

All-Cause, Cardiovascular, and Cancer Mortality in Western Alaska Native People: Western Alaska Tribal Collaborative for Health (WATCH)

Barbara V. Howard, PhD, Jesse S. Metzger, PhD, Kathryn R. Koller, RN, PhD, Stacey E. Jolly, MD, Elvin D. Asay, MS, Hong Wang, MD, Abbie W. Wolfe, MS, Scarlett E. Hopkins, RN, MA, Cristiane Kaufmann, MD, Terry W. Raymer, MD, Brian Trimble, MD, Ellen M. Provost, DO, MPH, Sven O. E. Ebbesson, PhD, Melissa A. Austin, PhD, William James Howard, MD, Jason G. Umans, MD, PhD, and Bert B. Boyer, PhD

Like many other indigenous populations, western Alaska Native people (i.e., those living in the remote coastal communities of the Norton Sound and Yukon–Kuskokwim regions of southwest Alaska) have undergone rapid changes in lifestyle during the past half century. The Norton Sound communities are primarily Inupiat and the Yukon–Kuskokwim communities are primarily Central Yup'ik, although these regions also include the Cup'ik and Siberian Yup'ik ethnic subgroups.¹ Previously, life spans were shorter, and mortality resulting from infection predominated.^{2,3} Although life expectancy has increased with improved access to health care under the Indian Health Service, from 46 years in the mid-1950s⁴ to 70.5 years in 2008,^{5,6} chronic disease has also increased, as has exposure to a Westernized diet and lifestyle.^{7–9} Alaska state health data^{2,3} and Indian Health Service records¹⁰ have shown that a large proportion of nontraumatic deaths in these communities is caused by cardiovascular disease (CVD). Chronic diseases appear to be common in other comparable indigenous Arctic groups^{11–17}; however, these reports have relied on death certificate data alone rather than systematic review of medical records from population-based cohorts and, therefore, may not accurately represent disease burden in these communities.¹⁸ Such data are essential for designing effective surveillance and prevention programs to improve health in this population.

The Western Alaska Tribal Collaborative for Health (WATCH) study combines 4 major cohorts residing in the Norton Sound and Yukon–Kuskokwim Delta regions of western Alaska, providing the first consolidated cohort large enough to produce reliable data on health outcomes among Alaska Native communities in these 2 regions. We ascertained all deaths occurring after the baseline examinations and

Objectives. We determined all-cause, cardiovascular disease (CVD), and cancer mortality in western Alaska Native people and examined agreement between death certificate information and adjudicated cause of deaths.

Methods. Data from 4 cohort studies were consolidated. Death certificates and medical records were reviewed and adjudicated according to standard criteria. We compared adjudicated CVD and cancer deaths with death certificates by calculating sensitivity, specificity, predictive values, and κ statistics.

Results. Men ($n=2116$) and women ($n=2453$), aged 18 to 95 years, were followed an average of 6.7 years. The major cause of death in men was trauma (25%), followed by CVD (19%) and cancer (13%). The major cause of death in women was CVD (24%), followed by cancer (19%) and trauma (8%). Stroke rates in both genders were higher than those of US Whites. Only 56% of deaths classified as CVD by death certificate were classified as CVD by standard criteria; discordance was higher among men (55%) than women (32%; κ s = 0.4 and 0.7).

Conclusions. We found lower rates for coronary heart disease death but high rates of stroke mortality. Death certificates overestimated CVD mortality; concordance between the 2 methods is better for cancer mortality. The results point to the importance of cohort studies in this population in providing data to assist in health care planning. (*Am J Public Health.* 2014;104:1334–1340. doi:10.2105/AJPH.2013.301614)

reviewed medical records for all deaths. Our objectives were to present data on all-cause, CVD, and cancer mortality; compare these data with data for the US White population; and compare adjudicated population-based CVD and cancer mortality rates with those obtained from death certificates.

METHODS

The WATCH study consolidates 4 study cohorts of western Alaska Native people living in a remote rural region of southwestern Alaska. Details of the WATCH study methods have been described elsewhere.¹⁹ The multisite Alaska Education and Research Toward Health study²⁰ examined 1493 men and women from 2004 to 2006 (32% of all adults), and the Center for Alaska Native Health Research study^{21,22} examined 1157 men and women between 2003 and 2010 in the

Yukon–Kuskokwim Delta region (approximately 50% of all adults). Participants in these studies were predominantly of Yup'ik ancestry. The third cohort was from the Genetics of Coronary Artery Disease in Alaska Natives study,²³ which examined 1335 men and women between 2000 and 2008 (83% of all adults from all but 1 village), and the fourth cohort was composed of 584 men and women from 4 villages (approximately 70% of all adults) examined in 1994 as part of the Alaska-Siberia Project.²⁴ Participants in these studies were from the Norton Sound region of Alaska and were predominantly of Inupiaq ancestry.

Procedures

We ascertained deaths occurring in the WATCH cohort since the baseline examinations for each study through queries to surviving participants, participant families, community members, and local leaders; review of death

data under an agreement with the State of Alaska; and review of community newspapers and notices. We obtained copies of death certificates from the State of Alaska Bureau of Vital Statistics.

For all deaths, information from the medical record was abstracted and deidentified by trained, experienced abstractors; these included 1 registered nurse, 1 master's-level registered nurse, 1 nurse practitioner, and 1 physician. Discharge summaries, examination reports, procedure reports, laboratory test results, and other relevant materials in possible CVD cases were copied and deidentified. We determined the cause of each death by review of medical records and other available information from village clinic records from the time of the baseline examination to the time of death. For all deaths that could possibly involve CVD, 2 trained physician adjudicators separately conducted blinded review of the deidentified records. Cases with ambiguous causes of death were adjudicated by a third physician adjudicator or discussed among the adjudicators until consensus was reached. For other causes of death, the adjudicators made a decision for the Alaska-Siberia Project and Genetics of Coronary Artery Disease in Alaska Natives cases, and 2 of the trained abstractors (1 physician, 1 master's-level registered nurse) determined cause of death for the Center for Alaska Native Health Research and Alaska Education and Research Toward Health cases. We classified deaths as resulting from CVD, malignant neoplasm, infection (including pneumonia, influenza, septicemia, and HIV/AIDS), other chronic condition (including chronic obstructive pulmonary disease, diabetes, liver disease or cirrhosis, and kidney disease), or trauma (including intentional and unintentional injury). We further classified CVD deaths as coronary heart disease (CHD), stroke, or heart failure, using standardized criteria.^{19,25}

Statistical Methods

We computed incidence rates per 1000 person-years for total mortality and major causes of death by gender and age-adjusted CVD mortality rates by the direct method using 2000 US population data.²⁶ Cause-specific adjudicated data from WATCH were compared with adjudicated data from the Atherosclerosis

Risk in Communities Study²⁷; although published earlier, the surveillance and adjudication methods were similar to those used in WATCH, and a recent publication indicated only a 6% decline in CHD deaths in Whites since the earlier analysis.²⁸ We compared rates from death certificates with published data from Alaska records.^{26,29} Rate ratios (RRs) and 95% confidence intervals (CIs) were computed to evaluate relative differences in mortality rates and causes of death in men versus women and by study and region. We used the κ statistic to evaluate agreement between adjudicated deaths and death certificate data for CVD and cancer mortality. Additional evaluations were done by calculating sensitivity, specificity, and positive predictive value; we used the latter to compare the classifications by adjudication versus death certificates.³⁰ We compared mortality rates with those of the general US population³¹ and with the Atherosclerosis Risk in Communities Study data.²⁷

RESULTS

The consolidated WATCH dataset included 2116 (46%) men and 2453 (54%) women from 4 population-based cohorts (Table 1). Average follow-up time was 6.7 (range = 4.0–14.4)

years. Mean ages at baseline ranged from 39 to 47 years, and more women than men participated in each original study.^{32,33} Diabetes prevalence was 4.3% overall, mean body mass index was 28, and 71% had a history of cigarette smoking. Except for age in the Alaska-Siberia Project, the covariates in the 4 cohorts were similar. Loss to follow-up, defined as being unable to locate or deaths for which a death certificate or other documentation for cause of death could not be obtained, was minimal because participants were known by community members, and almost all had medical records. During an average follow-up of 6.7 years, a total of 280 deaths occurred; of these, 150 (53.6%) were men.

Age-adjusted total mortality rates were higher in men than in women (12.1 vs 7.9; Table 2) for the consolidated WATCH cohort, as well as for each of the component studies; the gender difference, adjusted for age, diabetes, smoking, and obesity, was significant for the whole cohort and for the Norton Sound cohorts. Mortality rates among men appeared to be higher in the Norton Sound region than in the Yukon–Kuskokwim Delta, but these differences were not significant. For women, the rates did not differ as much between regions.

TABLE 1—Study Cohort Demographics Making Up Western Alaska Tribal Collaborative for Health: ASP, 1994–1998; CANHR, 2003–2010; EARTH, 2004–2006; and GOCADAN 2000–2008

Characteristics	ASP (NS)	CANHR (YK)	EARTH (YK)	GOCADAN (NS)	WATCH
Sample size, no.	584	1157	1493	1335	4569
Gender, no.					
Men	271	542	699	604	2116
Women	313	615	794	731	2453
Age, y, mean (range)					
Overall	47 (25–91)	39 (18–94)	39 (18–86)	42 (18–95)	41 (18–95)
Men	46 (25–91)	38 (18–86)	38 (18–86)	41 (18–88)	40 (18–91)
Women	47 (25–90)	39 (18–94)	41 (18–86)	42 (18–95)	42 (18–95)
BMI, kg/m ² , mean (SD)	27.1 (5.7)	27.8 (6.0)	28.4 (6.2)	27.4 (5.8)	28 (6.0)
Smoked, no. (%)	507 (88.6)	749 (66.6)	897 (60.2)	1069 (80.4)	3222 (71.4)
Diabetes, no. (%)	23 (3.9)	37 (3.2)	91 (6.1)	47 (3.5)	198 (4.3)
Follow-up, y, mean	14.4	4.8	4.5	7.3	6.7
Deaths, no.	100	32	53	95	280

Note. ASP = Alaska-Siberia Project; BMI = body mass index; CANHR = Center for Alaska Native Health Research; EARTH = Education and Research Toward Health; GOCADAN = Genetics of Coronary Artery Disease in Alaska Natives; NS = Norton Sound; WATCH = Western Alaska Tribal Collaborative for Health; YK = Yukon–Kuskokwim Delta.

TABLE 2—Gender-Specific Total Mortality in the Western Alaska Tribal Collaborative for Health and Its Component Studies: ASP 1994–1998, CANHR 2003–2010, EARTH 2004–2006, and GOCADAN 2000–2008

Study	Deaths, No.	Follow-Up, PY	Rate per 1000 PY	Age-Adjusted Rate (95% CI)	Adjusted HR ^a (95% CI)
CANHR					
Men	19	2582	7.4	8.8 (4.8, 12.7)	1.9 (0.7, 4.9)
Women	13	3020	4.3	5.9 (2.7, 9.1)	0.0 (Ref)
EARTH					
Men	27	3138	8.6	11.7 (7.0, 16.3)	1.2 (0.7, 2.1)
Women	26	3570	7.3	8.7 (5.3, 12.1)	0.0 (Ref)
YK region (CANHR + EARTH)					
Men	46	5719	8.0	10.2 (7.2, 13.3)	1.4 (0.9, 2.3)
Women	39	6590	5.9	7.4 (5.1, 9.7)	0.0 (Ref)
ASP					
Men	50	3850	13.0	12.0 (8.6, 15.5)	1.7 (1.1, 2.6)
Women	50	4573	10.9	7.7 (5.6, 9.9)	0.0 (Ref)
GOCADAN					
Men	54	4309	12.5	14.5 (10.6, 18.4)	2.0 (1.3, 3.1)
Women	41	5464	7.5	8.1 (5.6, 10.5)	0.0 (Ref)
Norton Sound region (ASP + GOCADAN)					
Men	104	8159	12.7	13.1 (10.6, 15.6)	1.7 (1.3, 2.3)
Women	91	10 037	9.1	8.1 (6.4, 9.7)	0.0 (Ref)
WATCH (all studies)					
Men	150	13 878	10.8	12.1 ^b (10.2, 14.0)	1.5 (1.2, 2.0)
Women	130	16 628	7.8	7.9 (6.5, 9.2)	0.0 (Ref)

Note. ASP = Alaska Siberia Project; CANHR = Center for Alaska Native Health Research; CI = confidence interval; EARTH = Education and Research Toward Health; GOCADAN = Genetics of Coronary Artery Disease in Alaska Natives; HR = hazard ratio; PY = person-years; WATCH = Western Alaska Tribal Collaborative for Health; YK = Yukon Kuskokwim.

^aAdjusted for age, diabetes, ever smoked, and obesity (body mass index > 30 kg/m²).

^bAge-adjusted risk ratio comparing men with women: 1.53 (95% CI = 1.22, 1.95).

Table 3 shows cause-specific mortality rates by gender for the WATCH cohort. In men, the major causes of death were trauma (25%) and CVD (19%). Trauma deaths were mainly in younger men (mean = 33 years, range = 18–59 years). Of the 29 CVD deaths, 59% (n = 17) of the CVD was attributable to CHD and 28% (n = 8) was attributable to stroke. Cancer accounted for 13% of deaths in men. In women, the major cause of death was CVD (24%). Of these 31 CVD deaths, 45% (n = 14) were from CHD and 35% (n = 11) were from stroke. Only a small proportion of strokes were hemorrhagic in either men or women (25% and 18%, respectively). Cancer accounted for 19% and trauma for 8% of deaths in women. The most frequent types of cancer in both genders were lung (14%) and gastrointestinal (12%).

We compared the rates for CVD and cancer deaths derived after medical record review and using standardized criteria with those obtained from death certificates to assess discordance (Table 4). After adjudication, only 56% of deaths classified as caused by CVD by death certificate were determined to be caused by CVD by standard criteria (i.e., the positive predictive value), resulting in a 44% discordance compared with death certificate data. The discordance in CVD was greater in men (positive predictive value for CVD by death certificate was 50% in men and 71.1% in women). Comparison of death certificate data with adjudicated data for categories of CVD showed that concordance was higher for heart failure (8/10) and stroke (14/19) than for CHD (6/31). We observed less discordance for cancer deaths. For men, 68% of deaths caused

by cancer were classified correctly by death certificate, and for women, 85% of cancer deaths were classified correctly.

We compare WATCH age-adjusted total mortality rates with US and Alaska data in Table 5. Total mortality rates were similar to those published for Alaska Native people as a whole, as well as to published rates for the Yukon–Kuskokwim Delta and Norton Sound regions, and the rates were higher than those for US Whites. The adjudicated CHD death rates in WATCH for both men and women appear lower than those published using death certificate data. Compared with US Whites, CHD mortality rates for WATCH appear to be almost a third lower in men and slightly lower in women. By contrast, stroke rates for both men and women in the WATCH study appear higher than those for the US White population.

DISCUSSION

The WATCH systematic population-based analysis indicates that total mortality rates among western Alaska Native people are higher than mortality rates among US Whites. For both genders, excluding trauma, CVD was the highest cause of death, and CVD mortality was only slightly higher in men than in women. Although CHD mortality rates tended to be lower among WATCH participants than among US Whites, rates for fatal stroke appear to be higher than among US Whites; among WATCH women, rates for stroke were almost as high as rates for CHD. Malignancies were the second highest cause of death from chronic disease, with similar rates in men and women. Comparisons with adjudicated mortality data showed that death certificate data overestimated CVD deaths, especially in men. Death certificates were more accurate for cancer mortality, especially in women.

Before the WATCH study, no population-based data on cause-specific mortality rates based on standardized criteria were available for this remote Indigenous population, except for cancers, which are followed by the population-based Alaska Native Surveillance Epidemiology and End Results registry. The only published mortality data for western Alaska Native people were derived primarily from state death certificates.³⁴ Although sampling strategy was by convenience, the large

TABLE 3—Cause-Specific Mortality by Gender: Western Alaska Tribal Collaborative For Health, 1994–2010

Condition	Men		Women		Men and Women	
	No. (%)	Rate (per 1000 PY)	No. (%)	Rate (per 1000 PY)	RR (95% CI)	Adjusted RR ^a (95% CI)
Total deaths	150 (100)	10.8	130 (100)	7.8	1.4 (1.1, 1.7)	1.5 (1.2, 1.9)
CVD	29 (19.3)	2.1	31 (23.9)	1.9	1.0 (0.6, 1.7)	1.4 (0.8, 2.4)
CHD	17 (11.3)	1.2	14 (10.8)	0.8	1.5 (0.7, 3.0)	2.0 (0.9, 4.5)
Stroke	8 (5.3)	0.6	11 (8.5)	0.7	0.9 (0.4, 2.2)	0.9 (0.4, 2.4)
Heart failure	4 (2.7)	0.3	6 (4.6)	0.4	0.8 (0.2, 2.8)	0.8 (0.2, 3.6)
Cancer	19 (12.7)	1.4	24 (18.5)	1.4	0.9 (0.5, 1.7)	0.9 (0.5, 1.7)
Infection	12 (8.0)	0.9	15 (11.5)	0.9	1.0 (0.4, 2.0)	1.3 (0.6, 3.1)
Trauma	37 (24.7)	2.7	11 (8.5)	0.7	4.0 (2.1, 7.9)	4.5 (2.1, 9.5)
Other chronic disease	6 (4.0)	0.4	6 (4.6)	0.4	1.4 (0.4, 4.7)	1.3 (0.4, 4.4)
Other/unknown	47 (31.3)	3.4	43 (33.1)	2.6	1.3 (0.9, 2.0)	1.4 (0.9, 2.1)

Note. CHD = coronary heart disease; CI = confidence interval; CVD = cardiovascular disease, combines all heart disease and stroke; PY = person-years; RR = rate ratio.

^aAdjusted for age, diabetes, ever smoked, and obesity (body mass index > 30 kg/m²).

number of villages and large proportion of residents who participated in most of the cohorts strongly suggest that the current data may be generalized to the Yup'ik and Inupiat peoples residing in coastal villages of western Alaska.

The high stroke mortality rates in western Alaska Native people are of concern. Stroke rates tend to be high in many northern populations, among Native (Greenland, Canadian Inuit)^{35,36} and non-Native (Sweden and Finland) people.³⁷ A major objective for future WATCH follow-up will be to examine risk factors for chronic diseases. For example, high smoking rates (66% in the WATCH cohort)¹⁹ may contribute to the high rates of stroke and cancer; in addition to smoking tobacco use, the rate of chewing tobacco use is reported to be high, especially in the Yukon–Kuskokwim Delta region.^{38,39} Further follow-up will allow us to evaluate the role of both forms of tobacco in chronic diseases in this population. Only about 20% of fatal strokes were hemorrhagic, and an analysis of strokes among all Alaska Native people, using death certificate data only,⁴⁰ showed that about 30% were hemorrhagic. Thus, the high stroke fatality rates are probably not related to high omega-3 fatty acid intake, as has earlier been suggested.⁴¹ One lifestyle factor that must be considered in relation to stroke mortality in this population is

lower education, which may limit awareness of stroke warning signals. Another factor is access to care. The remote locations of most of the communities, combined with the frequent inclement weather, may prevent stroke patients from reaching a hospital in time to prevent fatality. Future analyses will focus on stroke case-fatality rates that can be used to identify barriers to care, in addition to exploring prevalent risk factors. However, by contrast with stroke, CHD rates, although based on small numbers, appear to be lower than those for US Whites; future systematic examinations of risk factors by CVD subtype will be of interest to further explore this dichotomy.

We observed gender differences in the mortality data. Men had higher rates of CHD in WATCH, whereas stroke rates were similar among men and women. This gender difference in CHD, but not in stroke mortality, was similar to observations in US Whites. Death from trauma was more common among men than women, with rates for both exceeding those for US Whites.³⁴ Similar rates, however, have been observed in other rural populations.^{6,18,42}

On the basis of systematic review and adjudication, our data show that CVD rates are considerably lower than those derived from death certificates. Similar observations have

TABLE 4—Categories of Cardiovascular Disease and Cancer Deaths Determined by Death Certificate Only vs Medical Record Review and Adjudication: Western Alaska, 1994–2010

	By Review and Adjudication		By Death Certificate	
	Yes	No	Yes	No
CVD				
Overall				
Yes, no.	48	12	60	
No, no.	32	185	217	
Total, no.	80	197	277	
κ coefficient (95% CI)			0.6	(0.5, 0.7)
Sensitivity				80.0
Specificity				85.3
PPV ^a				60.0
Men				
Yes, no.	21	8	29	
No, no.	21	100	121	
Total, no.	42	108	150	
κ coefficient (95% CI)			0.5	(0.3, 0.6)
Sensitivity				72.4
Specificity				82.6
PPV ^a				50.0
Women				
Yes, no.	27	4	31	
No, no.	11	85	96	
Total, no.	38	89	127	
κ coefficient (95% CI)			0.7	(0.6, 0.8)
Sensitivity				87.1
Specificity				88.5
PPV ^a				71.1
Cancer				
Overall				
Yes, no.	41	2	43	
No, no.	13	221	234	
Total, no.	54	223	277	
κ coefficient (95% CI)			0.8	(0.7, 0.9)
Sensitivity				95.3
Specificity				94.4
PPV ^a				75.9
Men				
Yes, no.	19	0	19	
No, no.	9	122	131	
Total, no.	28	122	150	
κ coefficient (95% CI)			0.8	(0.6, 0.9)
Sensitivity				100.0
Specificity				93.1
PPV ^a				67.9

Continued

TABLE 4—Continued

Women			
Yes, no.	22	2	24
No, no.	4	99	103
Total, no.	26	101	127
κ coefficient (95% CI)	0.9 (0.7, 1.0)		
Sensitivity	91.7		
Specificity	96.1		
PPV ^a	84.6		

Note. CI = confidence interval; CVD = cardiovascular disease; PPV = positive predictive value. Death certificates for 3 people were not available and were not included in this table.

^aThe PPV, which can be interpreted as percentage properly classified, is calculated as the number adjudicated as “yes” (first row under the categories of overall, men, and women) divided by the number classified as “yes” by death certificate (first column of numbers).

been made in American Indian populations.⁴³ The WATCH study methods used for mortality review and adjudication were established by the National Heart, Lung, and Blood Institute and the National Institutes of Health and are the same as those used in many other studies, thus allowing for comparisons of data across populations and studies. A possible reason for the overestimation of CVD mortality in death certificates is that out-of-hospital deaths are frequently sudden or unwitnessed, and the death certificates are not completed on site. The certificates are sent to medical examiners, whose protocol assigns these cases as

cardiopulmonary arrest; thus, these deaths are coded as cardiovascular events. The more accurate information obtained in this study will help guide providers and community leaders in planning care and prevention programs.

The WATCH study has a number of strengths. The data are from a large representative sample of the Yukon–Kuskokwim Delta and Norton Sound communities. In addition, loss to follow-up was minimal because participants were known by many community members; thus, vital status could be ascertained for all participants. Almost all medical records were available at regional hospitals or from the Alaska Native Medical Center in Anchorage. All of the cohort studies were approved and supported by the regional health corporations and tribal governments, and all used the same methods for medical record abstraction and the same criteria for event adjudication.

The most significant limitation of this study is the relatively small number of deaths during follow-up. Most western Alaska Native people reside in remote communities of fewer than 500 people along the Alaskan coastline and along major rivers. None of the communities are connected by a road system. Subsequently, no individual component study or community dataset has sufficient numbers to allow precise estimation of rates of chronic diseases or examination of risk and protective factors; continued follow-up of the WATCH cohort will be the only way to

obtain data on larger numbers of deaths. Although bias may have been introduced by variation in the timing of baseline examinations and follow-up, the consolidated cohort is the only one large enough to provide reliable data.

In summary, this population-based systematic review and adjudication of mortality rates in western Alaska Native people has revealed high death rates. Rates of CHD mortality were lower than those in the general US population, but stroke mortality was higher. A large number of deaths were attributable to trauma, especially among men. Given the rapidly changing lifestyles in this population and the increases in death from chronic diseases, results from the WATCH study may be helpful in designing effective surveillance and prevention programs to improve health, lower morbidity, and decrease mortality rates in this remote rural population. ■

About the Authors

Barbara V. Howard, Hong Wang, and Jason G. Umans are with the MedStar Health Research Institute, Hyattsville, MD. Jesse S. Metzger is with the University of Alaska, Anchorage. Kathryn R. Koller, Elvin D. Asay, Abbie W. Wolfe, and Ellen M. Provost are with the Alaska Native Tribal Health Consortium Division of Community Health Services, Anchorage. Stacey E. Jolly is with the Cleveland Clinic Medicine Institute, Cleveland, OH. Scarlett E. Hopkins, Cristiane Kaufmann, and Bert B. Boyer are with the University of Alaska Fairbanks Center for Alaska Native Health Research. Terry W. Raymer and Brian Trimble are with the Alaska Native Medical Center, Anchorage. Sven O. E. Ebbesson is with the Norton Sound Health Corporation, Nome, AK. Melissa A. Austin is with the Department of Epidemiology, University of Washington, Seattle. William James Howard is with the MedStar Washington Hospital Center, Washington, DC.

Correspondence should be sent to Barbara V. Howard, PhD, Senior Scientist, MedStar Health Research Institute, 6525 Belcrest Road, Suite 700, Hyattsville, MD 20782 (e-mail: Barbara.V.Howard@MedStar.net). Reprints can be ordered at <http://www.ajph.org> by clicking the “Reprints” link. This article was accepted August 8, 2013.

Contributors

B. V. Howard, K. R. Koller, and B. B. Boyer participated in the study design, data collection and analysis, and article preparation and review. J. S. Metzger, E. D. Asay, and H. Wang analyzed the data. S. E. Jolly participated in the article preparation and review. A. W. Wolfe, S. E. Hopkins, and W. J. Howard participated in the data collection and article preparation and review. C. Kaufmann, E. M. Provost, and J. G. Umans participated in data collection and article preparation and review. T. W. Raymer and B. Trimble participated in data collection. S. O. E. Ebbesson participated in the study design and data collection. M. A. Austin participated in data analysis and article preparation and review.

TABLE 5—Annual Mortality Rates in the General US White Population and in the Western Alaska Tribal Collaborative for Health Population, 1994–2010

Condition	WATCH ^a		Alaska Natives ^b		Yukon–Kuskokwim ^b		Norton Sound ^b		US Whites ^c	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Total	14.6	10.1	14.0	9.3	12.2	9.3	15.5	9.4	10.1	7.0
CHD	1.2	0.8	2.7	1.7	2.1	1.7	2.5	1.3	1.7	0.9
Stroke	0.6	0.7	0.8	0.6	0.6	0.5	0.7	0.4	0.4	0.4
Cancer	1.4	1.4	3.0	2.0	3.1	2.0	4.2	1.5	2.4	1.6

Note. CHD = coronary heart disease; WATCH = Western Alaska Tribal Collaborative for Health.

^aAdjudicated deaths from current study.

^bDetermined by death certificate only.²⁹

^cAdjudicated deaths from the Atherosclerosis Risk in Communities Study,²⁷ using methods similar to those used in the WATCH study.

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Human Participant Protection

WATCH was approved by the Alaska Area institutional review board (IRB) as well as by the Norton Sound Health Corporation, the Yukon Kuskokwim Health Corporation, and the IRBs of all participating institutions and the Alaska Native Tribal Health Consortium.

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