

# Cardiovascular Risk Factors in Inuit of Greenland

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**Background.** Mortality from ischaemic heart disease (IHD) and prevalence of coronary arteriosclerosis are low in Inuit of Greenland (Greenlanders). Aetiological considerations have so far focused mostly on diet and blood lipids. The present study is a comprehensive analysis of behavioural, clinical and serological cardiovascular risk factors for IHD in Greenlanders.

**Methods.** An interview survey from West Greenland (n = 1436) was supplemented with clinical measurements and blood sampling in selected towns and villages (n = 264).

**Results.** The average consumption of marine mammals and fish was 28 meals per month. In Greenland 14% of males and 30% of females were physically inactive compared with 14% and 17% in the general population of Denmark; 79% were current smokers and 22% smoked 15+ cigarettes per day compared with 42% and 21% in Denmark. High density lipoprotein (HDL) concentration was 1.6 mmol/l in Greenland (1.1 in Denmark) and triglyceride concentration 1.0 mmol/l (1.5). Obesity, blood pressure and total cholesterol were similar in Greenland and Denmark. There were significant differences between Greenlanders with a predominantly traditional childhood and those with a more westernized childhood with regard to diet, physical activity (in women) and blood lipids.

**Conclusions.** In spite of an increased westernization of the Greenlanders' lifestyle and a high prevalence of several cardiovascular risk factors, mortality from IHD is still low. The change in risk factor patterns is, however, recent and an increased IHD mortality is still to be expected. Preventive measures should be initiated to reduce risk factors but they must take into consideration possible negative consequences of e.g. traditional outdoor activities and the consumption of marine mammals.

**Keywords:** diet, tobacco, blood pressure, blood lipids, ischaemic heart disease, Inuit

According to several publications, Inuit from Alaska, Canada and Greenland have substantially lower mortality from ischaemic heart disease (IHD) than the non-native populations of Alaska, southern Canada and Denmark.<sup>1–4</sup> The risk for cerebrovascular death, on the other hand, is similar<sup>1</sup> or higher<sup>4,5</sup> in Inuit. X-ray studies of the abdominal aorta<sup>6</sup> and ultrasonographic *in vivo* examination of the carotid and femoral arteries<sup>7</sup> indicated an occurrence and severity of arteriosclerosis in those vessels similar in Greenlanders and Danes but more recent autopsy studies have shown a much reduced degree of arteriosclerosis in the abdominal aorta and coronary arteries of Greenlanders compared with Alaska non-natives.<sup>8</sup>

Aetiological hypotheses have focused on the lipid metabolism and in particular on the effects of n-3 polyunsaturated fatty acids in the traditional marine diet<sup>9–14</sup>

while dietary monounsaturated fatty acids and anti-oxidants such as selenium may also play a role.<sup>15–17</sup> Genetic explanations involving apolipoprotein E, lipoprotein (a) and C3-polymorphism in the complement system have also been advanced.<sup>11,14,18–20</sup> Other risk factors such as lack of exercise, obesity, smoking and hypertension have been studied to a much lesser degree.<sup>14,21–24</sup> The prevalence of smoking is high and blood pressures seem to be similar to those of the general population of the USA.

In this paper we provide a comprehensive analysis of behavioural, clinical and serological risk factors for IHD in Inuit of Greenland (Greenlanders). The total population of Greenland was 55 000 in 1993 of which 86% were born in Greenland (a proxy measure of Inuit ethnicity). Genetically the Greenlanders are Eskimos with a substantial admixture of European, mainly Danish, genes. They are historically, culturally and genetically closely related to the Inuit of Canada and the Inupiat of Alaska and speak mutually intelligible dialects of the same language. The population is scattered along the coastline in 17 towns and 60 villages,

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the majority of which are situated on the west coast between the 60th and the 75th parallel. Among 18–59 year old male Greenlanders, only 19% rely on hunting or fishing for a living but subsistence hunting as a supplement to a paid job is common.<sup>25</sup>

## MATERIAL AND METHODS

In 1993–1994, 1728 residents of Greenland aged 18+ years were interviewed about their health, living conditions and lifestyle. A random sample of 3025 adult residents (Greenlanders and Danes) from all 17 towns and 24 randomly selected villages was chosen; for logistic reasons including time constraints and difficult travel conditions, the interviewers only managed to contact 2425 of these. Interviews were conducted in all towns and 21 villages (Figure 1) with a response rate of 71%. In the present analysis Danes, as well as East and North Greenlanders who differ genetically, culturally and linguistically from West Greenlanders and who make up a minority of 8% of the total indigenous population were excluded. The study base was thus 1436 people who lived in West Greenland and who identified themselves as Greenlanders. The response rate was higher in the villages and small towns than in the larger towns, and males 18–59 year old were underrepresented in the material. In general, however, it is concluded that the material is representative of the population of Greenland.<sup>25</sup> The survey questionnaire was developed in Greenlandic and Danish language and the interviewers were bilingual Greenlanders.

Based on parents' place of birth and occupation, own residence during childhood, knowledge of Greenlandic and Danish language, and school education the population was divided into a group of Greenlanders with a predominantly traditional childhood and a group with a more westernized childhood.<sup>26</sup> The two groups were of approximately equal size and sex composition but the traditional group was older than the westernized group (mean ages 34 and 45 years respectively). Among those belonging to the traditional group, 36% lived in a village and 19% in a hunting or fishing household compared to 4% and 8%, respectively, among those belonging to the westernized group.

In a subsample ( $n = 264$ ) of the study population from three representative towns and four villages on the west coast of Greenland the interview was supplemented with a clinical examination and blood sampling. The response rate for the interview in these areas was 67%, and 75% of those interviewed were included in the subsample.

Dietary questions focused on frequency of meals of seal, whale, wildfowl (eiderduck, guillemot etc), and



FIGURE 1 Map of Greenland with names of towns and villages where interviews for the 1993–1994 Health Interview Survey in Greenland were obtained. The present paper excludes information from the east coast and the northernmost part of the west coast. Clinical examinations and blood tests were performed in Nuuk, Ilulissat, Uummannaq, and the villages Niaqornat, Ukussissat, Illorsuit and Nugaatsiaq

salt- and freshwater fish during the past 3 months. Based on a question on physical activity during leisure time the population was divided into an inactive group who indicated that they spent their leisure time (summer and winter) reading, watching television or having similar sedentary occupations, and a more active group. Weight and height were reported in the survey, and in the subsample also measured with the participants in light

indoor clothing. Overweight and obesity were estimated by body mass index (BMI: weight in kilograms divided by height in meters squared); overweight was defined as BMI 27–29 and obesity as BMI 30+. In 136 subjects where BMI was both measured and reported, mean measured BMI was 4% higher than reported BMI ( $P < 0.0001$ ). This was due to average overreporting of height by 2.5 cm and underreporting of weight by 820 g. Respondents were classified as current cigarette smokers, other smokers, former smokers and non-smokers, and the number of cigarettes smoked daily was recorded; use of snuff and chewing tobacco is uncommon in Greenland and was not recorded.

Blood pressure was measured on sitting participants with an AND-Digital blood pressure meter UA-751 with an appropriate cuff size. Measurements were taken at room temperature on the right arm using the fifth Korotkoff sound for diastolic pressure. Two measurements were taken 2 minutes apart after at least 2 minutes initial rest and averaged for the analysis.

Blood samples were obtained after overnight fasting, separated, frozen at  $-20^{\circ}\text{C}$  and shipped to Denmark where the serum was analysed for cholesterol fractions, triglyceride and fatty acids. Cholesterol fractions were measured enzymatically by a commercial laboratory (Medi-Lab, Copenhagen) according to standard procedures.<sup>27–29</sup> Triglyceride was measured enzymatically by GPO-PAP (Boehringer Mannheim). Plasma lipids were extracted by chloroform-methanol and fatty acids were measured by gas chromatography as described earlier.<sup>30</sup> N-6/n-3 ratio was calculated as the ratio between the total concentration of n-6 polyunsaturated fatty acids and the total concentration of n-3 polyunsaturated fatty acids.

Data analysis and statistical tests were performed with SPSS/Windows version 6.1.3. Chi-square test, t-test, ANOVA, linear regression and logistic regression analyses were used as appropriate. Smoothing of graphs was performed by locally weighted regression using an iterative weighted least-squares method (LOWESS procedure of SPSS).<sup>31–32</sup> Median values were used for comparisons of blood pressures and blood lipids with published data from Denmark since these were only reported as medians.

## RESULTS

Behavioural risk factors were studied in the whole interview survey ( $n = 1436$ ) while blood pressure and lipids were studied in a subsample ( $n = 264$ ). The subjects in the subsample were slightly older than those in the rest of the survey (mean ages 42.5 and 39.0 years;  $P = 0.0005$ ) and 53% compared with 46% belonged to

TABLE 1 Consumption of traditional Greenlandic food items (seal, whale, wildfowl, fish) in Inuit of West Greenland 1993–1994 by age and sex. Mean number of meals per month

Age group	Males		Females	
	n	Meals	n	Meals
18–24	84	21.7	108	20.3
25–34	198	25.1	260	21.3
35–59	272	33.6	279	26.2
60+	92	41.5	90	36.1
Total	646	30.6	737	24.8

the traditional group ( $P = 0.05$ ). The two samples were similar regarding sex, occupation, and urbanization (residence in town or village). Behavioural risk factors were compared with data from a similar countrywide interview survey in Denmark from 1994 ( $N = 4668$ ).<sup>33</sup> Blood pressure and blood lipids were compared with published results from a survey in Copenhagen, Denmark, from 1981–1983 ( $N = 12\,698$ ).<sup>34</sup>

### Behavioural Risk Factors

**Diet.** The purpose of the dietary questions was to estimate the consumption of the traditional Greenlandic diet which consists primarily of marine mammals, wildfowl and fish. Consumption was found to be high; on average 8.9 meals of seal per month, 4.2 meals of whale, 5.9 meals of wildfowl, and 8.5 meals of fish, amounting to a total of 27.5 meals of these traditional marine food items per month. The consumption was higher in the subsample than in the rest of the survey, particularly of seal meat and fish; total consumption of marine food was 32.0 meals per month in the subsample ( $P = 0.0007$ ). Table 1 shows that males consumed more Greenlandic food than females and that the consumption increased with age. The westernized Greenlanders on average had 20.9 meals of Greenlandic food per month compared with 35.1 meals for the traditional Greenlanders, and there was a marked geographical trend with around 20 meals per month in the capital and some of the larger towns and 48 meals per month in the northern villages. All differences described were statistically significant at the  $P < 0.0001$  level. Data for comparison with Denmark do not exist but sea mammals are not part of the Danish diet and fish meals are rather uncommon.

**Exercise.** In the total sample, 37% hunted regularly or exercised vigorously several times per week, 10% hunted or exercised at least 4 hours per week, 29% hunted or

TABLE 2 *Physical activity during leisure time in Inuit of West Greenland (1993–1994) and population of Denmark (1994) by age and sex. Proportion of physically inactive*

Age group	Greenland		Denmark	
	Males	Females	Males	Females
	(n = 642) %	(n = 717) %	(n = 2152) %	(n = 2353) %
18–24	9.6	30.6	11.4	10.0
25–34	9.5	23.4	11.8	9.0
35–59	14.2	30.1	13.4	12.2
60+	24.2	47.6	20.7	34.5
Total	13.6	29.8	14.4	17.1

exercised to a lesser extent, and 25% were physically inactive during their leisure time. These figures are for summer time; during winter the activity level is lower: 26% are very active and 35% inactive. In all, 22% of the population were physically inactive both summer and winter with no difference between the subsample and the whole survey. The proportion of physically inactive people increased with age and was substantially higher in females than in males (Table 2). The differences between Greenlandic and Danish males was minimal, but Greenlandic females were much more often physically inactive than Danish females; in the younger age groups three times as often. Physical activity on the job to some extent compensated for a physically inactive leisure time in particular for men: only 5% of men in employment and 18% of women were physically inactive both at their job and during leisure times. After controlling for age, there was no difference in activity level between traditional and westernized men but traditional women were significantly more often physically inactive (odds ratio [OR] 1.7;  $P = 0.002$ ).

**Overweight and obesity.** BMI was calculated from reported heights and weights in the survey while height and weight were measured in the subsample. Measured BMI values are presented for international comparisons while reported BMI are used for comparison with reported BMI from Denmark. The reported BMI were similar in the whole survey and the subsample. After controlling for age and sex there was no difference between the traditional and the westernized population group.

Table 3 shows the survey population categorized into normal, overweight, and obese. Males were more often overweight and obese than females ( $P = 0.01$ ) and measured BMI were higher than those reported ( $P < 0.001$ ).

TABLE 3 *Normal, overweight and obese male and female Greenlanders. Body Mass Index (BMI) calculated from measured and reported heights and weights*

	Measured BMI		Reported BMI	
	Males	Females	Males	Females
	(n = 119) %	(n = 136) %	(n = 491) %	(n = 485) %
Normal (BMI <27)	67.2	76.5	74.3	81.9
Overweight (BMI 27–29)	19.3	13.2	17.1	10.7
Obese (BMI 30+)	13.4	10.3	8.6	7.4

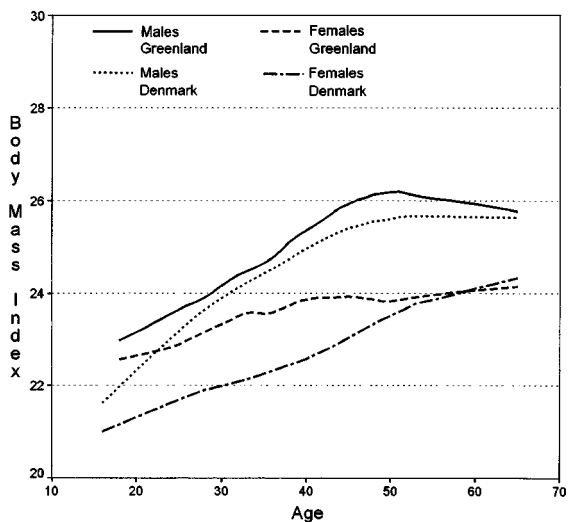


FIGURE 2 *Mean Body Mass Index in Greenlanders and Danes by sex and age. LOWESS regression smoothing*

Figure 2 shows reported BMI values in males and females by age in Greenland compared with Denmark. In both populations males had higher BMI than females, and for both sexes Greenlanders had higher BMI than Danes. The general pattern was one of increasing BMI until the age of approximately 50 followed by a slight decrease in males and a modest continued increase in females.

**Smoking.** In the total sample, 79% were current smokers and 22% heavy smokers smoking 15+ cigarettes per day. There was no difference between the subsample and the whole survey. The proportion of current

TABLE 4 *Smoking habits in Inuit of West Greenland (1993–1994) and population of Denmark (1994) by age and sex. Proportion of current smokers and heavy smokers smoking 15+ cigarettes per day*

Age group	Current smokers		Heavy smokers	
	Greenland	Denmark	Greenland	Denmark
	(n = 1387) %	(n = 4516) %	(n = 1387) %	(n = 4515) %
Males				
18–24	82.4	35.6	21.2	18.8
25–34	82.4	40.5	29.3	25.2
35–59	82.7	49.9	39.0	29.2
60+	73.9	19.0	20.7	14.2
Total	81.3	44.7	31.0	23.6
Females				
18–24	75.2	36.4	11.9	14.4
25–34	81.2	43.0	14.6	20.4
35–59	78.9	44.5	17.9	23.9
60+	66.7	32.5	9.5	8.7
Total	77.8	40.1	14.9	18.1

smokers was equally high in males and females and it was slightly lower in the 60+ year old than in the younger age groups (Table 4). In comparison with Denmark, the prevalence of smokers was significantly higher in all age and sex groups. The proportion of heavy smokers was higher in males than in females ( $P < 0.0001$ ) and in both sexes it increased with age until the 35–59 year age group. The proportion of people who had never smoked was highest in the youngest and the oldest age groups and higher in women than in men. There were almost twice as many current smokers in Greenland than in Denmark but the difference was not as pronounced for heavy smokers: For all age groups together, 1.3 times as many Greenlandic as Danish males were heavy smokers while 0.8 times as many Greenlandic as Danish females were heavy smokers. Smoking habits were similar in the traditional and the westernized group of Greenlanders.

#### Blood pressure

Table 5 shows median diastolic and systolic blood pressure in age and sex groups for Greenlanders compared with Danes. Both diastolic and systolic blood pressure was higher in Greenlandic males than in females and increased with age. In linear regression analyses the increase with age was statistically significant for both diastolic and systolic blood pressure ( $P < 0.0001$ ); also the sex difference was statistically significant, with

TABLE 5 *Blood pressure in Inuit of West Greenland (1993–1994) and population of Copenhagen (1981–1983). Median blood pressure in mmHg by age and sex*

Age group	Diastolic		Systolic	
	Greenland (n = 251)	Denmark (n = 12 678)	Greenland (n = 251)	Denmark (n = 12 683)
Males				
18–24	72	76	130	127
25–34	73	80	128	130
35–59	81	86	131	136
60+	88	86	146	148
Females				
18–24	67	67	114	114
25–34	75	70	114	115
35–59	77	82	117	131
60+	82	84	159	146

$P = 0.01$  for diastolic pressure and  $P = 0.0001$  for systolic pressure. Compared with Denmark, there were statistically significant differences in some age and sex groups but the pattern was not consistent and the overall impression was one of similarity. A closer analysis of the relation between blood pressure and age by LOWESS regression showed diastolic pressure in females to increase until around the age of 40 followed by a very slight increase later in life, while an increase in males until the age of 45 was followed by stagnation. Systolic pressure increased slowly until around the age of 50 followed by a steeper increase especially in females (Figure 3). Accordingly, the pulse pressure remained almost constant in both sexes until the age of 50 followed by an increase later in life. The age pattern was similar to the Danish pattern, the main difference being that the increase in systolic pressure for females started at age 40 in Denmark and not until age 50 in Greenland. There were no differences between traditional and westernized Greenlanders in diastolic or systolic blood pressure when results were adjusted for age and sex differences.

#### Blood Lipids

Table 6 shows median concentrations of total cholesterol, high density lipoprotein (HDL), and triglycerides in age and sex groups of Greenlanders compared with Danes. As in Denmark, total cholesterol increased with age ( $P = 0.0005$ ), but in Greenland there was a peak in middle age. Furthermore total cholesterol was slightly higher in females than in males ( $P = 0.08$ ). For all age

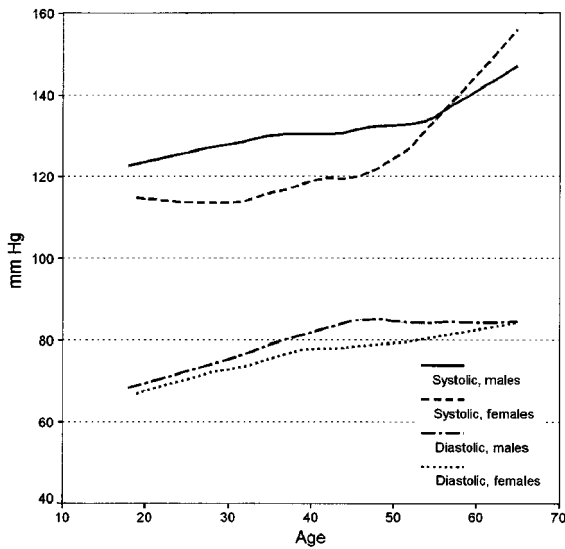


FIGURE 3 Mean diastolic and systolic blood pressure in Greenlanders by age. LOWESS regression smoothing

groups together, total cholesterol levels were lower in Greenlanders than in Danes ( $P = 0.01$ ) but this was not consistent in all age groups. HDL cholesterol levels were consistently higher in Greenlanders than in Danes ( $P < 0.001$ ), but there were no age or sex differences. Triglycerides were lower in Greenlandic males than in Danish males in every age group and the same pattern

was seen in middle aged and older females ( $P = 0.005$ ). The slight age and sex differences in Greenlanders were not statistically significant.

Table 6 shows median concentrations of monounsaturated fatty acids and ratios between concentrations of n-6 and n-3 fatty acids in Greenlanders. Monounsaturated fatty acids increased with age in males ( $P < 0.0001$ ) but not in females. In Greenland the greater part of n-3 fatty acids in the diet are of marine origin, and the n-6/n-3 ratio reflects the balance between consumption of fat of terrestrial and marine origin: the lower the n-6/n-3 ratio the greater proportion of the diet is marine. The ratio decreased with age ( $P < 0.0001$ ) while the sex difference was not statistically significant. Figures for comparison were not available from Denmark.

There were pronounced differences between traditional and westernized Greenlanders with regard to several blood lipids. Adjusted for differences in age-sex composition, mean total cholesterol was significantly lower in the traditional group (5.39 and 5.76 mmol/l;  $P = 0.007$ ), HDL cholesterol was higher (1.75 and 1.62 mmol/l;  $P = 0.05$ ), and n-6/n-3 ratio was lower (3.09 and 4.89;  $P < 0.0001$ ).

It is beyond the scope of this paper to describe in detail the association among the risk factors. Table 7 gives an overview of the relation between blood pressure and blood lipids as independent variables with the reported consumption of marine food together with age and sex as independent variables in linear regression analyses. The increase of 0.003 mmol/l in HDL cholesterol

TABLE 6 Plasma lipids in Inuit of West Greenland (1993–1994) and population of Copenhagen (1981–1983 for cholesterol; 1976–1978 for triglyceride). Median concentrations in mmol/l; median ratio between n-6 and n-3 fatty acids

		Total cholesterol (mmol/l)		HDL cholesterol (mmol/l)		Triglyceride (mmol/l)		Monounsaturated fatty acids (mmol/l)	n-6/n-3 ratio
		Greenland (n=243)	Denmark (n = 12 504)	Greenland (n = 235)	Denmark (n = 12 748)	Greenland (n = 243)	Denmark (n = 13 981)	Greenland (n = 190)	Greenland (n = 190)
Males	18–24	3.9	4.3	1.6	1.0	0.7	1.1	24.3	4.0
	25–34	5.1	4.8	1.6	1.0	0.9	1.4	26.8	3.4
	35–59	5.6	5.7	1.5	1.0	1.1	1.8	27.6	2.6
	60+	5.2	5.8	1.6	1.0	1.1	1.7	31.2	1.5
	Total	5.3	5.6	1.6	1.0	1.0	1.7	27.8	2.7
Females	18–24	4.5	4.4	1.5	1.1	0.9	0.9	27.7	6.2
	25–34	5.3	4.7	1.7	1.2	1.0	0.9	26.1	4.8
	35–59	6.0	5.8	1.8	1.2	1.0	1.3	27.9	2.4
	60+	5.9	6.3	1.7	1.2	1.0	1.5	27.5	2.0
	Total	5.7	5.9	1.7	1.2	1.0	1.3	27.1	3.2

TABLE 7 *Linear regression models with age, sex and consumption of marine mammals, wildfowl and fish (measured as number of meals per month) as independent variables. Population means of the dependent variables and regression coefficients for diet with 95% confidence intervals*

Dependent variable	n	Mean	Regression coefficient	95% CI
Diastolic blood pressure	217	79	0.01	-0.05, 0.08
Systolic blood pressure	217	128	-0.08	-0.19, 0.02
Total cholesterol	209	5.6	0.001	-0.007, 0.005
HDL cholesterol	201	1.7	0.003	0.0, 0.006
Triglycerides	209	1.2	-0.005	-0.009, -0.001
Monounsaturated fatty acids	157	27.6	-0.008	-0.04, 0.02
n-6/n-3 ratio	157	3.6	-0.03	-0.05, -0.02

concentration for each reported meal of marine food per month was statistically significant, as was the decrease in triglyceride concentration and n-6/n-3 ratio. Changes in blood pressure, total cholesterol, and monounsaturated fatty acids were not statistically significant.

## DISCUSSION

The present results come from the first comprehensive survey of cardiovascular risk factors in a representative sample of West Greenlanders. Other papers have focused on single districts<sup>9-14</sup> or selected risk factors, in particular smoking,<sup>21</sup> blood pressure<sup>22-24</sup> or blood lipids.<sup>9-13</sup> The inclusion of several risk factors is important because cardiovascular disease and arteriosclerosis have multifactorial aetiologies, and a countrywide coverage is critical because living conditions, in particular dietary habits, vary throughout Greenland.

The survey confirms the very high prevalence of smoking in Greenland.<sup>21</sup> Blood pressure has shown similar levels and trends as in Denmark,<sup>22</sup> while one early study showed lower diastolic and higher systolic pressure than in Finland.<sup>23</sup> Recent estimates of blood pressure based on histopathological studies of kidneys obtained at autopsy further indicated similar mean blood pressure in Greenland and the general population of the USA.<sup>24</sup> Total cholesterol and triglyceride concentrations were higher than observed by Bang and Dyerberg in Uummannaq in northwest Greenland in the 1970s<sup>10</sup> but lower than in Nanortalik in southwest Greenland in 1989<sup>14</sup> and lower than in the population of Denmark.<sup>34</sup> HDL cholesterol concentration was similar to what was found in Nanortalik and significantly higher than in Denmark.

The low mortality in Greenland from IHD and the low prevalence of arteriosclerosis of the aorta and coronary arteries seem well established.<sup>4,8</sup> Mortality from stroke is higher in Greenlanders than in Danes<sup>4,5</sup> but the significance of arteriosclerosis of cerebral vessels in the pathogenesis has not been investigated. This low incidence of coronary heart deaths is in agreement with the prevalence of some risk factors but at variance with others. The high consumption of marine mammals, wildfowl and fish, which is probably the main cause of high serum levels of HDL cholesterol, low concentrations of triglyceride, and low ratios of n-6 to n-3 fatty acids, concurs with the low incidence of coronary heart deaths. Using BMI as an indicator of overweight and obesity there are more overweight and obese people in Greenland than in Denmark but the difference is small and may very well be caused by a difference in body build and not by a higher accumulation of fat in Greenlanders. The similarity of blood pressure, and for males of physical activity, between Greenlanders and Danes are also indicators of similar risk for coronary heart disease, while the much higher prevalence of smokers, and for females of physical inactivity, implies an increased risk for coronary heart disease in Greenland.

Compared with southern Canadians the risk factor pattern in Keewatin Inuit of Canada's North West Territories shows some similarities to the risk factor pattern of Greenlanders.<sup>3</sup> HDL cholesterol concentrations were high and triglyceride concentrations were low in the Canadian Inuit, and the prevalence of cigarette smoking was high although not as high as in Greenland. However, the proportion of obese people, especially women, was much higher than in Greenland, while both diastolic and systolic blood pressure were lower.

The current mortality from IHD is low in Greenland and it is decreasing rather than increasing as would be expected in a society undergoing massive westernization.<sup>4,35</sup> In Greenland, however, the elderly, who are at highest risk for coronary heart deaths, mostly grew up and spent much of their lives in a traditional society with a lower prevalence of most cardiovascular risk factors than in modern Greenlandic society. The secular trend of risk factors cannot be estimated directly from the present cross-sectional study but for some risk factors the age pattern may reflect a time trend rather than age-related changes. It is probable that the preference of the older people for traditional food items is because they have retained the dietary habits of their youth rather than having grown increasingly fond of traditional food with age. Furthermore, the lower proportion of current smokers and heavy smokers in the 60+ year old probably reflect the fact that tobacco became much more available in Greenland after the 1950s

when the smoking habits of the elderly had already become consolidated. The lower consumption of marine food in the most westernized group of Greenlanders is another indication of increasing risk for IHD in a society undergoing westernization while, in women, westernization was accompanied by increased physical activity.

Depending on the relative importance of genetic risk factors and the presently known external risk factors for IHD an increase in mortality from IHD may be expected in the coming years in Greenland as is already the case in Alaska Eskimos.<sup>36</sup> This calls for a preventive strategy focused on three areas where according to present knowledge behavioural changes will be able to reduce the risk of IHD: smoking must be reduced, physical activity must be encouraged, especially in women, and consumption of marine food must be promoted. Some of these behavioural changes may, however, have other, negative consequences for health. Traditional physical activity like hunting and fishing increases the risk of drowning and fatal boat accidents, which are already major causes of death,<sup>37</sup> and increased consumption of marine mammals increases exposure to toxic organochlorines including PCBs, toxaphenes, and pesticides which is among the highest reported in the world.<sup>38</sup> In choosing a preventive strategy it is important to balance the expected benefits of the preventive strategies against associated health risks.

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