoscopy uptake in two early periods (2003–05 and 2009–2010), but the direction of association reversed after 2011. Compared to non-Hispanic Whites, Hispanics had lower colonoscopy use in 2003–08 and Asians and Native Hawaiians/Pacific Islanders had lower use in all time periods except 2011–12. The following groups of participants had decreased colonoscopy uptake in at least three time periods: those who were born outside of the United States, were not married or partnered, had children in the household, were unemployed, lived outside of Manhattan, were uninsured or enrolled in Medicaid, did not have a primary care provider, did not have diabetes, had not exercised in the last 30 days, or were current smokers. Relative to those who spoke English at home, individuals who spoke Spanish, Russian, Chinese, or an Asian Indian language had decreased up-to-date colonoscopy use in two time periods. Conversely, positive predictors of colonoscopy in at least two time periods included the following: having attended or completed college, not being in the labor force, having income ≥200% of the poverty line, being enrolled in Medicare, having received an updated annual flu vaccine, eating ≥1 serving of fruits/vegetables per day, not drinking sugar sweetened beverages, and being a former smoker.

On multivariable analysis (Table 4), age ≥65 years was a positive predictor of up-to-date colonoscopy in all time periods [OR ranging from 1.20 (95% CI 1.03–1.41) in 2003–05 to 1.54 (95% CI 1.28–1.85) in 2013–14]. Female sex was a negative predictor of colonoscopy

in the first three time periods [OR ranging from 0.80 (95% CI 0.71–0.91) in 2003–05 to 0.83 (95% CI 0.70–0.98) in 2006–08]. In terms of race and ethnicity, relative to non-Hispanic Whites, non-Hispanic Black individuals had increased odds of up-to-date colonoscopy in 2006–08 [OR 1.28 (95% CI 1.04–1.58)] and 2015–16 [OR 1.58 (95% CI 1.29–1.92)]. In contrast, the Asian and Native Hawaiian/Pacific Islander population had significantly lower odds of up-to-date colonoscopy in 2009–10 [OR 0.59 (95% CI 0.37–0.92)]. Factors that were negative predictors of up-to-date colonoscopy in at least two time periods included the following: Asian Indian home language, not being married or partnered, having children in the household, living in Queens or Staten Island, being uninsured or on Medicaid, not having a primary care provider, not having exercised in the last 30 days, and being a current smoker. On the contrary, positive predictors of colonoscopy use in at least two time periods included: Spanish home language, income ≥200% of the poverty line, having received an annual flu vaccine, not drinking sugar sweetened beverages, and being a former smoker.

DISCUSSION

In this analysis of the NYCCHS from 2003 to 2016, we identified substantial variation in colonoscopy uptake between racial and ethnic subgroups among participants aged 50 years and older. All racial and ethnic subgroups with reliable estimates saw a net increase in colonoscopy uptake between 2003 and 2016. While the non-Hispanic Black, Other Asian, Puerto Rican, Dominican, and Central/South American subgroups had higher colonoscopy use compared to non-Hispanic Whites by 2015–16, uptake among the non-Hispanic Other, Chinese, Asian Indian, Mexican, and Other Hispanic subgroups remained lower. On multivariable regression models, we identified age, sex, race and ethnicity, marital status, presence of children in the household, insurance status, presence of primary care provider, receipt of annual flu vaccine, exercise in the last 30 days, and smoking status as independent predictors of colonoscopy uptake in at least three out of six time periods.

Our findings add to the relatively limited body of literature surrounding colorectal cancer screening disparities in Hispanic subgroups. In New York City, Cubans had the highest colonoscopy uptake among Hispanic subgroups in 2006–08 and 2011–12 (range 72.87%–75.93%), and Dominicans had the highest in 2013–16 (range 72.93%–73.99%). Mexicans had the lowest uptake in 2015–16 (32.20%). These results parallel those of Castañeda et al., who examined trends in colorectal cancer screening among Hispanics/Latinos living in four urban communities across the United States (Chicago, Miami, San Diego, and the Bronx). They found that Puerto Rican females and Dominican males had significantly higher sigmoidoscopy/colonoscopy use compared to Mexican females and males, respectively[17]. However, these trends differ from the 1999–2005 MEPS data, which showed that 51.0% of Cubans, 45.7% of Puerto Ricans, 35.2% of Mexicans, and 28.5% of Dominicans had undergone up-to-date colorectal cancer screening[10]. Data for Central/South Americans were not included in MEPS. Conversely, a more recent 2015 report from the American Cancer Society found that Cubans and Dominicans had the lowest uptake (38.6%) of up-to-date colorectal cancer screening among Hispanic subgroups on a national level[18]. Additionally, Puerto Ricans had the highest proportion of colorectal cancer screening test use (56.80%), followed by Mexicans (44.60%) and Central/South Americans (40.50%). Taken together, these data suggest that New York City has achieved higher colonoscopy uptake among

minority subgroups – potentially as a result of C5 initiatives – even though substantial variation remains between subgroups. The discrepancy in estimates between our study and prior studies for certain Hispanic subgroups (specifically Cubans and Dominicans) may be attributed to demographic and behavioral differences in distinct regional communities of the same ethnic group. Additionally, the relatively small number of Cubans surveyed may have influenced our finding.

We found similar variation among Asians and Native Hawaiians/Pacific Islanders in our analysis. Chinese individuals had the highest colonoscopy uptake in half of the time periods (range 60.20%–69.50%) and Asian Indians had the lowest uptake in both time periods for which estimates were reliable (range 41.58%–52.21%). These findings differ slightly from those of Sy et al., who found that Filipinos had the highest prevalence of colorectal cancer screening (55.0%) followed by Chinese (50.9%) and Asian Indians (48.6%) using data from the 2009–14 MEPS[13]. Similarly, in their analysis of aggregated data from the 2001, 2003, and 2005 CHIS, Lee et al. reported that Japanese individuals had the highest overall colorectal cancer screening uptake (59.8%), followed by Chinese (50.70%), Vietnamese (46.60%), South Asians (42.30%), Pacific Islanders (42.40%), Filipinos (41.70%), and Koreans (32.70%)[11]. Additionally, further analysis determined that Filipinos, Koreans, Pacific Islanders, and South Asians were significantly less likely to have up-to-date screening compared to Japanese, Chinese, and Vietnamese individuals. Our findings are broadly consistent with these trends, with Chinese adults having relatively high colonoscopy uptake and Asian Indian adults having relatively low colonoscopy uptake. However, we did not conduct separate analyses for Korean, Japanese, Vietnamese, or Pacific Islander individuals due to small sample sizes. Nevertheless, the aggregated category of “Other Asian,” which included these subgroups, had the highest colonoscopy uptake (77.97%) of any Asian subgroup in the final time period of our study. Consistent with multiple prior analyses, Asian Indians emerged as one of the groups with the lowest screening uptake[12–14].

In addition to the influence of race and ethnicity, we examined the association between language spoken at home and colonoscopy uptake. Those who spoke an Asian Indian home language or fell into the category of “Other” (speaking a language other than English, Spanish, Russian, Chinese, or Asian Indian) had significantly decreased odds of up-to-date colonoscopy in two time periods. Additionally, those who spoke Russian had lower colonoscopy use compared to English speakers in 2009–10. Home or preferred language has been used as a surrogate for acculturation, and previous studies of both Asian and Hispanic populations have found that higher levels of acculturation may correlate with increased likelihood of colorectal cancer screening[25, 26]. On the other hand, we also found that Spanish home language was an independent positive predictor of colonoscopy uptake in 2011–12 and 2013–14. Although the findings in Spanish speakers contrast with the results of other languages included in the survey, they reflect an overall increase in colonoscopy uptake among Hispanic subgroups over the study period and may indicate a positive response to C5 initiatives targeting the Spanish-speaking community. Interestingly, this same phenomenon was observed by Costas-Muniz et al., who found that Hispanic individuals with a preference for Spanish and lower levels of acculturation were more likely to have up-to-date colorectal cancer screening[27].

Older age[19–12], male sex[20, 21], being insured[20–22], higher income[19, 23], and being married[20, 21, 24] are well-established sociodemographic predictors of colonoscopy uptake. The results of our study are consistent with the current body of literature in that all of these characteristics were identified as independent predictors of colonoscopy uptake in our adjusted model. We found that age ≥ 65 years was a positive predictor of colonoscopy uptake in all time periods and that income ≥ 200% of the poverty line was a positive predictor in both periods it was included in the survey; additionally, being uninsured was a negative predictor across all time periods, not being married or partnered was a negative predictor in four periods, and female sex was a negative predictor in three periods. We also found that participants with children in the household, compared to those without, had a significantly lower likelihood of up-to-date colonoscopy in three time periods. To our knowledge, this is a novel observation that may reflect a trade-off in the amount of time spent on childcare responsibilities versus personal health care in these adults. In fact, this may be an important component factor that explains why younger adults are less likely to complete screening than older adults.

Lastly, some of the strongest predictors of colonoscopy uptake in our model fall under the category of health-related factors. For instance, receipt of annual flu vaccine was a positive predictor of colonoscopy use across all time periods. This echoes findings from a previous study which demonstrated a positive association between influenza immunization and fecal occult blood test (FOBT) completion[28]. Similarly, lack of a primary care provider was a negative predictor of colonoscopy uptake in five periods. This is consistent with past studies that have shown a relationship between colonoscopy uptake and frequency of visits to the physician or having a usual source of healthcare[19, 21, 28]. Additionally, compared to never smokers, current smokers and former smokers had decreased and increased odds of up-to-date colonoscopy respectively, a finding which mirrors results from previous studies[24, 29]. Ultimately, these conclusions highlight the importance and impact of being well-connected to medical care. Similar reasoning may be used to explain why individuals without diabetes were less likely to have up-to-date colonoscopy, as those with diabetes tend to have more frequent contact with providers who manage their chronic condition.

The major strengths of this study include the large sample size, longitudinal nature, and wide range of variables captured in the NYCCHS. Additionally, the nuanced racial and ethnic data (specifically within Asian and Hispanic subgroups) recorded in the survey enables investigation of trends that are currently poorly studied. However, it is also important to acknowledge several limitations. First, the NYCCHS is a phone survey and therefore data may be biased towards those who are more accessible by phone. Second, the survey asks participants specifically about colonoscopy, which is the most commonly used of several screening modalities. Therefore, our results underestimate the overall up-to-date colorectal cancer screening uptake. Third, due to the relatively low number of participants surveyed in certain ethnic subgroups, some of our estimates may be imprecise and therefore must be interpreted with caution. Finally, as with any study involving a distinct geographic region, conclusions drawn from the NYCCHS may not be generalizable to other areas of the United States. Nevertheless, the demographic diversity of New York City makes this population ideal for studying health disparities.

In summary, among New Yorkers aged 50 years and older, we found significant variation in colonoscopy uptake among Asian and Hispanic subgroups. In addition, we identified numerous demographic, socioeconomic, and health-related predictors of colonoscopy uptake in this population. These findings highlight the importance of examining health disparities through the lens of disaggregated racial and ethnic subgroups and have the potential to inform future targeted public health interventions to increase screening colonoscopy uptake.

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Table 1.

Up-to-date colonoscopy in 2003–16 by race and ethnicity

	Number Screened/Total and Percent Screened (Weighted)							
Race and Ethnicity	**2003–05 (n=11,687)**	**2006–08 (n=13,672)**	**2009–10 (n=10,216)**	**2011–12 (n=9,884)**	**2013–14 (n=8,524)**	**2015–16 (n=10,640)**	**% Diff, 2015–16**	**% Change, 2003–16**
White, Non-Hispanic	3110/5707 54.27	4274/6580 64.24	3527/5092 67.53	3580/4977 68.16	2675/3662 69.54	3022/4275 68.16	Ref	13.89
Black, Non-Hispanic	1208/2474 47.20	1891/3006 63.21	1493/2188 65.01	1404/1953 68.99	1196/1751 67.24	1717/2357 71.13	2.97	23.93
Other, Non-Hispanic	128/265 48.39	163/286 53.66	111/154 58.59	94/148 62.74	97/147 61.11	139/198 64.12	−4.04	15.73
Chinese	109/256 41.31	213/355 60.20	201/340 55.51	306/441 68.12	346/539 68.50	440/658 64.36	−3.80	23.05
Asian Indian	13/49 23.35 *	42/76 49.88 *	30/61 42.53 *	53/101 41.58	54/95 49.26 *	65/123 52.21	−15.95	28.86 [a]
Filipino	19/48 38.37 *	35/57 58.29 *	28/43 78.65 *	30/41 57.47 *	31/47 59.15 *	26/41 51.48 *	−16.68 [a]	13.11 [a]
Other Asian	36/69 54.16 *	25/54 43.69 *	10/17 74.36 *	26/43 67.29 *	30/58 46.35 *	49/68 77.97	9.81	23.81 [a]
Puerto Rican	478/994 46.54	674/1078 61.19	589/902 62.61	534/762 63.31	532/745 69.08	687/937 71.44	3.28	24.90
Cuban	33/67 51.98 *	56/86 72.87	37/54 84.13 *	61/82 75.93	39/57 62.48 *	33/58 49.17 *	−18.99 [a]	−2.81 [a]
Dominican	181/404 44.26	381/589 61.13	366/523 67.42	459/607 69.65	522/713 73.99	671/905 72.93	4.77	28.67
Mexican	14/42 40.20 *	25/54 42.73 *	14/35 34.08 *	27/45 67.38 *	29/51 49.98 *	43/97 32.20	−35.96	−8.00 [a]
Central/ South American	155/351 39.62	294/481 60.57	245/346 68.57	273/364 67.53	308/447 69.72	416/561 70.44	2.28	30.82
Other Hispanic	61/131 44.44	75/141 47.41 *	83/126 50.13	77/104 75.85	49/71 64.82 *	78/119 67.90	−0.26	23.46

*Estimate should be interpreted with caution. Estimate's relative standard error (a measure of estimate precision) is greater than 30%, the 95% confidence interval half-width is greater than 10, or the sample size is too small, making the estimate potentially unreliable.

[a]Calculated using potentially imprecise estimate

Table 2.

Frequency of up-to-date colonoscopy by participant characteristic

Variable	Number Screened/Total and Percent Screened (Weighted)					
Age	**2003–2005**	**2006–2008**	**2009–2010**	**2011–2012**	**2013–2014**	**2015–2016**
50–64	2846/6137 45.05	4118/7071 58.03	3453/5366 60.01	3372/5067 63.52	3030/4687 63.29	3586/5460 64.58
65 and older	2764/4897 55.92	4161/6032 67.78	3380/4695 70.87	3625/4716 74.00	2907/3739 76.26	3871/5059 74.52
Sex						
Male	2361/4388 52.64	3161/4953 63.00	2674/3835 66.35	2772/3899 65.34	2422/3505 66.44	2884/4187 66.33
Female	3249/6646 47.83	5118/8150 61.71	4159/6226 62.91	4225/5884 69.41	3515/4921 69.75	4573/6331 70.09
Race and Ethnicity						
White, non-Hispanic	3110/5707 54.27	4274/6580 64.24	3527/5092 67.53	3580/4977 68.16	2675/3662 69.54	3022/4275 68.16
Black, non-Hispanic	1208/2474 47.20	1891/3006 63.21	1493/2188 65.01	1404/1953 68.99	1196/1751 67.24	1717/2357 71.13
Hispanic	953/2060 44.72	1552/2503 59.92	1364/2030 64.97	1455/2000 67.73	1495/2107 69.88	1948/2712 69.38
Asian/Native Hawaiian/Pacific Islander, non-Hispanic	211/528 38.88	399/728 55.40	338/597 52.92	464/705 63.80	474/759 63.12	631/977 62.20
Other, non-Hispanic	128/265 48.39	163/286 53.66	111/154 58.59	94/148 62.74	97/147 61.11	139/198 64.12
Birthplace						
United States	3994/7491 52.95	5476/8417 64.80	4579/6526 68.62	4493/6259 66.65	3491/4819 69.18	4192/5821 69.66
Foreign	1608/3526 44.46	2801/4681 58.63	2240/3508 59.50	2493/3510 68.72	2429/3578 67.43	3241/4662 67.15
Home Language						
English	-	6384/9895 64.25	5327/7680 66.73	5298/7362 68.18	4071/5709 68.62	4974/6967 69.50
Spanish	-	1072/1689 60.92	912/1362 65.40	1019/1379 68.95	1112/1553 70.72	1444/1977 70.56
Russian	-	324/577 55.89	225/376 53.68	218/324 68.42	251/347 68.88	400/544 68.89
Chinese	-	188/322 59.64	191/318 55.06	272/398 67.40	323/508 67.88	439/672 63.96
Asian Indian	-	20/34 54.33*	14/24 54.00*	15/32 31.99*	9/18 28.19*	8/14 47.17*
Other	-	260/545 47.35	147/265 50.89	153/257 58.91	157/268 57.30	166/307 48.23
Education						
High school Graduate or less	2425/5137 46.76	3450/5781 58.27	2597/4076 61.38	2529/3709 65.35	2387/3521 66.67	3072/4437 66.42
Some College	1052/2041 49.79	1502/2418 61.14	1291/1913 62.53	1295/1805 67.17	1078/1558 66.52	1375/1973 67.75
College Graduate	2103/3797 54.14	3276/4812 67.86	2915/4019 71.30	3137/4220 71.56	2441/3301 71.85	2962/4043 71.73
Marital Status						
Married or partnered	1677/3000 55.19	3404/5289 63.66	2764/3963 64.99	2875/3920 70.09	2629/3640 70.22	3177/4451 69.07
Not married or partnered	2465/4635 51.63	4820/7732 60.71	4025/6032 63.75	4075/5800 64.66	3276/4735 66.09	4223/5989 67.75

Variable	Number Screened/Total and Percent Screened (Weighted)					
Children in household						
No	1889/9330 51.71	7092/10985 63.74	5980/8677 65.21	6091/8326 68.92	5012/6959 69.55	6368/8778 69.78
Yes	702/1672 41.39	1155/2065 55.82	842/1362 60.71	896/1445 61.42	916/1456 62.13	1074/1720 61.48
Employment status						
Employed	2112/4491 45.65	3256/5431 59.88	2812/4202 62.44	2725/3930 66.02	2381/3583 64.71	2868/4290 65.27
Unemployed	292/669 42.53	337/625 52.42	312/524 57.01	353/581 53.22	290/496 58.68	300/494 59.96
Not in Labor Force	3176/5798 54.24	4624/6952 65.37	3695/5304 67.28	3894/5231 71.40	3236/4300 72.72	4260/5688 72.33
Income [a]						
<200% of Poverty Line	-	-	-	-	2566/3832 65.26	3458/5043 65.86
>=200% of Poverty Line	-	-	-	-	3371/4594 71.24	3999/5476 70.87
Borough of residence						
Manhattan	1372/2406 57.45	2061/2957 69.85	1940/2690 69.37	2542/3413 70.79	1728/2298 73.66	1472/1968 73.57
Bronx	842/1612 49.71	1209/1918 61.62	1026/1564 61.68	867/1220 66.09	932/1341 67.15	1261/1760 69.34
Brooklyn	1551/3349 46.36	2268/3782 58.97	1626/2430 63.42	1390/2043 66.97	1393/2043 68.34	2351/3371 65.99
Queens	1430/2897 47.23	2085/3393 60.68	1683/2558 62.85	1592/2259 66.81	1273/1884 66.15	1930/2776 67.44
Staten Island	415/770 54.45	656/1053 61.38	558/819 66.95	606/848 67.82	611/860 64.16	443/644 65.75
Insurance						
Private	2344/4481 52.11	3638/5614 65.06	3086/4366 67.65	2900/4009 70.74	2397/3313 70.76	2832/3964 69.67
Medicare	1869/3222 57.09	2695/3896 67.82	2466/3491 69.32	2542/3338 72.77	1996/2623 74.01	2779/3658 73.89
Medicaid	851/1986 41.42	915/1544 58.17	651/1052 58.76	828/1200 62.64	1017/1497 66.87	1376/2045 64.18
Other	246/470 50.76	438/665 66.05	290/412 62.72	271/367 71.26	164/243 65.23	170/232 71.51
Uninsured	223/739 28.72	452/1133 39.36	276/648 37.31	386/751 49.95	276/614 45.76	178/441 40.78
Primary care provider						
Yes	5138/9639 52.54	7645/11594 65.31	-	6620/8999 69.78	5603/7710 70.67	7107/9735 70.66
No	445/1319 32.59	595/1424 40.72	-	349/742 49.82	304/671 45.33	319/731 40.95
Diabetes						
Yes	-	-	1398/1964 68.80	1368/1853 70.34	1295/1735 73.05	1831/2416 74.27
No	-	-	5426/8078 63.36	5605/7899 66.99	4623/6663 67.05	5604/8068 66.76
General health						
Excellent	709/1441 49.30	1003/1611 63.78	906/1358 62.48	994/1404 64.99	773/1118 67.70	832/1206 69.16
Very good	1140/2256 49.29	1740/2698 63.89	1567/2197 69.99	1651/2275 68.49	1318/1859 68.54	1650/2345 67.53

Variable	Number Screened/Total and Percent Screened (Weighted)					
Good	1819/3568 50.64	2687/4288 61.00	2072/3113 62.79	2145/3005 66.42	1801/2584 67.07	2272/3285 65.15
Fair	1248/2473 47.75	1778/2833 61.98	1490/2187 63.65	1407/1951 69.65	1336/1884 68.99	1776/2410 72.35
Poor	659/1219 53.87	961/1502 62.31	744/1118 62.26	727/1024 69.03	660/906 71.06	853/1165 70.52
Flu shot						
No	2745/6288 42.57	3957/7183 54.60	3018/5070 56.40	2628/4275 59.29	2169/3597 58.39	2783/4530 58.03
Yes	2840/4690 59.99	4163/5671 72.49	3773/4924 73.93	4341/5464 75.01	3751/4793 76.66	4643/5947 76.77
Fruits/vegetables servings						
0	-	-	577/938 58.68	573/880 63.07	527/822 61.05	671/1043 62.58
1–4	-	-	5197/7627 64.85	5349/7466 67.83	4585/6442 68.76	5836/8114 69.46
5+	-	-	907/1267 67.45	916/1197 73.22	670/926 71.60	774/1077 69.91
Sugar sweetened beverage (1+ SSB per day)						
Yes	-	-	1341/2114 59.49	1195/1789 62.50	847/1339 58.77	1185/1810 63.30
No	-	-	5432/7861 65.71	5728/7893 68.91%	5024/6972 70.41	6203/8593 69.64
BMI						
<25	1936/3861 49.01	2986/4696 63.21	2490/3769 62.52	2648/3722 67.24	2017/2955 67.20	2501/3578 67.84
25 to <30	2064/3881 51.79	3093/4838 62.22	2487/3550 65.39	2490/3412 68.27	2213/3097 68.92	2814/3900 69.85
30+	1370/2702 50.38	2039/3275 61.74	1743/2544 66.05	1763/2505 67.06	1650/2276 69.35	2021/2853 67.31
Exercise in last 30 days						
Yes	3876/7277 52.38	-	4849/6895 66.74	5474/7491 69.11	4440/6170 70.03	5473/7511 70.49
No	1671/3642 67.03	-	1980/3158 59.70	1517/2283 63.12	1491/2245 64.26	1975/2994 63.52
Tobacco						
Never	-	1402/2302 59.37	3562/5349 63.59	3772/5224 69.88	3351/4767 67.97	4397/6189 69.30
Current	-	323/648 48.38	665/1202 49.64	695/1193 53.95	570/1004 55.70	744/1202 56.61
Former	-	955/1455 64.96	2571/3457 72.11	2489/3302 69.72	1986/2613 74.44	2268/3058 71.48

[a]Household income was imputed for those with missing data.

Table 3.

Univariable analysis of factors associated with receipt of colonoscopy in last 10 years

Variable	Unadjusted Odds Ratio (95% CI)					
Age	**2003–2005**	**2006–2008**	**2009–2010**	**2011–2012**	**2013–2014**	**2015–2016**
50–64	Ref	Ref	Ref	Ref	Ref	Ref
65 and older	**1.55 (1.41–1.69)**	**1.52 (1.39–1.66)**	**1.62 (1.40–1.87)**	**1.63 (1.42–1.89)**	**1.86 (1.62–2.14)**	**1.60 (1.41–1.83)**
Sex						
Male	Ref	Ref	Ref	Ref	Ref	Ref
Female	**0.83 (0.75–0.90)**	0.95 (0.87–1.04)	**0.86 (0.74–1.00)**	**1.20 (1.05–1.39)**	**1.17 (1.02–1.34)**	**1.19 (1.05–1.35)**
Race and Ethnicity						
White, non-Hispanic	Ref	Ref	Ref	Ref	Ref	Ref
Black, non-Hispanic	**0.75 (0.67–0.84)**	0.96 (0.86–1.07)	0.89 (0.75–1.07)	1.04 (0.86–1.25)	0.90 (0.75–1.08)	1.15 (0.97–1.36)
Hispanic	**0.68 (0.60–0.77)**	**0.83 (0.74–0.94)**	0.89 (0.74–1.08)	0.98 (0.81–1.18)	1.02 (0.86–1.21)	1.06 (0.90–1.25)
Asian/Native Hawaiian/ Pacific Islander, non-Hispanic	**0.54 (0.43–0.66)**	**0.69 (0.57–0.83)**	**0.54 (0.42–0.70)**	0.82 (0.65–1.05)	**0.75 (0.59–0.95)**	**0.77 (0.62–0.95)**
Other, non-Hispanic	0.79 (0.59–1.07)	**0.64 (0.47–0.89)**	0.68 (0.40–1.17)	0.79 (0.47–1.32)	0.69 (0.42–1.13)	0.84 (0.51–1.36)
Birthplace						
United States	Ref	Ref	Ref	Ref	Ref	Ref
Foreign	**0.71 (0.65–0.78)**	**0.77 (0.70–0.84)**	**0.67 (0.58–0.78)**	1.10 (0.95–1.27)	0.92 (0.81–1.06)	0.89 (0.78–1.01)
Home Language						
English	-	Ref	Ref	Ref	Ref	Ref
Spanish	-	**0.87 (0.76–0.99)**	0.94 (0.76–1.16)	1.04 (0.84–1.27)	1.10 (0.92–1.32)	1.05 (0.88–1.25)
Russian	-	**0.71 (0.58–0.86)**	**0.58 (0.42–0.80)**	1.01 (0.71–1.44)	1.01 (0.72–1.43)	0.97 (0.73–1.29)
Chinese	-	0.82 (0.63–1.07)	**0.61 (0.44–0.85)**	0.96 (0.71–1.31)	0.97 (0.74–1.26)	**0.78 (0.62–0.98)**
Asian Indian	-	0.66 (0.30–1.45)	0.59 (0.20–1.68)	**0.22 (0.09–0.56)**	**0.18 (0.06–0.57)**	0.39 (0.07–2.21)
Other	-	**0.50 (0.40–0.62)**	**0.52 (0.35–0.75)**	**0.67 (0.47–0.96)**	**0.61 (0.44–0.86)**	**0.41 (0.29–0.57)**
Education						
High school Graduate or less	Ref	Ref	Ref	Ref	Ref	Ref
Some College	**1.13 (1.00–1.28)**	**1.13 (1.00–1.27)**	1.05 (0.87–1.27)	1.09 (0.90–1.31)	0.99 (0.83–1.19)	1.06 (0.90–1.26)
College Graduate	**1.34 (1.22–1.49)**	**1.51 (1.37–1.67)**	**1.56 (1.33–1.84)**	**1.33 (1.14–1.56)**	**1.28 (1.10–1.49)**	**1.28 (1.11–1.48)**
Marital Status						
Married or partnered	Ref	Ref	Ref	Ref	Ref	Ref
Not married or partnered	**0.87 (0.78–0.97)**	**0.88 (0.81–0.96)**	0.95 (0.82–1.09)	**0.78 (0.68–0.90)**	**0.83 (0.72–0.95)**	0.94 (0.83–1.07)
Children in household						

Variable	Unadjusted Odds Ratio (95% CI)					
No	Ref	Ref	Ref	Ref	Ref	Ref
Yes	**0.66 (0.58–0.75)**	**0.72 (0.64–0.81)**	**0.83 (0.68–1.00)**	**0.72 (0.60–0.86)**	**0.72 (0.61–0.85)**	**0.69 (0.59–0.81)**
Employment status						
Employed	Ref	Ref	Ref	Ref	Ref	Ref
Unemployed	0.88 (0.72–1.08)	**0.74 (0.60–0.91)**	0.80 (0.57–1.11)	**0.59 (0.44–0.77)**	0.77 (0.60–1.01)	**0.70 (0.54–0.92)**
Not in Labor Force	**1.41 (1.29–1.55)**	**1.27 (1.16–1.39)**	**1.24 (1.07–1.43)**	**1.29 (1.11–1.49)**	**1.45 (1.26–1.68)**	**1.39 (1.22–1.59)**
Income [a]						
<200% of Poverty Line	-	-	-	-	Ref	Ref
>=200% of Poverty Line	-	-	-	-	**1.32 (1.15–1.51)**	**1.26 (1.11–1.43)**
Borough of residence						
Manhattan	Ref	Ref	Ref	Ref	Ref	Ref
Bronx	**0.73 (0.63–0.85)**	**0.69 (0.60–0.81)**	**0.71 (0.56–0.90)**	0.80 (0.63–1.02)	**0.73 (0.59–0.90)**	0.81 (0.65–1.02)
Brooklyn	**0.64 (0.56–0.73)**	**0.62 (0.55–0.70)**	**0.77 (0.61–0.96)**	0.84 (0.68–1.03)	**0.77 (0.64–0.93)**	**0.70 (0.58–0.84)**
Queens	**0.66 (0.58–0.76)**	**0.67 (0.59–0.76)**	**0.75 (0.60–0.94)**	0.83 (0.68–1.02)	**0.70 (0.58–0.84)**	**0.74 (0.61–0.91)**
Staten Island	0.89 (0.73–1.07)	**0.69 (0.58–0.82)**	0.89 (0.67–1.20)	0.87 (0.67–1.13)	**0.64 (0.50–0.83)**	**0.69 (0.52–0.92)**
Insurance						
Private	Ref	Ref	Ref	Ref	Ref	Ref
Medicare	**1.22 (1.10–1.36)**	**1.13 (1.02–1.26)**	1.08 (0.92–1.28)	1.11 (0.93–1.31)	1.18 (0.99–1.40)	**1.23 (1.05–1.45)**
Medicaid	**0.65 (0.57–0.74)**	**0.75 (0.65–0.86)**	**0.68 (0.54–0.87)**	**0.69 (0.56–0.86)**	0.83 (0.69–1.01)	**0.78 (0.66–0.92)**
Other	0.95 (0.76–1.18)	1.05 (0.85–1.29)	0.80 (0.55–1.18)	1.03 (0.73–1.45)	0.78 (0.52–1.16)	1.09 (0.71–1.68)
Uninsured	**0.37 (0.30–0.46)**	**0.35 (0.30–0.41)**	**0.29 (0.21–0.38)**	**0.41 (0.32–0.53)**	**0.35 (0.27–0.45)**	**0.30 (0.23–0.40)**
Primary care provider						
Yes	Ref	Ref	-	Ref	Ref	Ref
No	**0.44 (0.38–0.51)**	**0.37 (0.32–0.42)**	-	**0.46 (0.36–0.58)**	**0.34 (0.27–0.44)**	**0.29 (0.23–0.36)**
Diabetes						
Yes	-	-	Ref	Ref	Ref	Ref
No	-	-	**0.78 (0.65–0.94)**	0.86 (0.72–1.02)	**0.75 (0.63–0.89)**	**0.70 (0.60–0.81)**
General health						
Excellent	Ref	Ref	Ref	Ref	Ref	Ref
Very good	1.00 (0.85–1.17)	1.00 (0.86–1.17)	**1.40 (1.09–1.80)**	1.17 (0.92–1.49)	1.04 (0.83–1.31)	0.93 (0.74–1.16)
Good	1.06 (0.91–1.22)	0.89 (0.77–1.03)	1.01 (0.80–1.28)	1.07 (0.85–1.33)	0.97 (0.78–1.20)	0.83 (0.67–1.03)
Fair	0.94 (0.81–1.10)	0.93 (0.79–1.08)	1.05 (0.82–1.35)	1.24 (0.97–1.57)	1.06 (0.84–1.34)	1.17 (0.93–1.47)

Variable	Unadjusted Odds Ratio (95% CI)					
Poor	**1.20 (1.00–1.44)**	0.94 (0.79–1.12)	0.99 (0.74–1.33)	1.20 (0.91–1.59)	1.17 (0.89–1.55)	1.07 (0.81–1.41)
Flu shot						
No	Ref	Ref	Ref	Ref	Ref	Ref
Yes	**2.02 (1.85–2.22)**	**2.19 (2.00–2.40)**	**2.19 (1.89–2.54)**	**2.06 (1.79–2.38)**	**2.34 (2.04–2.69)**	**2.39 (2.10–2.72)**
Fruits/vegetables servings						
0	-	-	Ref	Ref	Ref	Ref
1–4	-	-	**1.30 (1.02–1.65)**	1.24 (0.98–1.56)	**1.40 (1.13–1.75)**	**1.36 (1.11–1.67)**
5+	-	-	**1.46 (1.07–2.00)**	**1.60 (1.17–2.20)**	**1.61 (1.20–2.15)**	**1.39 (1.06–1.83)**
Sugar sweetened beverage (1+ SSB per day)						
Yes	-	-	Ref	Ref	Ref	Ref
No	-	-	**1.31 (1.10–1.54)**	**1.33 (1.12–1.58)**	**1.67 (1.40–2.00)**	**1.33 (1.13–1.56)**
BMI						
<25	Ref	Ref	Ref	Ref	Ref	Ref
25 to <30	**1.12 (1.01–1.24)**	0.96 (0.87–1.06)	1.13 (0.96–1.34)	1.05 (0.89–1.24)	1.08 (0.93–1.27)	1.10 (0.94–1.28)
30+	1.06 (0.94–1.19)	0.94 (0.84–1.05)	1.17 (0.97–1.40)	0.99 (0.83–1.18)	1.11 (0.93–1.32)	0.98 (0.83–1.15)
Exercise in last 30 days						
Yes	Ref	-	Ref	Ref	Ref	Ref
No	**0.73 (0.67–0.81)**	-	**0.74 (0.64–0.86)**	**0.77 (0.65–0.90)**	**0.77 (0.66–0.89)**	**0.73 (0.64–0.84)**
Tobacco						
Never	-	Ref	Ref	Ref	Ref	Ref
Current	-	**0.64 (0.52–0.79)**	**0.56 (0.45–0.70)**	**0.51 (0.41–0.62)**	**0.59 (0.48–0.73)**	**0.58 (0.48–0.70)**
Former	-	**1.27 (1.08–1.50)**	**1.48 (1.26–1.74)**	0.99 (0.85–1.16)	**1.37 (1.17–1.60)**	1.11 (0.96–1.29)

[a]Household income was imputed for those with missing data.

Table 4.

Multivariable analysis of factors associated with receipt of colonoscopy in last 10 years

Variable	Adjusted Odds Ratio (95% CI)					
Age	**2003–2005**	**2006–2008**	**2009–2010**	**2011–2012**	**2013–2014**	**2015–2016**
50–64	Ref	Ref	Ref	Ref	Ref	Ref
65 and older	**1.20 (1.03–1.41)**	**1.33 (1.10–1.61)**	**1.37 (1.13–1.66)**	**1.34 (1.10–1.62)**	**1.54 (1.28–1.85)**	**1.22 (1.02–1.46)**
Sex						
Male	Ref	Ref	Ref	Ref	Ref	Ref
Female	**0.80 (0.71–0.91)**	**0.83 (0.70–0.98)**	**0.80 (0.68–0.94)**	1.17 (0.99–1.38)	1.12 (0.96–1.30)	1.03 (0.89–1.19)
Race and Ethnicity						
White, non-Hispanic	-	Ref	Ref	-	-	Ref
Black, non-Hispanic	-	**1.28 (1.04–1.58)**	1.19 (0.96–1.46)	-	-	**1.58 (1.29–1.92)**
Hispanic	-	1.14 (0.91–1.42)	1.29 (0.95–1.74)	-	-	1.10 (0.82–1.48)
Asian/Native Hawaiian/ Pacific Islander, non-Hispanic	-	0.77 (0.56–1.07)	**0.59 (0.37–0.92)**	-	-	0.96 (0.63–1.45)
Other, non-Hispanic	-	0.88 (0.52–1.49)	0.84 (0.47–1.51)	-	-	1.17 (0.73–1.89)
Home Language						
English	-	-	Ref	Ref	Ref	Refs
Spanish	-	-	1.08 (0.76–1.54)	**1.35 (1.06–1.72)**	**1.61 (1.29–2.00)**	1.36 (0.99–1.88)
Russian	-	-	**0.58 (0.40–0.86)**	1.15 (0.78–1.70)	0.98 (0.64–1.51)	1.17 (0.82–1.67)
Chinese	-	-	1.20 (0.67–2.16)	0.87 (0.61–1.23)	1.00 (0.72–1.39)	0.86 (0.53–1.40)
Asian Indian	-	-	0.82 (0.24–2.76)	**0.26 (0.10–0.67)**	**0.24 (0.07–0.84)**	0.23 (0.04–1.52)
Other	-	-	**0.66 (0.44–1.00)**	0.87 (0.57–1.32)	0.77 (0.53–1.11)	**0.56 (0.39–0.81)**
Education						
High school Graduate or less	-	-	Ref	-	-	-
Some College	-	-	1.08 (0.88–1.34)	-	-	-
College Graduate	-	-	**1.53 (1.25–1.86)**	-	-	-
Marital Status						
Married or partnered	Ref	Ref	-	Ref	Ref	-
Not married or partnered	**0.88 (0.78–0.99)**	**0.83 (0.70–0.98)**	-	**0.81 (0.68–0.95)**	**0.83 (0.71–0.98)**	-
Children in household						
No	Ref	-	-	-	Ref	Ref
Yes	**0.78 (0.66–0.92)**	-	-	-	**0.81 (0.66–0.98)**	**0.78 (0.65–0.93)**
Employment status						

Variable	Adjusted Odds Ratio (95% CI)					
Employed	Ref	-	-	-	-	-
Unemployed	**1.37 (1.04–1.81)**	-	-	-	-	-
Not in Labor Force	**1.31 (1.12–1.52)**	-	-	-	-	-
Income [a]						
<200% of Poverty Line	-	-	-	-	Ref	Ref
>=200% of Poverty Line	-	-	-	-	**1.23 (1.02–1.49)**	**1.31 (1.10–1.56)**
Borough of residence						
Manhattan	Ref	-	-	-	Ref	-
Bronx	**0.73 (0.60–0.89)**	-	-	-	0.80 (0.64–1.01)	-
Brooklyn	**0.62 (0.53–0.74)**	-	-	-	0.93 (0.76–1.15)	-
Queens	**0.63 (0.53–0.74)**	-	-	-	**0.79 (0.65–0.97)**	-
Staten Island	**0.68 (0.53–0.86)**	-	-	-	**0.69 (0.52–0.91)**	-
Insurance						
Private	Ref	Ref	Ref	Ref	Ref	Ref
Medicare	**0.82 (0.69–0.98)**	1.00 (0.80–1.26)	0.84 (0.68–1.05)	0.86 (0.69–1.07)	0.87 (0.68–1.09)	0.99 (0.80–1.22)
Medicaid	**0.58 (0.47–0.72)**	**0.78 (0.61–0.99)**	**0.75 (0.56–1.00)**	**0.66 (0.51–0.85)**	0.87 (0.69–1.11)	**0.80 {0.64–0.99)**
Other	0.85 (0.65–1.11)	1.09 (0.76–1.57)	0.69 (0.46–1.03)	0.95 (0.66–1.36)	0.70 (0.43–1.13)	1.23 (0.77–1.97)
Uninsured	**0.44 (0.35–0.57)**	**0.41 (0.30–0.56)**	**0.34 (0.26–0.46)**	**0.51 (0.38–0.69)**	**0.55 (0.40–0.77)**	**0.54 (0.39–0.76)**
Primary care provider						
Yes	Ref	Ref	-	Ref	Ref	Ref
No	**0.60 (0.49–0.73)**	**0.55 (0.44–0.71)**	-	**0.69 (0.51–0.92)**	**0.54 (0.41–0.72)**	**0.42 (0.32–0.55)**
Diabetes						
Yes	-	-	Ref	-	-	-
No	-	-	**0.81 (0.66–1.00)**	-	-	-
General health						
Excellent	Ref	-	-	-	-	-
Very good	0.91 (0.74–1.11)	-	-	-	-	-
Good	1.05 (0.88–1.27)	-	-	-	-	-
Fair	0.92 (0.75–1.13)	-	-	-	-	-
Poor	**1.33 (1.04–1.71)**	-	-	-	-	-
Flu shot						
No	Ref	Ref	Ref	Ref	Ref	Ref

Variable	Adjusted Odds Ratio (95% CI)					
Yes	**1.71 (1.51–1.93)**	**1.94 (1.64–2.29)**	**1.85 (1.57–2.18)**	**1.79 (1.53–2.09)**	**1.89 (1.62–2.21)**	**2.13 (1.85–2.46)**
Sugar sweetened beverage (1+ SSB per day)						
Yes	-	-	-	-	Ref	Ref
No	-	-	-	-	**1.37 (1.12–1.69)**	**1.29 (1.08–1.55)**
Exercise in last 30 days						
Yes	Ref	-	Ref	Ref	-	Ref
No	**0.82 (0.72–0.93)**	-	**0.82 (0.69–0.97)**	**0.81 (0.68–0.96)**	-	**0.71 (0.61–0.84)**
Tobacco						
Never	-	Ref	Ref	Ref	Ref	Ref
Current	-	**0.71 (0.57–0.89)**	**0.58 (0.45–0.73)**	**0.60 (0.48–0.75)**	**0.76 (0.60–0.96)**	**0.72 (0.59–0.89)**
Former	-	1.12 (0.93–1.34)	**1.24 (1.04–1.49)**	0.95 (0.80–1.14)	**1.33 (1.12–1.57)**	1.04 (0.88–1.22)

[a] Household income was imputed for those with missing data