News from the
Center for Alaska Native Health Research

Building and increasing research capacity to improve the health of Alaska Natives.

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CANHR Studies to be Presented at the Alaska Native Health Research Conference

INSIDE THIS ISSUE

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FAIRBANKS

The incidence of obesity and diabetes is dramatically increasing in Alaska Natives. CANHR has been working with Alaska Native people from Yup'ik communities in southwest Alaska to better understand the factors that contribute to these changes.

A collection of eight studies will be presented at the 2nd Alaska Native Health Research Conference in Anchorage Alaska on March 30 and 31, 2006.

The following pages outline these studies through brief articles. Specifically, the studies assessed: 1) the relationships between tobacco use, the risk factors for chronic disease, adherence to a Yup'ik lifestyle, and a number of other psychosocial variables relevant to cultural identity; 2) the prevalence of obesity by evaluating markers of obesity such as percent body fat and several body measurements; 3) the heritability of the accumulation of central-ly located body fat; 4) the prevalence of metabolic syndrome; 5) the relationships between perceived stress, Yup'ik cultural orientation, and established risk factors for chronic disease; 6) the relationship between circulating adiponectin levels and several measurements of body fat distribution in Yup'ik Eskimos; 7) physical activity using pedometers to understand the relationship between diet and chronic diseases; and 8) the prevalence of metabolically healthy obese (MHO) individuals, by looking at biological markers, body fat distribution patterns, and environmental factors.

The researchers also focused on finding new methods of measuring risk factors and prevention approaches that show some promise in reducing diabetes in Yup'ik populations.

The CANHR staff has worked closely with participating communities during the conduct of these studies. Study participants were actively involved with data collection and the interpretation of the data. We wish to thank them for their support and wisdom in understanding the meaning of the data.

The CANHR team hopes that leaders in Alaska Native Tribal Health organizations, providers, researchers, and community members will use the results of the research to develop a better understanding of ways of reducing type 2 diabetes in Alaskans.

A Publication of the University of Alaska

Tobacco Use, Enculturation, and Risk for Metabolic Disorders

Gerald V. Mohatt, EdD[1]; Christopher Wolsko, PhD[1]; Cecile Lardon, PhD[1]; Elizabeth Ruppert[2]; and Scarlett Hutchison, MA[1]

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Background: The relationship between how immersed an indigenous person is in his/her traditional culture has been used to explain psychosocial problems. Research has not adequately examined how cultural identity relates to risk factors for chronic disease. Competing arguments dispute whether individuals who identify with or are strongly immersed in their local indigenous way of life are protected against such risks.

Purpose: This study examined the relationships between tobacco use, the risk factors for chronic disease, adherence to Yup'ik lifestyle, and a number of other psychosocial variables relevant to cultural identity.

Methods: 674 male and non-pregnant female Yup'ik Eskimos 14 years and older were recruited from seven communities in the Yukon Kuskokwim River Delta. The following two aspects were studied:

1. Psychosocial characteristics, including: health and wellness in Yup'ik culture, identity with Yup'ik/White culture, mastery over important life outcomes, satisfaction with emotional support, extent of overwhelming and challenging life situations, and level of happiness.
2. Physiological characteristics, including: height, weight, percent body fat, waist circumference, blood pressure, triglycerides, HDL, LDL, and glucose levels.

Results:

▲ 29% smoked, 55% chewed Igmik (an indigenous tobacco mixture), and 14% used snuff tobacco.
▲ 76% of the sample had some lifetime exposure to nicotine.
▲ Relative to non-smokers, smokers reported having a stronger non-Native cultural identity, a weaker Native cultural identity, less satisfaction with their social support network, and a weaker sense of communal and personal mastery.
▲ Physiologically, smokers had lower HDL and LDL, higher blood pressure, lower fasting glucose, and lower percentage body fat.
▲ Users of Igmik had a different psychosocial and physiological profile. They had a stronger Native identity, a weaker non-Native identity, higher HDL and LDL, higher percentage body fat, and lower triglycerides.

Conclusion: Results suggest that cultural factors play a complex role in understanding both risk and protective factors for metabolic disorders. It appears that choice of substances is significantly influenced by a combination of cultural identity and beliefs and practices in traditional Yup'ik concepts of health and wellness. ▲

Breakdown of Results

Who chews iq'mik more?

- Older people more than younger people
- Women more than men
- People who identify less with white culture
- People who identify more with Yup'ik culture

Who smokes more?

- Younger people more than older people
- People who identify more with white culture

Who eats more traditional food?

- Older people more than younger people
- People who identify less with white culture
- People who identify more with Yup'ik culture

Who uses drugs and alcohol more to cope?

- Younger people more than older people
- Men more then women
- People who identify more with white culture
- People who identify less with Yup'ik culture

Obesity and Patterns of Centralized Body Fat Among Yup'ik Eskimos in Southwestern Alaska

Scarlett H. Hutchison, MA; Rosemarie Plaetke, PhD; Johanna R. Herron; Gerald V. Mohatt, EdD; and Bert B. Boyer, PhD

Background: The prevalence of obesity and type 2 diabetes mellitus is increasing dramatically in ethnic minorities.

Purpose: Researchers determined the prevalence of obesity by evaluating markers such as percent body fat and several body measurements.

Methods: The study population consisted of 341 women and 276 men ages 18 to 94 years of Yup'ik descent from 6 villages and a small town in southwestern Alaska.

Results:

▲ Waist-to-hip ratios were significantly larger in men than women, but women had larger hip and thigh circumferences.

▲ Women had larger skinfolds and more body fat measured by electrical bioimpedance, a machine that passes a slight electrical current up the leg of the participant.

▲ Average systolic and diastolic blood pressure was significantly higher in men than women.

▲ There were no differences between men and women in total cholesterol or triglycerides.

▲ High density lipoproteins (HDL) were significantly higher in women compared to men, while LDL was significantly higher in men than women.

▲ Blood pressure increased by age and by BMI.

Conclusions: Data suggested that high percentage of body fat and centralized body fat accumulation in Yup'ik women could become a significant health risk for type 2 diabetes in the future. However, the significantly higher blood pressure in men indicates a risk factor unrelated to weight; further investigation is needed in this area.

The research team feels it is a priority to examine additional ways to reduce body fat accumulation among females. Efforts are currently underway to identify protective factors influencing well-managed blood lipids (fats), the low rates of type 2 diabetes mellitus, and metabolic syndrome in this Yup'ik study population. ▲

Table 1: Age and Anthropometric Measures by Gender

Measurement	Total Study Sample n	Mean SD	Females n	Mean SD	Males n	Mean SD	p value	NHANES n	Mean SD
Age (years)	635	42±16	349	42±16	286	42±17	0.9	19618	48±21
Height (cm) *	635	159.0±27.03	349	154.3±25.02	286	164.8±28.29	=.001	***19182	173.8±110.1
Weight (kg)	635	72.1±15.98	349	71.5±17.74	286	72.8±13.53	0.15	17696	74.7±18.0
Body Fat									
BMI* (kg/m²) *	635	28.9±6.90	349	29.5±7.46	286	25.9±5.54	=.001	***17689	27.0±5.9
Percentage Body Fat (BIA) *	635	29.8±11.15	349	36.3±9.20	286	21.9±7.68	=.001	not available	
Percentage Body Fat (DW) *	627	29.4±7.98	346	32.5±6.78	281	25.7±7.76	=.001	not available	
Circumferences									
Waist Circumference (cm)	629	92.0±14.27	346	93.2±15.67	283	90.7±12.21	0.072	***16423	92.8±14.6
Hip Circumference (cm) *	626	101.7±11.78	345	105.8±13.11	281	96.8±7.35	=.001	***16397	101.0±11.7
Triceps Circumference (cm)	628	31.4±4.36	346	31.7±4.91	282	31.0±3.54	0.077	***16920	31.8±4.8
Thigh Circumference (cm) *	622	51.0±6.57	345	52.0±7.64	277	49.8±4.66	=.001	***16339	51.3±6.7
Skinfolds									
Abdominal Skinfold (mm) *	625	28.8±14.47	345	34.4±12.15	280	21.9±14.15	=.001	15774	21.4±10.2
Subscapular Skinfold (mm) *	627	22.0±12.12	346	27.4±11.77	281	15.3±8.75	=.001	15580	20.6±8.9
Triceps Skinfold (mm) *	628	21.2±10.92	346	28.0±8.96	282	13.0±6.56	=.001	***16539	18.4±9.4
Thigh Skinfold (mm) *	620	23.1±13.44	345	31.7±11.14	275	12.4±6.57	=.001	***14381	20.6±11.1
Ratios									
Waist-to-Hip Ratio *	626	0.90±0.08	345	0.88±0.07	281	0.93±0.08	=.001	***16398	0.9±0.09
Waist-to-thigh Ratio	622	1.81±0.22	345	1.80±0.24	277	1.83±0.20	0.064	16300	1.8±0.2
SubscapSF-to-TricepSF Ratio *	627	1.07±.31	346	.96±.22	281	1.21±.35	=.001	not available	
Waist-to-Height Ratio *	629	.57±.10	346	.60±.11	283	.54±.09	=.001	not available	
Visceral Adipose Tissue 8	621	558.7±160.67	345	552.9±181.52	276	565.9±129.97	0.011	not available	
Total Abdominal Area	625	690.2±224.07	346	710.0±249.05	279	665.7±186.10	0.072	not available	
Visceral Compartment Area *	621	443.0±121.60	345	416.3±130.08	276	476.2±100.85	=.001	not available	
Subcutaneous Adipose Tissue *	621	247.69±147.78	345	294.0±139.51	276	189.9±137.31	=.001	not available	

8 Mann-Whitney 2P=0.05 by gender within CANHR population
* Mann-Whitney 2P=0.001 by gender within CANHR population
*** Mann-Whitney 2P=0.05 between CANHR population and NHANES

Table 2: Blood Pressure Measurements

Measurement	Total Study Sample (n=532) Mean SD	Females (n-278) Mean SD	Males (n=254) Mean SD	NHANES (n=16638-16640) Mean SD
Mean Arterial Pressure *	88.1±9.81	86.3±10.30	90.0±8.85	89±14.1
Systolic BP *	120.5±13.64	116.9±14.21	124.3±1.86	125±22.2
Diastolic BP 8	71.9±+9.45	70.9±9.72	72.9±9.05	72.1±14.0

8 Mann-Whitney 2P=0.05 by gender within CANHR population
* Mann-Whitney 2P=0.001 by gender within CANHR population
*** Mann-Whitney 2P=0.05 between CANHR population and NHANES

Heritability Analysis of Obesity Related Traits in Alaskan Yup'ik Eskimos

Hemant K.Tiwari, PhD[1]; Amit Patki[1]; Yichen Wang, MS[2]; Anna V. Goropashnaya, PhD[2]; Gabriela Antunez de Mayolo, PhD[2]; Rosemarie Plaetke, PhD[2]; Gerald V. Mohatt, EdD[2]; David B. Allison, PhD[1]; and Bert B. Boyer, PhD[2]

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Background: The incidence of obesity and diabetes is dramatically increasing in Alaska Natives. Data collected in this study showed that the accumulation of centrally located body fat is especially common among Yup'ik Eskimos.

Methods: Over 770 Yup'ik Eskimos 14 to 95 years of age residing in seven rural villages in Southwest Alaska were enrolled in this study. The following calculations were made to estimate heritability of BMI:

▲ Parent-Offspring Correlations and corresponding standard deviation for each trait.
▲ Heritability as twice the parent-offspring correlation.
▲ Familial correlations using the FCOR program of SAGE5.0 package.

Several characteristics of body type were also obtained, and participants provided family history information which enabled the research team to construct several extensive multigenerational pedigrees.

Results:

▲ Compared to men, women had significantly higher BMI (30.0±7.1 (SD) vs. 26.4±4.4), waist circumference (94.0±15.9 vs. 91.1±12.3), and percent body fat (36.9±8.6 vs. 22.4±7.0).

▲ In this study population, the heritability estimate was: 0.35 for BMI, 0.26 for waist circumference, and 0.26 for percent body fat.

Conclusions: These results suggest that a substantial portion of the differences seen in BMI is due to genetic influences, and that heritability estimates are compatible with other population studies. Thus, it is important to understand how predisposing genetic factors influence the development of overweight and obesity among the population.

This is a novel data set to investigate genes of obesity related traits, and recruitment is still underway to fill the gaps in the data. A new complete data set will give more precise estimates of heritability of obesity related traits. ▲

Descriptive Statistics with Adjustment of Sex, Age, and Age_square and Using Transformation						
Variable	Transformation	N	Mean	Std Dev	Skewness	Kurtosis
BMI	log	702	3.302	0.207	0.4587	0.2581
Percent body fat	none	702	29.496	10.829	0.1035	-0.8859
Triceps skinfold	none	702	21.121	10.803	0.4049	-0.5976
Subscapular Skinfold	log	699	2.901	0.597	-0.1946	-0.9858
Abdominal Skinfold	none	698	28.003	14.565	0.2302	-0.6917
Thigh Skinfold	square root	695	4.594	1.411	0.1097	-0.9262
Waist Circumference	log	702	4.495	0.156	0.3132	0.041

BMI

Percent Body Fat

Waist Circumference

Waist Circumference

Abdominal Skinfold

Triceps Skinfold

Thigh Skinfold
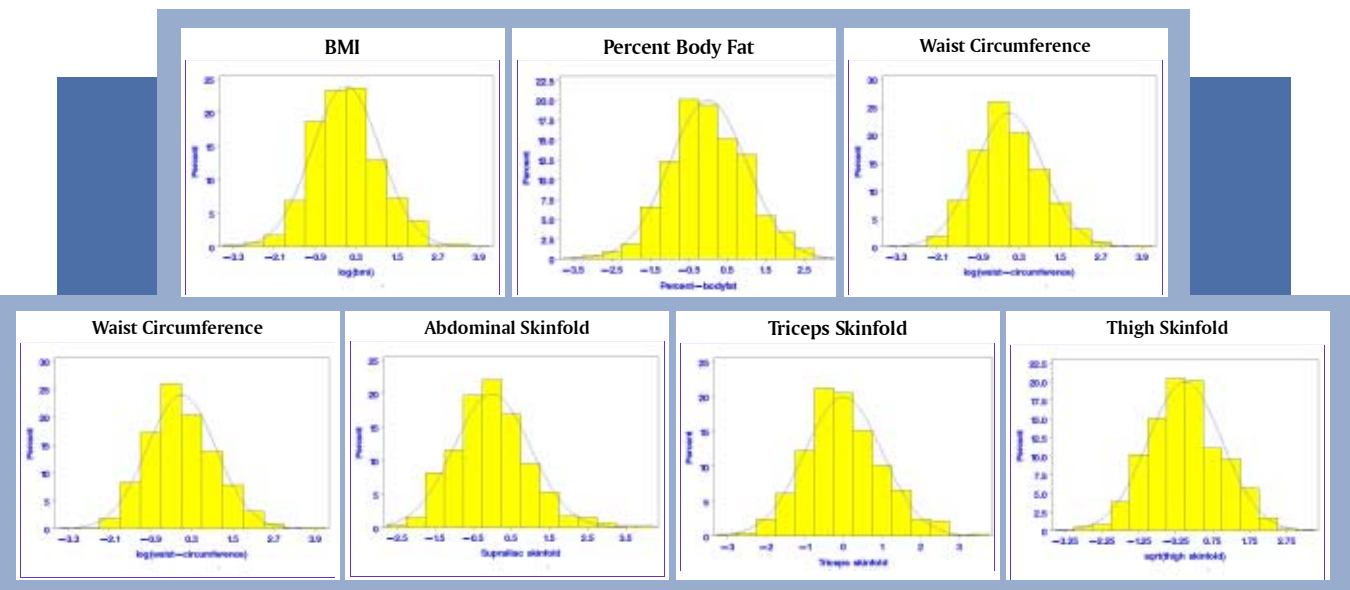
Low Prevalence of Metabolic Syndrome in Yup'ik Eskimos

Bert B. Boyer, PhD[1]; Rosemarie Plaetke, PhD[1]; Kimber L. Stanhope, MS[2]; Andrea Bersamin, MS[2]; Peter J. Havel, PhD[2]; and Gerald V. Mohatt, EdD[1]

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Background: Historically, the prevalence of obesity and type 2 diabetes (T2D) in Alaskan Eskimos has been low when compared to other Alaska Native ethnic groups, Native Americans, and individuals of European decent. Although T2D prevalence rates among Alaskan Eskimos is 50% of U.S. all races, the percent change (118%) over the last 13 years is greater than U.S. all races (75%; *Alaska Native Tribal Health Consortium Diabetes Program*). It is important to understand the risks associated with T2D among Alaska Natives.

Methods: Researchers assessed the prevalence of metabolic syndrome, which consists of five risk factors for chronic disease: waist c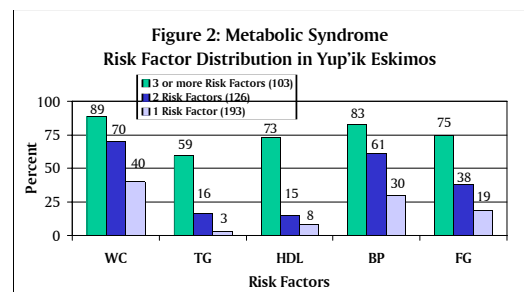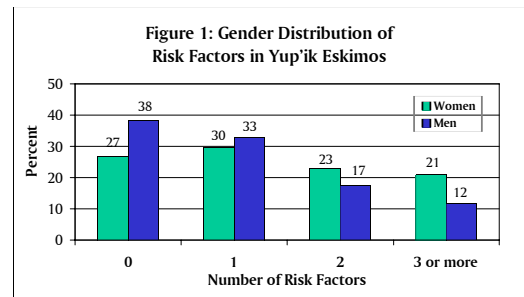ircumference, blood pressure, HDL, Triglycerides, and fasting blood glucose. The study group consisted of 571 Yup'ik Eskimos ages 18-94 years from 6 rural villages and a small town in Southwestern Alaska.

Results:

▲ The age-adjusted prevalence of metabolic syndrome was 17.7% (20.4% for females and 11.9% for males). This is compared with 23.9% for the 1999-2000 NHANES national sample.

▲ The prevalence by gender was 15.2% (n=51) in females and 6.8% (n=18) in males, a statistically significant difference.

▲ High waist circumference was the most prevalent risk factor for metabolic syndrome. Over 50% of female participants exceeded the 88 cm ATPIII criteria cutoff.

▲ Blood pressure was the second most common risk factor, while abnormal fasting glucose, HDL, and triglycerides were much less common.

▲ As the number of risk factors increased, the plasma levels of leptin, insulin, and C-reactive protein significantly increased, and adiponectin levels significantly decreased. These levels are consistent with increased risk for developing chronic disease.

Conclusions: Preliminary results suggest that metabolic syndrome is not yet common among Yup'ik Eskimos. Potential protective factors to explain this lower prevalence are being investigated and include a diet rich in omega 3 polyunsaturated fatty acids, which may partially explain the healthy lipid profiles observed in our study population. It is important to note that the data suggest combining primary prevention to maintain protective factors with secondary prevention to reduce risk factors such as increased visceral fat. ▲

Figure 1: Gender Distribution of Risk Factors in Yup'ik Eskimos

Figure 2: Metabolic Syndrome Risk Factor Distribution in Yup'ik Eskimos

Anthropometric and Biochemical Measures by Gender					
		CANHR			
	NHANES III	Total CANHR	Females	Males	
Measurement	*Mean±SD*	*Mean±SD*	*Mean±SD*	*Mean±SD*	*p* value
Age	47±21	42±16	42±16	42±17	0.733
Height (cm) *	166.4±10.0	160.4±8.5	155.6±6.2	166.4±7.1	= 0.001
Weight (kg)	74.7±18.0	72.5±15.5	72.1±17.0	73.0±13.6	0.184
BMI (kg/m²) *	27.0±5.8	28.2±6.1	29.8±6.9	26.3±4.2	= 0.001
Percentage Body Fat (BIA) *	not available	30.1±10.7	36.5±8.6	22.2±7.1	= 0.001
Waist Circumference (cm)	92.4±14.5	92.0±14.4	93.1±15.8	90.7±12.4	0.085
Blood Pressure					
Mean Arterial Pressure *	89.0±13.0	88.8±10.4	87.4±11.2	90.4±9.0	= 0.001
Systolic BP *	122.7±20.7	122.3±14.9	119.6±15.8	125.5±13.1	= 0.001
Diastolic BP †	72.2±12.6	72.0±10.1	71.3±10.9	72.9±9.0	0.01
Biochemical Measures					
Cholesterol (mg/dl)	203.3±44.0	209.5±44.1	209.1±41.8	210.0±46.8	0.967
HDL (mg/dl) *	50.9±15.1	63.7±16.7	67.1±16.1	59.4±16.4	= 0.001
LDL (mg/dl) †	127.0±38.5	128.2±38.9	123.9±35.5	133.5±42.1	0.011
Triglyceride (mg/dl)	135.1±105.8	89.3±51.7	88.0±45.0	90.9±59.0	0.802
Fasting Glucose (mg/dl) †	101.5±31.6	94.6±12.1	94.1±13.1	95.1±10.8	0.042
Insulin (μU/ml)*	11.1±8.0	15.8±9.0	17.1±9.9	14.0±7.2	= 0.001
Adiponectin (μg/ml)	not available	8.5±4.3	8.7±4.4	8.2±4.1	0.177
Leptin (ng/ml)*	not available	11.9±10.4	17.7±10.2	4.1±3.2	= 0.001
C-Reactive Protein (mg/dl)	0.48±0.80	0.36±1.01	0.27±0.58	0.48±1.39	0.114

* Mann-Whitney 2P=0.001 by gender within CANHR population
† Mann-Whitney 2P=0.05 by gender within CANHR population

▲ Waist circumference: men >102cm; women >88cm.
▲ Triglycerides: >150 mg/dl (1.7mmol/L) or meds to lower TG.
▲ HDL: men <40 mg/dl (1.03mmol/L) or cholesterol lowering meds; women: <50 mg/dl (1.29mmol/L) or cholesterol lowering meds.
▲ Blood Pressure: >130 or >85 mm Hg or antihypertensive meds.
▲ Fasting Glucose: >100 mg/dl (5.6mmol/l), known diabetes or currently taking diabetes meds.

Psychosocial Stress, Enculturation, and Risk for Metabolic Disorders

Christopher Wolsko, PhD[1]; Cecile Lardon, PhD[1]; Gerald V. Mohatt, EdD[1]; Elizabeth Ruppert[2]; and Scarlett Hutchison, MA[1]

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Background: Research indicates that chronic psychosocial stress significantly undermines physical, mental, and behavioral health. Life in many Alaska Native communities is shaped by a high stress load due in part to historical trauma and rapid cultural change, potentially creating serious risks for the development of chronic disease. Competing arguments suggest that individuals who identify with and are strongly immersed in the local indigenous way of life may or may not be protected against such risks.

Purpose: The present study of 674 Yup'ik Eskimos examined the relationships between perceived stress, Yup'ik cultural orientation, and established risk factors for chronic disease.

Methods: The study group included male and non-pregnant female Yup'ik Eskimos 14 years and older from seven communities in the Yukon Kuskokwim River Delta. To measure psychosocial stress, researchers looked at the extent to which participants felt emotionally overwhelmed or unable to cope with life in the past month. They also looked at a variety of Yup'ik cultural activities and the frequency with which a person engaged in those activities. Physiological risk factors were also measured for chronic disease.

1. Psychosocial stress looked at perceived stress and Yup'ik wellness:

  ▲ Perceived Stress: the extent to which participants felt overwhelmed with challenging life situations over the past month.
  ▲ Yup'ik Wellness: the extent to which participants engaged in activities considered integral to staying healthy in Yup'ik culture (e.g., engaging in subsistence activities, eating traditional foods, using traditional medi-cine, getting outside for fresh air, helping others).

2. Physiological characteristics were measured to determine risk factors for chronic disease. These characteristics included: height, weight, percent body fat, waist circumference, blood pressure, and HDL and LDL levels.

Results:

  ▲ For women, greater perceived stress was associated with greater BMI, percent body fat, waist circumference, and blood pressure.
  ▲ For men, greater perceived stress was not associated with any of the risk factors. However, men who placed more importance on living a Yup'ik lifestyle also had greater BMI, percent body fat, waist circumference, blood pressure, HDL, and LDL.
  ▲ In contrast, for women, scores on the Yup'ik cultural orientation measure were not associated with any of the risk factors.

Conclusions: The CANHR study results suggest that psychosocial stress and issues of cultural identity play a complex role in the development of risk factors for metabolic disorders in this population.

Additional discussion focuses on explanations for the observed gender differences and on preliminary analyses incorporating measures of diet and exercise into the statistical models. ▲
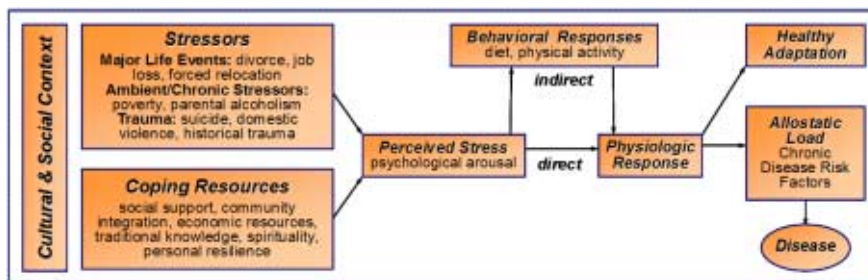
Pathways from Stress to Disease

Table 1: Correlations between Stress, Enculturation, and Physiological Characteristics for Male Participants (n = 206)

	Perceived Stress	Yup'ik Wellness (Frequency)	Yup'ik Wellness (Importance)
Body Mass Index (kg/m^2)	-.01	.12*	.29***
Percent Body Fat	.01	.15*	.37***
Waist Circumference (cm)	.00	.14*	.33***
Systolic Blood Pressure	-.04	.15*	.14*
Diastolic Blood Pressure	.04	.12	.18*
HDL	.10	.16*	.15*
LDL	-.11	.14*	.30***
Note: *p<.05, ***p<.001			

Table 2: Correlations between Stress, Enculturation, and Physiological Characteristics for Female Participants (n = 287)

	Perceived Stress	Yup'ik Wellness (Frequency)	Yup'ik Wellness (Importance)
Body Mass Index (kg/m^2)	.15**	-.01	.06
Percent Body Fat	.11*	.01	.06
Waist Circumference (cm)	.17**	-.02	.04
Systolic Blood Pressure	.14*	.06	.14*
Diastolic Blood Pressure	.19***	-.03	.07
HDL	-.02	.09	.10
LDL	.01	.06	.03
Note: *p<.05, **p<.01, ***p<.001			

Weak Association between Adiponectin and Body Fat Distribution, Insulin Sensitivity, & Plasma Lipoproteins in Alaskan Yup'ik Eskimos

Anna Goropashnaya, PhD[1]; Johanna Herron[1]; Peter J. Havel, PhD[2]; Kimber Stanhope, MS[2]; Rosemarie Plaetke, PhD[1]; Gerald V. Mohatt, EdD[1]; and Bert B. Boyer, PhD[1]

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[2]Department of Nutrition, University of California Davis

Background: Adiponectin is a hormone produced only in fat cells that regulates the activity of fats and glucose, and influences the body's response to insulin. Low levels of adiponectin are found in individuals who are obese and who are at increased risk for type 2 diabetes mellitus.

Purpose: The aim of this study was to assess the relationship between circulating adiponectin level and several measurements of body fat distribution in Yup'ik Eskimos.

Methods: The study group consisted of 504 participants (210 men and 294 women). These individuals ranged between the ages of 18 and 94 years and resided in seven villages in Southwest Alaska.

Results:

▲ The hormone adiponectin was lower in those individuals with high body mass index (BMI), percent body fat, triglycerides, and fat accumulation within the abdomen.

▲ Age and sex influenced the relationship between adiponectin and both BMI and percent body fat: older individuals had lower levels of adiponectin, and women had lower levels of adiponectin than men.

▲ A positive relationship was observed between adiponectin and total cholesterol, and high density lipoprotein (HDL).

The research team also completed an analysis using the homeostasis model assessment for insulin resistance (HOMA-IR). It is based on fasting plasma glucose and insulin levels, and is used to assess insulin resistance. Statistical analysis revealed a negative relationship between adiponectin and HOMA-IR or fasting insulin. Participants were divided into three groups: (1) low HOMA-IR <1.5; (2) intermediate HOMA-IR =1.5 and =3.0; and (3) high HOMA-IR > 3.0. Adiponectin concentrations between the three groups differed significantly. Adiponectin levels were lower in the high HOMA-IR group and higher in the low HOMA-IR group.

Findings & Conclusions:

▲ Individuals with high HOMA-IR levels had elevated BMI, percent body fat, cholesterol, triglycerides, fasting plasma glucose, insulin, and leptin levels.

▲ Plasma adiponectin levels were significantly lower in individuals with higher BMI, percent body fat, and fat accumulation within the abdomen; plasma adiponectin levels were significantly higher in individuals with higher HDL levels.

These findings suggest that HOMA-IR may be an added tool for researchers to assess insulin resistance. Adiponectin may also be used to measure risk for developing type 2 diabetes mellitus. ▲

Table 1: Adiponectin Levels in Low, Intermediate, and High HOMA-IR Groups

HOMA-IR group	HOMA-IR values	Adiponectin (mean±S.E.M.), μg/mL
Low	<1.5	10.6±0.6
Intermediate	=1.5 and =3.0	9.3±0.3
High	>3.0	7.7±0.2

Table 2: Physiological Characteristics of Individuals in Low and High HOMA-IR Groups

Physiological Characteristics	Low HOMA-IR, mean±S.E.M	High HOMA-IR, mean±S.E.M
BMI (kg/m2)	25.8±0.8	30.7±0.4
% body fat	28.0±1.7	34.3±0.6
Cholesterol (mg/dl)	198.5±6.7	212.5±2.4
Triglycerides (mg/dl)	67.6±4.3	101.9±3.8
Glucose (mmol/l)	4.8±0.1	5.5±0.1
Insulin (μU/ml)	5.8±0.2	20.6±0.6
Leptin (ng/ml)	9.2±1.2	15.2±0.7

Association of Pedometer Assessed Physical Activity and Measures of Health Among Alaska Natives

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Background: The prevalence of factors for metabolic syndrome, particularly obesity, is increasing among Alaska Natives. The World Health Organization identified physical activity as an important factor in understanding what causes obesity, yet no study to date has measured physical activity levels directly in an Alaska Native population. Such an assessment is critical and needs to be included in analyzing the effect of nutrition on health outcomes.

Purpose: Physical activity was measured in 167 male and female Alaska Natives ages 14 to 74 years living in rural communities in southwestern Alaska.

Methods:

▲ Participants wore pedometers for three days, recording the number of steps taken each day.

▲ Body measurements and percent body fat were taken using a bioimpedence machine that sends a very low wave of electricity up the legs to measure body fat, muscle, and water.

▲ A fasting blood sample was taken to measure blood lipids, glucose, and other hormones of importance to understanding obesity and its relationship to chronic diseases such as diabetes and heart disease.

Results:

▲ The number of average steps/day was significantly higher among men than women.

▲ There was a negative relationship between fasting blood glucose and average steps per day among males and females.

▲ In females (controlling for age), the number of average steps/day was lower the higher the Body Mass Index, percentage body fat, waist circumference, and plasma triglycerides.

Conclusion: Pedometer measurements offer a simple, valid, and cost-effective means of assessing physical activity among Alaska Natives. These data support using pedometer assessed physical activity as a way of understanding the relationship of diet to chronic diseases and should be investigated further in this population. Results suggest that prevention efforts should focus on designing programs to increase activity among females in this population. ▲

Table 1: Participant Characteristics by Sex

	Females (n = 94)	Males (n = 73)
Age	33.2 ± 15.1	35.2 ± 16.4
BMI (kg/m^2)	29.5 ± 7.0*	25.5 ± 4.4
% Body Fat	36.0 ± 8.5*	20.3 ± 7.2
WC (cm)	91.3 ± 15.8	86.9 ± 17.1
HDL (mg/dL)	62.4 ± 16.3	57.8 ± 18.7
Triglycerides (mg/dL)	92.2 ± 51.3	94.6 ± 80.6
Fasting glucose (mg/dL)	93.0 ± 10.1	95.7 ± 11.3
Mean steps/day	5824 ± 3308*	9178 ± 3196

Mean ± s.d
WC = Waist circumference
*Significantly different from Males, $P < .001$ (student's t-test)

Table 2: Partial Correlation between Steps/day and Health Outcomes, Controlling for Age

	Males	Females
BMI (kg/m^2)	-.09	-.36**
% Body fat	-.07	-.39**
WC (cm)	.10	-.36**
HDL	.07	.23*
Triglycerides	-.16	-.22*
Glucose	-.28*	-.25*

WC = Waist circumference
HDL, triglycerides, and glucose (mg/dL)
* $P < 0.05$, ** $P < 0.001$

Figure 2: Comparison of mean glucose, waist circumference, and BMI by tertile of steps/day among women
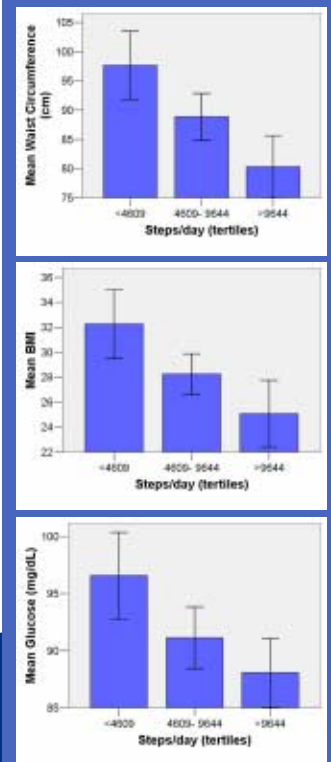
Metabolically Healthy, But Obese Yup'ik Eskimos

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Background: Recent studies have demonstrated the existence of a unique subgroup of obese individuals who display a healthy metabolic profile, despite having significant levels of body fat.

Purpose: This study sought to identify the prevalence of metabolically healthy obese (MHO) individuals in a large sample of Alaska Native Yup'ik Eskimos, and to examine potential explanatory factors underlying MHO prevalence. The study group consisted of 639 Yup'ik Eskimos--350 women and 289 men aged 18 to 94 years.

Methods:

The following data were gathered for this study:

▲ Standing height, weight, blood pressure (sitting), and percent body fat by bioimpedance, a machine that provided Body Mass Index and Percent Body Fat.

▲ Fasting blood sample for triglycerides, total cholesterol, LDL, HDL, insulin, glucose, adiponectin, C-reactive protein, and ghrelin levels.

Each of these is important for understanding how to define a metabolically healthy individual, or for understanding the underlying mechanisms associated with the development of obesity.

Results:

▲ A total of 211 individuals were identified as obese, and 30 individuals (23 females and 7 males) met at least four out of the five MHO defining criteria (14.2%). The remaining 181 obese participants were classified as "at risk."

▲ MHO participants had reduced triglycerides, LDL, and total cholesterol, as well as increased HDL levels when compared to at risk individuals.

▲ Interestingly, HOMA values, including plasma levels of adiponectin, C-reactive protein, and ghrelin, were not different between MHO and at risk participants.

Conclusions: While the mechanisms underlying MHO are unknown at this time, we are investigating additional biological markers and body fat distribution patterns, as well as environmental factors, including diet and activity, that may help to explain why some obese individuals are protected from an unhealthy blood lipid pattern. Although obesity is a major risk factor for metabolic diseases, this analysis further highlights the importance of investigating other factors that are protective in nature. ▲

Table 2: Physical Characteristics of All Yup'ik Eskimo Participants Categorized as MHO and At Risk

Physical Characteristics/ Measurement	MHO Females		At Risk Females	
	n	Mean	n	Mean
Age (years)	22	32 ± 9	103	44 ± 14
Height (cm)*	22	157.7 ± 5.9	103	154.4 ± 6.0
Weight (kg)	22	87.1 ± 10.8	103	85.5 ± 14.2
BMI (kg/m²)*	22	34.94 ± 3.31	103	35.84 ± 5.34
Systolic BP (mmHg)*	22	110.6 ± 12.7	102	124.6 ± 13.3
Diastolic BP (mmHg)**	22	71.9 ± 8.9	102	77.6 ± 9.9

Physical Characteristics/ Measurement	MHO Males		At Risk Males	
	n	Mean	n	Mean
Age (years)	6	32 ± 15	42	44 ± 17
Height (cm)*	6	170.4 ± 8.6	42	166.7 ± 5.6
Weight (kg)	6	94.2 ± 6.9	42	92.3 ± 11.3
BMI (kg/m²)*	6	32.48 ± 1.75	42	33.11 ± 2.78
Systolic BP (mmHg)*	6	122.3 ± 7.6	42	128.6 ± 11.6
Diastolic BP (mmHg)**	6	71.7 ± 4.5	42	78.7 ± 8.5

Table shows differences between female and male participants, Mean values ± SD
*Mann-Whitney 2P<=0.001 by gender within obese population
**Mann-Whitney 2P<=0.05 by gender within obese population

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