

Inuit Health in Transition

Greenland survey 2005-2008

Population sample and survey methods



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The Inuit Health in Transition study is a study of adults in West and East Greenland. The total population in Greenland numbered 56.969 in 2005; of these 52.289 (92%) lived in West Greenland and most of the remaining persons in Ammassalik municipality in East Greenland. The population may be divided according to place of birth into persons born in Greenland and persons born outside Greenland. For the adult population this corresponds roughly to ethnic Greenlanders (Inuit) and Danes, respectively. Place of birth is the only ethnic variable in the central person register, but in an interview study these criteria may be supplemented with additional information. In the following, the participants were classified as Greenlanders or Danes based on the impression of the interviewers. This corresponds well with objective criteria collected as part of the interview, such as ethnicity of the grandparents, place of birth of parents, self-identification etc.

1. Development of methods

A number of new questions and procedures were included in the study after pilot testing. This included the FFQ and long IPAQ, ultrasound of abdomen and carotids, body impedance, Actiheart®, and on the spot measurement of blood glucose with Hemocue. In 2003 a logistic pilot study was carried out by chartered boat in three villages in Ilulissat municipality (Saqqaaq, Qeqertaq og Ilimanaq). For 99 participants, information was collected about by and large the same variables as was collected during the survey in 2005-2008. The participation rate was 49.7%.

2. Data collection

The participants were selected through a stratified random sample of adult (aged 18+) inhabitants in Greenland, who had been born in Greenland or Denmark. Faroese people or persons born in other countries were not included. Participants in our population survey in 1999-2001 were also excluded, except in one town (Qasigiannuguit) where they were followed up.

Greenland was divided into 10 regions based on geography and community size (figure 1). From each region a number of towns and villages were selected for the study.

	Towns with 2000+ inhabitants Adult population 24,400	Smaller towns Adult population 8700	Villages Adult population 6000
South	Qaqortoq	Narsaq	Eqalugaarsuit Narsarmiit Aappilattoq
Mid	Nuuk Maniitsoq		Atammik Napasooq
North	Aasiaat	Qasigiannuguit Upernavik	Kullorsuaq Innaarsuit Aappilattoq
East		Tasiilaq	Kuummiut Tiniteqilaaq

Figure 1. Communities selected for the study.

The towns were selected as being representative of the region with regard to living conditions. In towns, a random sample of 11-22% was drawn from the central population register with a view to result in an expected number of participants around 300. This number represents the practical limit for a team during a 4-6 weeks' visit. The sample size ranged from 161 in Upernavik to 1106 in Nuuk.

Villages (settlements) were chosen at random in the selected municipalities and in the selected villages all adults were invited to participate.

Information was collected during 2005-2007 in 7 towns and 8 villages in West Greenland from Kullorsuaq in Upernavik municipality in the north to Narsarmiit and Aappilattoq in Nanortalik municipality in the south (figure 2). Some towns (Aasiaat, Qaqortoq, Nuuk) were visited twice in order to reach the desired participation rate. One town and two villages were visited in East Greenland.



Figure 2. Map of Greenland with study communities.

Data was collected of a team consisting of a local person responsible for the recruitment of participants, a supervisor, one or two laboratory technicians, a number of interviewers, and to clinical assistants. In addition to this Greenlandic/Danish team an ultrasound technician from Québec participated in 2006-2008. The interviews were conducted in Greenlandic or Danish according to the choice of the participant. A total of 77 persons assisted with data collection or processing of data (appendix 1).

In towns we usually rented accommodation for the investigators from private house owners, while the local hospital or health centre assisted with procuring facilities for the examinations. While the towns, except Upernavik and Tasiilaq, were visited by public transport, the villages were visited on three expeditions by a chartered boat (figure 3). The expeditions took place in the Fall of 2006 (North Greenland), 2007 (Central and South Greenland), and 2008 (East Greenland). M/s Kisaq can travel in almost all weather conditions and has accommodation for 12 passengers and large volumes of equipment. It is an unambiguously more convenient and cost neutral alternative to public transport, chartered helicopter or local boat charter.



Figure 3. M/S Kisaq was used for transport to and as floating hotel in the villages on three expeditions in 2006, 2007 and 2008.

The participants were informed about our arrival and about the investigation by a personal letter and they were after the arrival of the team contacted by the person responsible for recruitment. On the day of the investigation the participants were asked to show up at an appointed time, fasting (i.e. at least 8 hours without eating or drinking). They were orally and in writing informed about the investigation and signed an informed consent. Then fasting blood samples were drawn and a 2hr oral glucose tolerance test was started by ingestion of 75g glucose in a drink. During the next 2½ hours the participants were interviewed (40 min.), filled in a questionnaire, had various clinical tests performed and were issued with an Actiheart device for a 1-4 days' monitoring of pulse and movements. After 2 hours, another blood sample was drawn. At the end of the session, participants were informed about the results of the investigation and were invited to ask questions. When the Actiheart device was returned, a compensation of DKK 200 was paid to each participant.

3. Questionnaires

Two questionnaires were used as survey instruments, one for the interviewers and one self-administered by the participants. In both cases the questions consisted partly of questions used before in Greenland, partly of newly developed questions a number of which were constructed in close collaboration with Canadian scientists. The questionnaires covered the following topics. Some questions, marked with an *, were identical with questions used in the population survey of 1993-1994.

Interview questionnaire

[Interview questionnaire in Danish](#); [Interview questionnaire in Greenlandic](#); [Interview questionnaire in English](#)

- *Sociocultural and demographic factors**
- *Dietary Food Frequency Questionnaire (constructed with researchers from Québec)*
- *Physical activity (long IPAQ - International Physical Activity Questionnaire)*
- *Smoking**
- *Social risk factors, social capital, traditional activities*
- *Self rated health**
- *Self reported disease and symptoms**
- *Self reported heart disease, diabetes, hypertension*
- *Satisfaction with health care**
- *Knowledge about prevention and the public health programme - Inuuneritta*

Self administered questionnaire

[Self-administered questionnaire in Danish](#); [Self-administered questionnaire in Greenlandic](#); [Self-administered questionnaire in English](#)

- *Suicidal thoughts* and attempts*
- *Alcohol**
- *Marihuana**
- *Violence and sexual abuse**
- *Gambling*

In particular the FFQ and IPAQ were new to this study. The FFQ included questions about frequency of consumption of 23 traditional and 43 imported foods, portion sizes and seasonal variation. This enables the researchers to calculate daily consumption of various foods, energy intake and distribution on macronutrients, consumption of dietary fatty acids, contaminants and micronutrients. The international "Long IPAQ" (International Physical Activity Questionnaire) was used (www.prevnut.ki.se/ipaq) slightly modified to suit the local conditions. This questionnaire taps moderate and vigorous activity in four domains (work, transport, domestic chores, leisure time) and sedentary activities.

4. Clinical procedures and sampling of biological media

The clinical procedures included:

- *Anthropometric measurements: height, weight, waist and hip circumference*
- *Body impedance*
- *Blood pressure*
- *ECG*
- *Ultrasound examination of subcutaneous abdominal and intraabdominal*
- *Ultrasound examination of carotid arteries*
- *Oral glucose tolerance test*
- *Combined measurement of pulse and body movement (Actiheart®)*

Blood samples were collected and stored for future analyses. The following analyses were performed before storage:

- *Glucose, insulin, C-peptide (0 and 120 min. as part of OGTT)*
- *HbA_{1c}*
- *Cholesterol (total, HDL, calculated LDL) and triglyceride*

- *Fatty acids in RBC membranes*
- *Mercury and selenium in full blood*
- *Organochlorines (PCB and pesticides)*

Urine samples were analysed for microalbumin and creatinine. Nail samples were collected for analysis of stable isotopes of carbon (¹³C), nitrogen (¹⁵N) and sulphur (³⁴S).

Capillary blood glucose was also measured on the spot at 0 and 120 min. with Hæmocue®, in order for the participants to be given information about their diabetic status immediately.

5. Information about results to participants and the local health centres

At the end of the examination participants were informed about some of the results, i.e. blood pressure, body mass index, percent body fat, diabetes, and they were given the possibility to discuss their results with a health professional. Later the results of the blood tests and reading of the ECG were sent as a letter to the participants and the local health centre, provided the participant had given his or her permission. This included information about cholesterol, OGTT and ECG. The eventual follow-up of diagnosed disease was the responsibility of the local health centre.

If, during the examination we discovered hypertension (blood pressure $\geq 140/90$) or diabetes, the participant was recommended to see a doctor. In a few cases the investigators contacted the health care centre directly, e.g. upon unexpected findings during ultrasound examinations (thyroid tumour, renal anomaly).

Remaining blood tests, e.g. mercury, HbA_{1c} and fatty acid profile, were considered as not being clinically significant at the individual level and were only communicated if the participant specifically requested this.

6. Participation rate, non-participation and representativity

Population lists from the central population register were used to initially specify the sample. From these lists a random sample was drawn. Those in the sample were contacted in writing with an invitation to participate. Information about the study and examination procedures was given, and the recipients were asked to inform the investigators by letter or phone whether or not they wanted to participate. The samples were revised locally with information about who were not actually living in the community at the time of the examination. Neighbours and the municipality office (in the villages) were good sources of information. The raw samples were on average reduced by 19%, predominantly because people had moved from the community (table 1). Especially in the villages the samples were supplemented with new arrivals but this was not done systematically.

Table 1. Reasons for reduction of initial sample.

Reason	N	%
Moved	681	70.9
Deceased	52	5.4
Long term fishing	51	5.3
Pregnant	44	4.6
Unknown at address	39	4.1
Other reasons	93	9.7
Total	960	100.0

The final sample consisted of 3652 persons and the participation rate for the total study was 66.1%. Danes were recruited for an interview only and their participation rate was significantly lower than that of the Greenlanders. A total of 2600 Greenlanders participated in the study with a participation rate of 68.4% and 129 Danes with a participation rate of only 39.4% (table 2).

Community	Register population born in Greenland, aged 18+ N	Register sample incl. Danes N	Revised sample N	Participants		Participation rate		
				Greenlanders N	Danes N	Greenlanders (interview) %	Greenlanders (clinical) %	Danes (interview) %
Qaqortoq	2236	590	509	301	22	66.9	64.9	37.3
Narsaq	1191	256	222	145	1	69.7	69.7	7.1
Nuuk	10640	1111	932	453	75	61.1	59.7	39.5
Maniitsoq	1975	400	352	235	8	71.2	71.2	36.4
Aasiaat	2260	406	340	204	20	65.6	65.6	69.0
Qasigiannuguit	902	617	404	295	0	73.4	73.4	-
Upernavik	768	160	121	84	0	69.4	69.4	0.0
Aappilattoq (Nan)	100	100	78	65	0	84.4	84.4	0.0
Narsarmiit	79	79	63	52	0	83.9	83.9	0.0
Eqalugaarsuit	90	90	67	55	0	82.1	82.1	-
Atammik	141	141	119	77	0	64.7	64.7	-
Napasog	75	75	62	37	0	59.7	59.7	-
Aappilattoq (Upv)	119	119	98	65	0	67.0	67.0	0.0
Innaarsuit	112	112	75	65	0	86.7	86.7	-
Kullorsuaq	232	232	210	114	1	55.3	55.3	25.0
Tasiilaq	284	284	224	173	0	77.2	77.2	-
Tiniteqilaaq	98	98	71	54	0	76.1	76.1	-
Kuummiut	225	225	177	126	2	72.8	72.8	50.0
Total	21527	5095	4124	2600	129	67.5	66.9	39.3

The following concerns Greenlanders only. Participation ranged from 86.7% in Innaarsuit to 55.3% in Kullorsuaq (figure 4). According to community size participation was 61.1% in Nuuk, 67.8% in other large towns, 73.0% in small towns and 70.2% in the villages. Participation rates also varied by age and sex (figure 5). Women more often participated than men and particularly young men were under-represented. The reasons for non-participation are seen from table 3. Ca. half of the non-participants (16% of the total sample) stated that they did not want to participate or gave a variety

of excuses which were interpreted as such. This was respected without further questioning or pressure. For 414 persons no information was obtained. There were certain differences between the communities; in particular in Nuuk many persons indicated lack of time as the reason for not wanting to participate (17% of the non-participants compared with 2% in the rest of the communities).

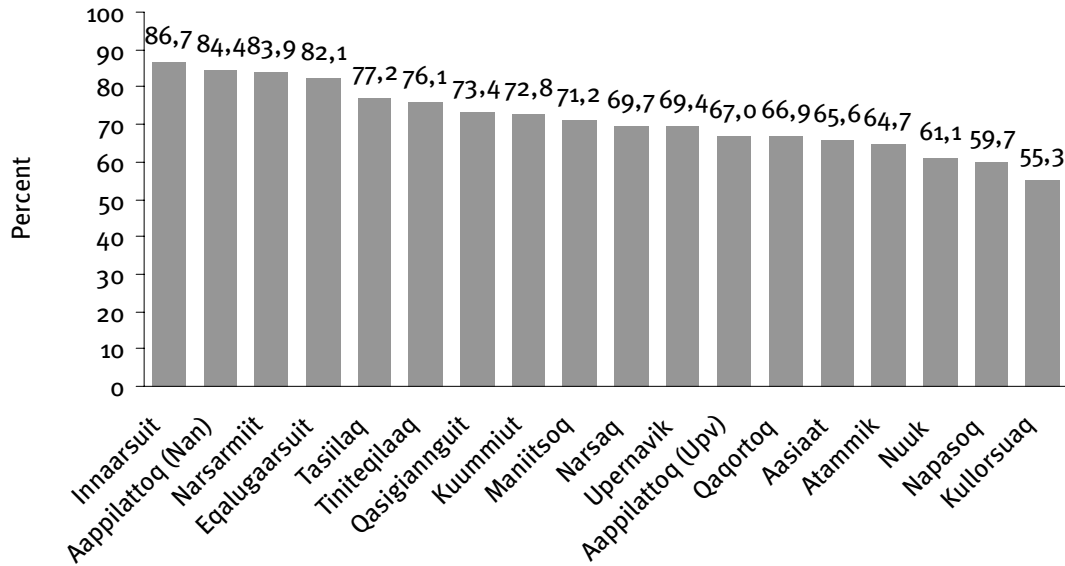


Figure 4. Participation rate (clinical examination) by community.

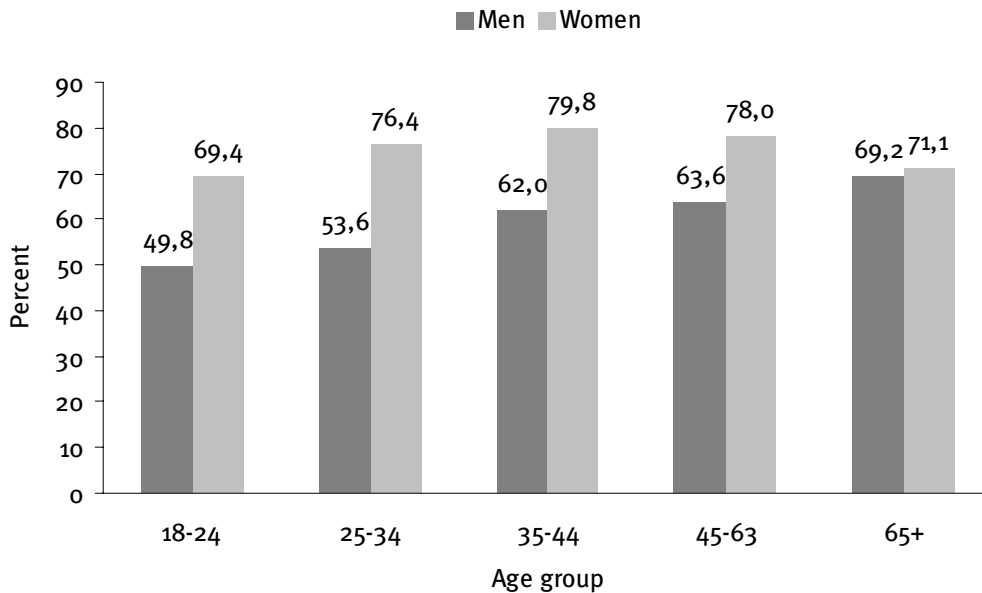


Figure 5. Participation rate (interview) by age and sex.

Table 3. Reasons for non-participation.

Reason	N	%
Doesn't want to participate	678	48.6
No contact	162	11.6
Serious illness or disability	93	6.7
Out of town	29	2.1
Other reasons	19	1.4
Unknown	414	29.7
Total	1395	100.0

The non-random distribution of non-participants has implications for the precision of countrywide estimates. We know that persons with serious illness or disability are over represented among the non-participants as well as those who tend to move often, and we suspect that socially exposed persons, alcohol abusers and persons who frequently go in and out of jobs and the unemployed likewise are over represented among the non-participants. It was the impression of the interviewers that there was a distinct downwards social trend from the beginning to the end of data collection in a town. In some towns it could be demonstrated that during the first week of the study 10% of those who had made an appointment did not show up, while during the last week of the study as many as 26% did not show up ($p < 0.001$).

This was confirmed by information about income obtained from Statistics Greenland. The participants in the study had an average income of DKK 142,000 while those who did not participate had an income of DKK 123,000 and those who were excluded from the sample DKK 122,000 ($p < 0.001$).

7. Data entry and validation

Data was double entered by different persons and validated in the computer programme Epi-Info (www.epiinfo.com). The data files were subsequently imported into the SAS package and combined with results of blood analyses and clinical procedures. The validity of data was checked against permitted values and logical errors. Analyses were performed with SAS v. 9.1 or higher and with SPSS v. 15.0 or higher.

Weighting

The non-random non-participation can be adjusted for by weighting for age, sex and geographical region. This means that a particular participant contributes more or less to the country total depending on how many persons he or she represents. For instance, the 9 males aged 18-24 from Aasiaat represent a total of 393 18-24 year old men in large towns in Northwest Greenland, while the 11 women aged 65+ from Eqalugaarsuit, Narsarmiit and Aappilattoq only represent 54 women of the same age in villages in South Greenland. Table 4 shows some examples of how weighting affects the results. Non-weighted analyses give a good estimate of self rated health, while obesity, smoking and consumption of traditional food are over estimated by 0,8-1,9 percent points. There is accordingly a rather small error introduced by not weighting the analyses and it was chosen not to weight. The same conclusion was reached for the analyses of the population survey in 1993-1994.

Table 4. Weighting of data for age, sex and region results in different estimates at country level.

	Unweighted %	Weighted for age and sex %	Weighted for age, sex and region %
Good self rated health	65.2	65.8	65.1
Obesity (BMI 30+)	23.9	22.5	22.1
Daily smokers	66.2	66.6	65.4
Pct. energy from traditional food	21.0	20.3	19.1

Classification of socioeconomic variables

Education

The interview had questions on years in school and type of post school education. Based on this the following categories were defined:

1. *Primary or high school only*
2. *Short vocational education (1-2 years)*
3. *Midlevel or long education, university*

Job

The participants were asked about their own and their partner's job title. This was subsequently coded into 24 job categories. For participants below the official age of retirement (63 years) the job categories were combined into the following categories:

1. *Persons with job requiring midlevel or higher education*
2. *Skilled workers*
3. *Unskilled workers*
4. *Hunters and fishermen*
5. *Students*
6. *Unemployed persons, pensioners, home makers*

A household social group was created by first identifying the highest job category of the couple and then combining the categories into four social groups:

1. *High*
2. *Skilled workers*
3. *Unskilled workers, hunters, fishermen*
4. *Not gainfully employed*

Assets

As a proxy for wealth the participants were asked whether or not they had these items in their household: video/DVD player, computer, landline telephone, refrigerator, microwave oven, washing machine and dishwashing machine. An index of assets was calculated as the sum of items ranging from 0 to 7. Since there were few participants with 0-2 assets these were combined into an index of 6 categories.

Income

Information on individual and household income was obtained from Statistics Greenland.

Appendix 1

Participants in data collection and data treatment in the population study in Greenland 2005-2008.

Abelone Filemosen	Ida Heinrich	Majken Søndergaard Nielsen
Anike Møller	Ina Sørensen	Margrethe Kleist
Anna Ballan	Inge Kjærgaard	Maria Dahl Kristensen
Anna Kleist	Inge Lyberth	Marianne Probst
Anne-Louise Schmidt Hansen	Ingeborg Heinrich	Marianne Tellier
Anni Nielsen	Ingelise Olesen	Marie Iversen
Astrid Ledgaard Holm	Inger Dahl-Petersen	Marit Eika Jørgensen
Birgitte Born	Inger Dehn	Martin Noël
Birgitte Hemmingsen	Ivalo K. Jensen	Najaaraq Kleist
Bolethe Hendriksen	Jan Petersen	Nina Krøgh Larsen
Britta Drangsfeldt	Janemaria Pedersen	Ole Schnor
Camilla Budtz	Johansine Poulsen	Paarma Egede Lund
Cecilia Petrine Pedersen	Juliane Villadsen	Pauline Olesen
Charlotte Jeppesen	Karoline Klenow	Peter Bjerregaard
Charlotte Lange	Katja Løngaard	Sechmann Lama Rosbach
Christina V L Larsen	Klaus Poulsen	Silas Bjerregaard
Connie Lynge	Knut Borch-Johnsen	Sofie Steenholt
Dorthe Furstrand	Kristian Jonathansen	Susanne Brenaa Reiman
Ebba Josvassen	Kunuk Kristiansen	Susanne Månsson
Edvard Mørch	Lene Aabo	Suzie Côté
Else Jeppson	Loni Keil Brigsted	Svend Rosing Olsen
Flemming Heinrich	Louise Kleemann	Thomas Enoksen
Gert Pivat Lynge	Louise Mattaq Kristiansen	Tine Curtis
Gustav Lyberth	Louis-Frédéric Daigle	Trine Hansen
Hanne Nielsen	Maja Schick	Vive K. Egede
Helle Bekker Sørensen	Maja Lis Dybdahl Halkjær	