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Family Health History and Health Behaviors in Alaska Native and American Indian People

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Abstract

Background—Family history of diseases among American Indian and Alaska Native (AIAN) people may influence health.

Methods—We examine the prevalence of family health history among a cohort of AIAN people (n= 10,374) enrolled in the Education and Research Towards Health (EARTH) Study. We evaluate the association between having a positive family history and health behaviors to determine if those reporting a family history were more likely to report lifestyles that put them at risk of developing these health conditions.

Results—Among participants, 17.7% reported not knowing their family history and 23.5% preferred not to answer the family history component of the questionnaire. Eight percent of participants reported a family history of colorectal cancer, 7.9% a family history of breast cancer, 25.8% a family history of heart attack, and 46.7% a family history of diabetes. Obesity, physical activity, cholesterol, and perceived health were associated with family history.

Conclusions—Individuals with a family history of diseases may have lifestyles that influence their disease risk.

Keywords

Family history; cancer; heart disease; diabetes; diet; American Indian; Alaska Native; health; stroke

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Chronic disease rates are heterogeneous within American Indian and Alaska Native populations. Alaska Native people have among the highest incidence and mortality rates for all cancers combined as well as for several specific types.[1,2] Differences in cancer mortality rates among American Indians and Alaska Native people based on geographic region of residence have been documented, with the highest mortality rates found in Alaska and the Northern Plains and the lowest mortality rates among Southwest U.S. American Indian people.[1] Age-adjusted cancer incidence rates for American Indians in the United States for all cancers combined continue to increase, and in Alaska specifically, are increasing at about 4% per year.[3]

Death rates from ischemic heart disease, once very low among American Indian populations, are increasing and in some instances are higher than rates in non-Hispanic White populations.[4–7] Among the Alaska Native population, current age-adjusted death rates from stroke ranks fifth among leading causes of death, and the age-adjusted mortality rate is 26% higher than for the U.S. White population.[8] The national prevalence of type-2 diabetes in the American Indian/Alaska Native population is the highest of any ethnic group in the United States,[9] although the prevalence rates for diabetes differ markedly by region. In contrast to cancer rates, the prevalence of diabetes is lowest among Alaska Native people, although prevalence and death rates are increasing. Because chronic diseases are among the leading causes of death and the patterns for chronic diseases are rapidly changing among American Indian populations, knowledge of family history of these chronic conditions may play an important role in identifying those at greatest risk for developing the disease and those who could benefit health promotion/disease prevention, enhanced screening and early detection, and targeted medical care.

Knowledge of family health history may be important to improving health for many reasons. Screening recommendations may change based on family health history. Determining family history of disease may identify individuals who would benefit the most from adopting a healthy lifestyle or who are at risk because of an unhealthy lifestyle. Education directed at altering lifestyle characteristics associated with such a disease could reduce an individual's risk of developing it.[10]

In this study, we examine the prevalence of self-reported family history of cancer, heart attack, stroke, and diabetes among a cohort of American Indian and Alaska Native people. We also evaluate the association between having a positive family history among first degree relatives and health behaviors, such as smoking cigarettes, physical activity level, dietary intake, and alcohol consumption, to determine if those reporting a family history of diseases were more or less likely to report healthier lifestyles or conversely, health behaviors that may put them at higher risk of developing the family health conditions.

Methods

Data for these analyses come from the Alaska and Navajo sites of the Education and Research Towards Health Study that was initiated in 2001.[11] Tribal partnerships were established and the study was approved by the Navajo Nation institutional review board (IRB), the Alaska Area IRB, the Indian Health Service National IRB, and the University of Utah IRB. Additionally, regional, local, and village health boards and chapters within local health boards reviewed and approved the study. The study methods have been described in detail.[11] The study population is a convenience sample, although participants were similar in distribution of age and marital status to the tribes in which they were enrolled. Baseline study visits were conducted in a variety of settings including stationary locations in the larger population areas, temporary study centers in remote villages, and mobile vans that

traveled from community to community. Study visit centers were set up to assure participant confidentiality for all study components.

Detailed information on study components is described elsewhere.[6] Briefly, the baseline study visit consisted of informed consent, intake questionnaire, medical measurements, an audio computer-assisted self-interview (ACASI) diet history questionnaire (DHQ); an ACASI health and lifestyle questionnaire that included detailed physical activity (HLPA), medical conditions, family health history, reproductive history, and screening history; an exit interview, and individual feedback (health report to each participant at the conclusion of the study visit). The referent period for diet and physical activity components was the past year. Medical tests included seated blood pressure, height, weight, waist and hip circumference measurements, and serum lipid and glucose levels via a finger stick blood sample.[12]

Family history of cancer, heart attack, stroke, and diabetes in first degree relatives was collected as part of the HLPA questionnaire. Community members in some participating communities requested that participants be given the option of not being asked the family history questions because of cultural reasons, therefore, participants were given three options at the beginning of the section: 1) Continue to questions about my blood relatives; 2) I do not know anything about my blood relatives; and 3) I prefer not to answer any questions about my blood relatives. If a participant selected either of the last two options, the entire family history section was skipped. In addition to skipping the whole section, participants could skip individual questions or select *not sure* instead of *yes* or *no*. For those who chose to continue the family history questions, participants were asked if any of their first-degree relatives had a history of cancer (colorectal, breast, ovarian, prostate, and other types of cancer), heart attack, stroke, or diabetes. Additional follow-up questions were asked to identify family members diagnosed at a young age (before age 50 for all conditions except for female heart attack which was before age 60). In some instances participants subsequently reported that the relative initially specified was a grandparent or other relative. These individuals were not included in the calculation of first-degree relatives with family history.

Statistical methods

We describe the prevalence of family history of cancer, heart attack, stroke, and diabetes among first degree relatives of study participants. Analyses are conducted for all study subjects together and for Alaska and Navajo field sites and men and women separately. We evaluated the likelihood of completing the family history questionnaire using prevalence ratios (PR), using the proportional hazards SAS program adjusting for age, gender, and study location.[13] Demographic characteristics of participants who preferred not to answer the family history questionnaire and those who reported not knowing their family history are described. We use t-test and chi-squared statistics to identify factors associated with family history of cancer, cardiovascular disease (which included both heart attack and stroke), and diabetes. In these analyses, we excluded individuals who reported having been diagnosed with any type of cancer (n= 158), heart attack or stroke (n= 552), or diabetes (n= 95). Factors evaluated were body mass index (BMI) using the formula of weight (kg)/height (m^2), hours of vigorous activity per week, servings per day of red meat, fruit, and vegetables, SF-12 mental component and SF-12 physical component,[14] where higher scores indicated better physical and mental functioning, HDL and LDL cholesterol level, perceived general health, current use of cigarettes (*yes*/*no*), and recent alcohol use (*none or low* if ≤0.07g/day, *moderate* if >0.07 to 4.59 g/day, and *high* if >4.59 grams/day). Data from participants in Alaska and Navajo Nation enrolled prior to March 1, 2007 are included in these analyses.

Results

Of 10,374 study participants, 17.7% reported not knowing their family health history and 23.5% preferred not to answer the family history section of the questionnaire (Table 1). Among those who continued with the family history section of the questionnaire, 16% of participants did not know their family history of colorectal cancer, 4.6% did not know their family history of breast cancer, 8.1% did not know their family history of ovarian cancer, and 8.2% did now know their family history of prostate cancer. Additionally, 12% did not know their family history of heart attack, 14.3% did not know their family history of stroke, and 10.8% did not know their family history of diabetes. While a larger percentage of participants on the Navajo Nation than in Alaska reported not knowing their family history at the beginning of the questionnaire, and therefore skipping the entire questionnaire, more participants in Alaska than on the Navajo Nation reported not knowing individual components of their family health history.

Of those participants who reported knowing their family health history, 8.0% reported a family history of colorectal cancer, 7.9% reported a family history of breast cancer, 5.1% a family history of ovarian cancer, 46.7% reported a family history of diabetes, 25% reported a family history of heart attack, and 22.1% reported a family history of stroke. Participants in Alaska reported a prevalence of a family history of all health conditions higher than that reported by Navajo Nation participants, with two exceptions: diabetes was reported more often on the Navajo Nation and a family history of ovarian cancer was reported with equal frequency in Alaska and on the Navajo Nation.

Of those reporting a family history of various medical conditions among first-degree relatives, a large percentage reported that the relatives were diagnosed at a young age, as previously defined (Table 1). Of those who reported the age at diagnosis of their family members, 38.8% reported that that a family member was diagnosed with colorectal cancer before age 50, 58.1% reported a young age at diagnosis of breast cancer, 70.5% reported a young age at diagnosis of ovarian cancer, 24% reported a young age at diagnosis of prostate cancer, 42.1% reported young age at diagnosis of other cancers. For heart attack, 56.6% reported female relatives with a young age at diagnosis (younger than 60 years) and 36.7% reported male relatives with a young age at diagnosis (younger than 50 years).

The characteristics associated with the likelihood of answering were similar regardless of the comparison group of those not knowing their family history versus preferring not to answer questions about their family history (Table 2). Women were more likely than men to know their family history and to be willing to complete the questionnaire. Education was strongly associated with completing the family history section: participants with a college degree were more likely than those with less than a high school education to know their family history. Participants who were younger than 30 years of age and older than 60 years of age were least likely to complete this section of the questionnaire. Although perceived health did not appear to be associated with completing the family history section, those who reported more medical conditions were significantly more likely than others to answer the questionnaire and to know their family health histories. Participants who spoke a Native language at home and those identifying with a Native culture were less likely than others to complete the questionnaire. Participants living on the Navajo reservation and in the southwestern region of Alaska were less likely than others to complete the questionnaire. People living in urban areas (i.e., 50,000 or more residents), were more likely to answer than were people living in rural areas.

We evaluated the association between family history of cancer and health characteristics and behaviors among those individuals who reported their cancer family history (Table 3).

Overall, participants with a family history of any cancer reported significantly lower scores on the physical component of the SF12 than those without a family history of cancer. Participants with a family history of cancer were more likely than those without a family history of cancer to report that they perceived their general health to be *fair* or *poor* rather than *excellent* or *very good*. Among participants from the Navajo Nation, those without a family history of cancer reported higher levels of vigorous physical activity than those with a family history of cancer. Women who reported a family history of cancer had significantly higher total and HDL serum cholesterol levels, although the magnitude of the difference was small.

Evaluation of the same health conditions and behaviors with a family history of heart attack or stroke (Table 4) revealed similar associations for SF12 and perceived health as were reported for cancer. Participants with a family history of heart attack or stroke tended to have a slightly higher BMI than those without a family history of heart attack or stroke, although the results were statistically significant at the 0.05 level. These participants also reported less vigorous physical activity than their counterparts without a family history of heart attack or stroke. Participants with a family history of heart attack or stroke were more likely to have higher total serum cholesterol levels and lower HDL cholesterol levels than those without a family history of heart attack or stroke. Health characteristics and behaviors associated with family history of diabetes were similar to those identified with family history of heart attack and stroke (data not shown in table).

Discussion

Family health history is associated with increased risk of several diseases, including cancer, diabetes, heart disease and stroke.[15–18] This association may result from shared genes, shared lifestyle, shared environment, or a combination of these factors. Most studies of family history have focused on non-Hispanic white populations, with few reports including American Indian and Alaska Native populations. With the increasing prevalence of many chronic diseases among American Indian and Alaska Native people, family health histories may be an important component of prevention. Knowledge of family history of chronic conditions may play an important role in identifying those at greatest risk for developing the disease and those who could benefit health promotion/disease prevention, enhanced screening and early detection, and targeted medical care.

While some participants did not want to answer the family health history component of the questionnaire, the majority were willing to answer questions regarding their family history. Tribal IRBs requested that participants be given the option to skip this section of the questionnaire because of cultural beliefs that asking about illness will be wishing illness on the family. Since the family health history section was placed close to the end of the questionnaire, some individuals may have skipped this section because of time needed to complete the study visit. Some characteristics of the participants who preferred not to answer the family history component of the questionnaire imply cultural reasons for not answering, among them speaking their Native language, identifying with Native culture *a lot*, and living in more rural areas. Other reasons for refusing to answer or not knowing family history were age (both those who were youngest and oldest were more likely to not answer the family history component of the questionnaire) and gender (men were more likely not to answer than women). Although perceived health did not affect answering the family history questions, people with more health problems were more likely to complete the questions and to know their family health history. It is possible that these individuals knew more about their family health because of their own medical conditions and contact with medical care providers, or served as care providers to family members.

Our study population, although a convenience sample, was similar in age and marital status to that of the larger target population.11 In Alaska, where incidence rates of breast cancer are higher than among American Indian people living in the Southwest U.S., a larger proportion of people reported having a family history of breast cancer, 10% in Alaska vs. 6% of study participants in the Southwest reported a family history of breast cancer. This is in keeping with variation in breast cancer incidence rates in these two areas. We also observed that 12.7% of study participants in Alaska reported a family history of colorectal cancer while only 5.2% of participants in the Southwest reported a family history of colorectal cancer. Rates of colorectal cancer also are known to be higher in Alaska than in the Southwest.3 We also have shown that colorectal cancer screening is much higher in Alaska than in the Southwest;[19] it is possible that more widespread cancer screening makes people more aware of their family history. In Alaska, 33.0% reported a family history of heart attack while only 21.3% of participants in the Southwest reported a family history of heart attack. A much higher prevalence of a family history of diabetes was reported in the Southwest than in Alaska (55.7% versus 31.6%) which is in keeping with known difference in prevalence of the diseases in these two populations.[20,]21 Other studies in American Indian populations have shown that differences in reported health behaviors parallel differences in disease rates for coronary heart disease.9

The majority of study participants who reported a family history of cancer and heart attack reported having first-degree relatives diagnosed at a young age, prior to age 50. We believe that this partially reflects the young age of the population being studied, where the mean age was around 40. In other populations, a young age at diagnosis has been associated with stronger inherited risk.[22,23]

Our data suggest that people with a family history are more likely to have lifestyle factors that have been associated with increased risk of cancer, heart attack, stroke, and diabetes. Moreover, participants with a family history in comparison with those without a family history generally perceived their health to be poorer, and they reported low levels of physical functioning on the SF12 health survey. Given that shared environment is a contributor to family health, knowledge of family history may help identify those at greatest risk for developing diseases and help establish priorities for intervention and prevention. However, it is also possible that participants that have risk factors for a disease, such as high lipid levels, smoking cigarettes or being overweight, may be more aware of their family history.

While a potential benefit of knowing family health history is modification of behaviors that can reduce disease risk, data from our study do not show this pattern. In fact, most individuals who reported knowing their family health history had health behavior profiles that have been associated with increased disease risk in other populations.[24–29] While these findings could be due to recall error by study participants, our risk factor behavior data (including obesity, diet, and activity patterns) are the similar to the reported prevalence of these factors among American Indian and Alaska Native people from the Navajo Health and Nutrition Survey[30] and the Behavioral Risk Factor Surveillance System.31

Although this is one of the first studies to examine family health history among American Indian and Alaska Native populations, there are study limitations. The data are cross-sectional and therefore we are limited in our ability to make causal inferences. Additionally, because this is a sample of convenience, it may not fully represent the target population. All data were self-reported, so there is always the possibility of reporting error.

Because of increasing prevalence of chronic diseases (such as cancer, heart disease, and diabetes) among American Indian and Alaska Native people, there are increasing numbers

of individuals who have a family history of chronic diseases. Shared lifestyle and environment by family members can contribute to the observed increased risk of disease development among those with a family history of the disease. Fortunately, lifestyle factors such as diet and activity patterns are open avenues for risk reduction. Increasing knowledge of family health history can be an important step in promoting health and preventing chronic diseases.

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Table 1

FAMILY HISTORY OF VARIOUS HEALTH CONDITIONS IN FIRST DEGREE RELATIVES REPORTED BY EARTH STUDY PARTICIPANTS IN ALASKA AND THE SOUTHWEST

	All participants	%	Alaska	%	Navajo	%
Number of participants	10374		3832		6542	
Age(mean/standard)	39.9(14.4)		40.3(15.0)		39.6(14.0)	
Gender						
Men	3885	37.5	1507	39.3	2378	36.4
Women	6489	62.5	2325	60.7	4164	63.6
Response to family history questions						
Answered	5981	58.8	2443	64.3	3538	55.6
Don't know	1796	17.7	550	14.5	1246	19.6
Preferred not to answer	2391	23.5	807	21.2	1584	24.9
Family history of colorectal cancer						
Don't know	1005	16.8	560	22.9	445	12.6
Answered	4976	83.2	1883	77.1	3093	87.4
No history	4576	92.0	1644	87.3	2932	94.8
History	400	8.0	239	12.7	161	5.2
Diagnosed before 50 years[a]	139	38.8	80	38.3	59	39.6
Family history of breast cancer						
Don't know	277	4.6	168	6.8	109	3.1
Answered	5704	95.4	2275	93.1	3429	96.9
No history	5251	92.1	2032	89.3	3219	93.9
History	453	7.9	243	10.7	210	6.1
Diagnosed before 50 years[a]	234	58.1	130	62.2	104	53.6
Family history of ovarian cancer						
Don't know	490	8.1	272	11.1	212	6.0
Answered	5497	91.9	2171	88.9	3326	94.0
No history	5214	94.9	2057	94.7	3157	94.9
History	283	5.1	114	5.3	169	5.1
Diagnosed before 50 years[a]	184	70.5	80	76.2	104	66.7

	All participants	%	Alaska	%	Navajo	%
Family history of prostate cancer						
Don't know	493	8.2	292	12.0	201	5.7
Answered	5487	91.7	2150	88.0	3337	94.3
No history	5211	95.0	2022	94.0	3189	95.6
History	276	5.0	128	6.0	148	4.4
Diagnosed before 50 years[a]	56	24.0	23	22.1	33	25.6
Family history of other cancer						
Don't know	797	13.3	426	17.5	371	10.5
Answered	5184	86.7	2017	82.6	3167	89.6
No history	4375	84.4	1538	76.3	2837	89.6
With history	809	15.6	479	23.7	330	10.4
Diagnosed before 50 years[a]	304	42.1	181	42.9	123	41.0

[a]Percentage is based on those participants who knew age at diagnosis which was 358 of those with colorectal cancer, 403 of those with breast cancer, 261 of those with ovarian cancer, 233 of those with prostate cancer, and 722 of those with other cancer

EARTH = education and research towards health

Table 2

FACTORS ASSOCIATED WITH COMPLETING THE FAMILY HISTORY SECTION OF THE QUESTIONNAIRE

	Answered (yes) vs. preferred not to answer (no)				Answered (yes) vs. did not know (no)			
	Yes	**No**	**Prevalence ratio (PR)**	**95% confidence interval (CI)**	**Yes**	**No**	**PR**	**95% CI**
Gender								
Men	1794	1131	1.00		1794	867	1.00	
Women	4187	1260	1.25	1.19–1.32	4187	929	1.21	1.15–1.28
Education								
<High school	1059	724	1.00		1059	710	1.00	
High school	1871	902	1.13	1.05–1.22	1871	627	1.24	1.15–1.34
Voc/tech/asso/col	2553	691	1.32	1.23–1.42	2553	415	1.43	1.33–1.53
Bac/Mas/PhD	454	49	1.52	1.36–1.69	454	25	1.57	1.41–1.76
Age (years)								
<30	1615	753	1.00		1615	589	1.00	
30–39	1306	509	1.06	0.98–1.13	1306	310	1.10	1.03–1.19
40–49	1544	543	1.08	1.01–1.16	1544	389	1.09	1.02–1.17
50–59	1027	343	1.10	1.02–1.19	1027	253	1.09	1.01–1.18
≥60	489	243	0.98	0.89–1.08	489	255	0.90	0.81–0.99
General health condition								
Excellent/very good	1837	770	1.00		1837	550	1.00	
Good	2556	1028	1.01	0.95–1.08	2556	716	1.02	0.96–1.08
Fair/poor	1582	586	1.04	0.97–1.11	1582	523	0.98	0.92–1.05
Medical condition								
No disease	2402	1267	1.00		2402	920	1.00	
1 disease	1620	593	1.12	1.05–1.19	1620	457	1.08	1.01–1.15
2+ diseases	1959	531	1.20	1.13–1.28	1959	419	1.14	1.07–1.21
Language spoken at home								
English	2783	939	1.00		2783	660	1.00	
American Indian Alaskan Native (AIAN)	479	290	0.84	0.76–0.92	479	237	0.83	0.75–0.92
Both	2694	1143	0.94	0.89–0.99	2694	875	0.94	0.89–0.99
Identity with native culture								
Not at all	1517	473	1.00		1517	402		

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	Answered (yes) vs. preferred not to answer (no)				Answered (yes) vs. did not know (no)			
	Yes	No	Prevalence ratio (PR)	95% confidence interval (CI)	Yes	No	PR	95% CI
A little	2426	934	0.95	0.89–1.01	2426	578	1.00	
Some	1328	584	0.91	0.85–0.98	1328	482	1.02	0.96–1.09
A lot	698	396	0.84	0.77–0.92	698	332	0.93	0.86–1.00
Residency area								
<50,000 people	4826	2060	1.00		4826	1580	1.00	
>50,000 people	1146	327	1.11	1.04–1.18	1146	209	1.12	1.05–1.20
Region								
South-Central Alaska	958	266	1.00		958	164	1.00	
South-East Alaska	651	139	1.05	0.95–1.16	651	94	1.02	0.93–1.13
South-West Alaska	834	402	0.86	0.79–0.95	834	292	0.87	0.79–0.95
Navajo	3538	1584	0.88	0.82–0.95	3538	1246	0.87	0.81–0.93

Table 3

ASSOCIATION BETWEEN SELF-REPORTED FAMILY HISTORY OF CANCER IN FIRST DEGREE RELATIVES AND HEALTH BEHAVIORS[a]

	All participants[b]			Alaska[b]			Navajo[b]			Men			Women		
Family history	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**
	Mean (SE)	**Mean (SE)**		**Mean (SE)**	**Mean (SE)**		**Mean (SE)**	**Mean (SE)**		**Mean (SE)**	**Mean (SE)**		**Mean (SE)**	**Mean (SE)**	
Body Mass Index (kg/m^2)	31.0 (0.1)	31.0 (0.1)	0.77	30.6 (0.2)	30.8 (0.3)	0.70	31.3 (0.2)	31.1 (0.1)	0.46	29.8 (0.3)	29.6 (0.2)	0.62	31.4 (0.2)	31.7 (0.2)	0.24
Vigorous activity (hours/week)	2.9 (0.2)	3.3 (0.2)	0.08	3.0 (0.4)	2.8 (0.3)	0.70	2.7 (0.2)	3.5 (0.2)	0.01	6.0 (0.8)	6.2 (0.4)	0.83	1.8 (0.1)	2.0 (0.1)	0.07
Daily dietary intake (servings/day)															
Red meat	1.6 (0.0)	1.6 (0.0)	0.60	1.5 (0.1)	1.5 (0.1)	0.51	1.7 (0.1)	1.7 (0.0)	0.37	2.1 (0.1)	2.3 (0.1)	0.23	1.4 (0.0)	1.3 (0.0)	0.11
Vegetables	4.7 (0.1)	4.9 (0.1)	0.24	4.2 (0.1)	3.8 (0.2)	0.09	5.3 (0.2)	5.4 (0.2)	0.83	4.5 (0.2)	4.9 (0.2)	0.22	4.8 (0.1)	4.9 (0.2)	0.50
Fruits	2.5 (0.1)	2.5 (0.1)	0.96	2.1 (0.1)	2.1 (0.1)	0.68	3.0 (0.1)	2.7 (0.1)	0.06	2.5 (0.2)	2.7 (0.1)	0.19	2.5 (0.1)	2.4 (0.1)	0.27
Short Form 12															
Physical	49.3 (0.2)	50.2 (0.2)	<0.01	50.1 (0.3)	51.5 (0.3)	<0.01	48.5 (0.3)	49.7 (0.2)	<0.01	50.4 (0.4)	50.8 (0.3)	0.50	49.0 (0.3)	49.9 (0.2)	<0.01
Mental	45.7 (0.2)	46.0 (0.2)	0.18	46.3 (0.3)	47.1 (0.3)	0.03	45.1 (0.3)	45.6 (0.2)	0.11	46.3 (0.4)	46.9 (0.3)	0.14	45.5 (0.2)	45.6 (0.2)	0.68

	All participants[b]			Alaska[b]			Navajo[b]			Men			Women		
Family history	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**
	n (%)	**n (%)**		**n (%)**	**n (%)**		**n (%)**	**n (%)**		**n (%)**	**n (%)**		**n (%)**	**n (%)**	
Perceived health															
Excellent/very good	596 (29.5)	929 (33.6)	<0.01	336 (32.2)	276 (34.8)	<0.01	260 (26.7)	653 (33.0)	<0.01	168 (31.8)	323 (37.2)	0.01	428 (28.8)	606 (31.9)	0.06
Good	856 (42.4)	1177 (42.5)		433 (41.5)	360 (45.5)		423 (43.5)	817 (41.3)		209 (39.5)	354 (40.8)		647 (43.5)	823 (43.3)	
Fair/poor	565 (28.0)	662 (23.9)		275 (26.3)	156 (19.7)		290 (29.8)	506 (25.6)		152 (28.7)	191 (22.0)		413 (27.8)	471 (24.8)	
Currently use cigarettes															
Yes	370 (20.2)	347 (13.8)	0.18	297 (30.9)	199 (27.3)	0.11	73 (8.4)	148 (8.3)	0.93	130 (28.8)	147 (19.7)	0.24	240 (17.3)	200 (11.3)	0.16
No	1466 (79.8)	2175 (86.2)		665 (69.1)	530 (72.7)		801 (91.6)	1645 (91.7)		322 (71.2)	599 (80.3)		1144 (82.7)	1576 (88.7)	
Alcohol															
None/low	689 (34.5)	899 (33.1)	0.74	405 (38.9)	316 (40.5)	0.72	284 (29.7)	583 (30.1)	0.66	118 (22.6)	171 (20.2)	0.26	571 (38.7)	728 (38.9)	0.28
Moderate	662 (33.1)	997 (36.7)		246 (23.7)	186 (23.8)		416 (43.5)	811 (41.8)		137 (26.2)	261 (30.8)		525 (35.6)	736 (39.3)	
High	646 (32.3)	824 (30.3)		389 (37.4)	278 (35.6)		257 (26.9)	546 (28.1)		268 (51.2)	416 (49.1)		378 (25.6)	408 (21.8)	

[a] Exclude 155 participants reported having had cancer

[b] Associations for all participants and men and women adjusted for center

SE = standard error

Table 4

ASSOCIATIONS BETWEEN SELF-REPORTED FAMILY HISTORY OF HEART ATTACK OR STROKE IN FIRST-DEGREE RELATIVES AND HEALTH BEHAVIORS[a]

	All participants[b]			Alaska[b]			Navajo[b]			Men			Women		
Family history	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**
	Mean (SE)	**Mean (SE)**		**Mean (SE)**	**Mean (SE)**		**Mean (SE)**	**Mean (SE)**		**Mean (SE)**	**Mean (SE)**		**Mean (SE)**	**Mean (SE)**	
Body Mass Index (kg/m^2)	31.5 (0.2)	30.7 (0.1)	<0.01	31.4 (0.3)	30.1 (0.2)	<0.01	31.6 (0.2)	31.0 (0.1)	0.02	29.8 (0.3)	29.3 (0.2)	0.10	32.1 (0.2)	31.3 (0.1)	<0.01
Vigorous activity (hours/week)	2.6 (0.2)	3.2 (0.1)	<0.01	2.6 (0.3)	2.9 (0.2)	0.43	2.6 (0.2)	3.4 (0.2)	0.01	4.7 (0.4)	5.9 (0.4)	0.04	1.8 (0.1)	2.1 (0.1)	0.04
Daily dietary intake (servings/day)															
Red meat	1.6 (0.0)	1.6 (0.0)	0.18	1.5 (0.1)	1.4 (0.1)	0.20	1.6 (0.1)	1.7 (0.0)	0.03	2.1 (0.1)	2.2 (0.1)	0.34	1.3 (0.0)	1.4 (0.0)	0.40
Vegetables	4.9 (0.1)	4.8 (0.1)	0.55	4.3 (0.2)	3.7 (0.1)	0.02	5.4 (0.2)	5.3 (0.1)	0.58	4.7 (0.3)	4.7 (0.2)	0.93	5.0 (0.2)	4.8 (0.1)	0.52
Fruits	2.5 (0.1)	2.6 (0.1)	0.79	2.2 (0.1)	2.0 (0.1)	0.08	2.8 (0.1)	2.8 (0.1)	0.84	2.5 (0.2)	2.6 (0.1)	0.53	2.6 (0.1)	2.5 (0.1)	0.91
Short Form 12															
Physical	49.0 (0.2)	50.5 (0.2)	<0.01	50.3 (0.3)	52.0 (0.3)	<0.01	47.8 (0.3)	49.8 (0.2)	<0.01	50.3 (0.4)	51.3 (0.3)	0.06	48.4 (0.3)	50.2 (0.2)	<0.01
Mental	45.7 (0.2)	45.8 (0.2)	0.68	46.4 (0.3)	46.6 (0.3)	0.65	45.1 (0.3)	45.5 (0.2)	0.30	47.0 (0.4)	46.5 (0.3)	0.22	45.2 (0.2)	45.6 (0.2)	0.23
Total cholesterol (mg/dl)	198.8 (1.0)	188.2 (0.7)	<0.01	200.6 (1.4)	190.7 (1.3)	<0.01	197.3 (1.4)	187.1 (0.9)	<0.01	208.1 (2.1)	197.7 (1.4)	<0.01	195.2 (1.1)	184.4 (0.8)	<0.01
HDL cholesterol (mg/dl)	52.5 (0.04	51.1 (0.3)	0.01	56.6 (0.7)	56.5 (0.6)	0.85	49.0 (0.5)	48.7 (0.3)	0.60	484 (0.8)	47.6 (0.6)	0.43	54.1 (0.4)	52.5 (0.3)	<0.01
LDL cholesterol (mg/dl)	114.8 (1.0)	107.3 (0.7)	<0.01	116.2 (1.4)	108.8 (1.2)	<0.01	113.4 (1.3)	106.5 (0.9)	<0.01	127.5 (2.1)	120.6 (1.5)	0.01	110 (1.0)	102.0 (0.7)	<0.01
	All participants[b]			**Alaska[b]**			**Navajo[b]**			**Men**			**Women**		
Family history	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**	**Yes**	**No**	**p-value**
	n (%)	**n (%)**		**n (%)**	**n (%)**		**n (%)**	**n (%)**		**n (%)**	**n (%)**		**n (%)**	**n (%)**	
Percieved health															
Excellent/very good	505 (29.7)	971 (32.6)	<0.01	246 (31.9)	308 (33.8)	0.09	259 (27.8)	663 (32.0)	0.04	157 (32.4)	327 (37.6)	<0.01	348 (28.6)	644 (30.5)	0.07
Good	725 (42.6)	1287 (43.2)		322 (41.8)	406 (44.6)		403 (43.3)	881 (42.6)		197 (40.7)	359 (41.3)		528 (43.4)	928 (44.0)	
Fair/poor	470 (27.6)	722 (24.2)		202 (26.2)	197 (21.6)		268 (28.8)	525 (25.4)		130 (26.9)	183 (21.1)		340 (28.0)	539 (25.5)	
Currently use cigarettes															
Yes	287 (18.6)	401 (14.8)	0.73	219 (30.8)	252 (30.1)	0.77	68 (8.2)	149 (8.0)	0.86	126 (31.7)	151 (20.3)	0.06	161 (14.0)	250 (12.7)	0.39
No	1257 (81.4)	2306 (85.2)		492 (69.2)	585 (69.9)		765 (91.8)	1721 (92.0)		272 (68.3)	593 (79.7)		985 (86.0)	1713 (87.3)	
Alcohol															
None/Low	594 (35.4)	934 (31.8)	<0.01	300 (39.3)	356 (39.4)	<0.01	294 (32.1)	578 (28.4)	0.03	104 (21.8)	158 (18.5)	0.55	490 (40.8)	776 (37.3)	<0.01

Family history	All participants[b]			Alaska[b]			Navajo[b]			Men			Women		
	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value	Yes	No	p-value
	Mean (SE)	Mean (SE)		Mean (SE)	Mean (SE)		Mean (SE)	Mean (SE)		Mean (SE)	Mean (SE)		Mean (SE)	Mean (SE)	
Moderate	608 (36.2)	1063 (36.2)		210 (27.5)	189 (20.9)		398 (43.5)	874 (43.0)		148 (31.0)	262 (30.7)		460 (38.3)	801 (38.5)	
High	477 (28.4)	938 (32.0)		254 (33.2)	358 (39.6)		223 (24.4)	580 (28.5)		225 (47.2)	433 (50.8)		252 (21.0)	505 (24.3)	

[a] Excludes 637 participants who reported having had a heart attack or stroke

[b] Associations for all participants, men and women adjusted for center

SE = standard error