

# Design and methods in a survey of living conditions in the Arctic – the SLiCA study

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**Objectives:** The main objective of this study is to describe the methods and design of the survey of living conditions in the Arctic (SLiCA), relevant participation rates and the distribution of participants, as applicable to the survey data in Alaska, Greenland and Norway. This article briefly addresses possible selection bias in the data and also the ways to tackle it in future studies.

**Study design:** Population-based cross-sectional survey.

**Methods:** Indigenous individuals aged 16 years and older, living in Greenland, Alaska and in traditional settlement areas in Norway, were invited to participate. Random sampling methods were applied in Alaska and Greenland, while non-probability sampling methods were applied in Norway. Data were collected in 3 periods: in Alaska, from January 2002 to February 2003; in Greenland, from December 2003 to August 2006; and in Norway, in 2003 and from June 2006 to June 2008. The principal method in SLiCA was standardised face-to-face interviews using a questionnaire.

**Results:** A total of 663, 1,197 and 445 individuals were interviewed in Alaska, Greenland and Norway, respectively. Very high overall participation rates of 83% were obtained in Greenland and Alaska, while a more conventional rate of 57% was achieved in Norway. A predominance of female respondents was obtained in Alaska. Overall, the Sami cohort is older than the cohorts from Greenland and Alaska.

**Conclusions:** Preliminary assessments suggest that selection bias in the Sami sample is plausible but not a major threat. Few or no threats to validity are detected in the data from Alaska and Greenland. Despite different sampling and recruitment methods, and sociocultural differences, a unique database has been generated, which shall be used to explore relationships between health and other living conditions variables.

**Keywords:** *Inuit; Inupiat; Sami; Indigenous peoples; living conditions; survey.*

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The *Survey of Living Conditions in the Arctic: Inuit, Sami, and the Indigenous Peoples of Chukotka* (SLiCA) is an international research project on health and other aspects of the living conditions of Indigenous peoples in Alaska, Canada, Greenland, Norway, Sweden and Russia. The motivation for launching SLiCA was the ambition to describe these aspects with regard to indigenous language, tradition and resource utilisation. The background of SLiCA is described in detail elsewhere (1–3).

The sampling methods used in the survey have been different due to country/regional variability in indigenous population density and register availability. The scope of this article does not allow in depth descriptions of the methods used in the involved countries/regions; we shall

thus focus on the data from Alaska, Greenland and Norway, as these indigenous populations are integral to the future research questions of the first author. The main objective of this article is to describe the methods and design of SLiCA, relevant participation rates and the distribution of participants, as applicable to the survey data in the aforementioned countries/regions. We also briefly address possible selection bias in the data and describe how to tackle it in future studies.

## Material and methods

The principal method in all SLiCA countries was standardised face-to-face interviews using a questionnaire. The questionnaire may be accessed on the project website (4). The SLiCA target population was indigenous

individuals aged 16 years and older (15 years and older in Canada and Greenland), residing in traditional settlements. Ethnic background was ascertained by self-report. The duration of each interview in Alaska, Greenland and Norway was approximately 1.5–2 hours, and the respondents were almost exclusively interviewed in their homes.

### Data collection and sampling

#### Alaska

Data collection took place from January 2002 to February 2003. In Alaska, we did not have access to the U.S. Census 2000 population lists. The sample frame consisted of 4 components, that is, regions and communities, blocks, housing units and individuals. The Alaska sample is a probability multi-stage sample (5). The Iñupiat regions of Northwest Arctic (NA), North Slope (NS) and Bering Strait (BS) were selected in advance. In each of the 3 regions, one started with 2 strata, that is, regional centres and villages. The regional centres of Kotzebue (NA), Barrow (NS) and Nome (BS) were included. Villages in NA and BS were sampled and stratified as coastal or inland. All villages on the NS were included, as there are only 8 of them. In the regional centres, one applied a 2-stage area probability-sampling approach. First, a probability sample of blocks with probabilities proportionate to the number of Iñupiat households was selected. Second, a probability sample of Inuit households in each sample block was done. A local Inuit colleague identified the Inuit households in the sample blocks. Finally, Iñupiat adults, within each sampled household, were sampled according to the person with the next birthday. We observed a bias in favour of females that was addressed as a final sampling weight. According to the U.S. Census 2000, a total of 4,581, 3,082 and 3,505 persons lived in the regional centres of Barrow, Kotzebue and Nome, respectively. The total population number in the villages varied between 136 in Deering and 772 in Selawik (6). In the villages, the American Indians/Alaska Natives (AIAN) make up close to 100% of the population. In Barrow, Kotzebue and Nome, 64%, 77% and 59% of the population reported AIAN ethnicity, respectively. Here and in the villages, the AIAN category almost exclusively refers to the people of Iñupiaq ethnicity. The total Iñupiaq population in Alaska is estimated at 13,500–15,700 (6–9).

#### Greenland

Data collection was performed from December 2003 to August 2006 by Statistics Greenland. The project was later transferred to Ilisimatusarfik, University of Greenland, in 2006.

Greenland is home to about 57,000 people, of which approximately 90% are Inuit (12). In terms of ethnic categorisation, the Greenlandic population may be di-

vided according to the place of birth, that is, in or outside Greenland. For the adult population, this variable roughly refers to an ethnic categorisation of Greenlanders and Danes, which may be ascertained in interview settings (10). On basis of the official regional division by Greenland Statistics, 8 municipalities and their main towns were selected in advance. The main towns were Nanortalik, Qaqortoq, Paamiut, Nuuk, Aasiaat, Ilulissat, Upernavik and Tasiilaq. Villages were chosen at random in the selected municipalities. In the selected towns and villages, a random sample of persons born in Greenland was drawn from the population register. As a minority of Greenlanders live in smaller settlements of less than 500 inhabitants (17% in 2005) (11, 12), a greater sample weight was given to this population (3). In 2006, the total population in the main towns varied from 1,133 inhabitants in Upernavik to 14,583 in Nuuk, and in the villages, from 47 in Saarloq to 404 in Kullorsuaq and Kuummiut<sup>1</sup> (13). Sampling in Greenland is also described elsewhere (3).

#### Norway

Data collection was commenced by the Centre for Sami Studies, University of Tromsø, in 2003. Since 2006, the study has been administered and run by the Centre for Sami Health Research. The majority of the material was collected between June 2006 and June 2008 and a smaller amount ( $n = 67$ ) in 2003. The areas included were chosen in advance, based on knowledge of Sami settlement patterns.

Sami respondents in Finnmark were selected through the representative database of the Population-based Study of Health and Living Conditions in Areas with both Sami and Norwegian Populations (SAMINOR). This study was run by the Centre for Sami Health Research and the Norwegian Institute of Public Health in 2003–2004 and is described in detail by Lund et al. (14). A random sample was drawn from the sample frame of all SAMINOR participants in Kautokeino, Karasjok and Nesseby, who reported Sami ethnicity and gave consent to be contacted in future studies. This method was unavailable in Sami settlement areas, south of Finnmark, as permission to contact these participants was not obtained during SAMINOR. Instead, a non-probability snowball sampling technique (15, 16) was applied to list Sami living in Sami settlement areas in Troms, Nordland and the Trøndelag counties. From this sample frame random samples were drawn. This method was also applied in Finnmark to recruit individuals in the youngest age strata, as SAMINOR only included participants aged 30 and 36–79 years in 2003–2004. Sticking to a random sampling became challenging in areas, where

<sup>1</sup>In Greenland, town status is not determined by population size but by the presence of the municipality headquarter, a hospital or health centre and a school (12).

the Sami population is a minority and lives scattered across great distances. The South Sami area is one such example. Because of funding issues, a scattered population structure and the few Sami living in each community, we had to interview a certain number of persons in each place to reach an adequate total number of completed interviews. Multi-stage probability sampling was not possible for the same reasons. Except for Røros (n = 5,683), all the municipalities and communities had, in 2008, less than 3,000 inhabitants (17). Among these, the Sami were majority only in Kautokeino, Karasjok and Nesseby. There is no updated demographic record on the Sami, but the population in Norway is usually and roughly estimated at 40,000 (18, 19).

### Logistics

The Iñupiat of Alaska inhabit the northern and western coasts as far south as Norton Sound (7), and most of the communities cannot be reached by car or ferry (20). Interviewers travelled by car within the regional centres, while all respondents lived within walking distance in the villages. Respondents were contacted by house visits, and the interviewer gave a brief description of the study to the person answering the door and asked to speak to the person who had the next birthday. If that person was not available, contact information (e.g. phone numbers) would then be obtained and attempts were made to contact the selected person. Those who failed to attend scheduled interviews were contacted to reschedule.

The majority of the Inuit in Greenland are concentrated on the west coast and in the south, with only 3,500 living on the east coast and less than 1,000 in the far north (11, 12, 21). In Greenland, the towns and villages are isolated from one another and can only be reached by boat or flight (21). As in Alaska, cars were used for transport in the towns, while interviewers could walk to interview appointments in the villages. Selected individuals were contacted and invited to participate by phone. If contact was not established by phone, interviewers would contact the person at home. Those who failed to attend scheduled interviews were re-contacted and new interviews were planned.

The traditional Sami settlement area in Norway stretches from Finnmark in the north to Engerdal in Hedmark County in the south, with the majority of the Sami population settled in Finnmark (19). All communities are reachable by car. In Norway, invitation to participate in the study was presented in 2 ways. First, SAMINOR-sampled individuals in Finnmark received a letter of invitation, containing information on the study, a written consent form and a return envelope. The recipients were asked to return the signed consent form and provide their telephone number. Those who consented were contacted by phone to schedule the time and date for the interview. Those who did not return the consent

form were tried contacted over the phone, if their number was accessible. Second, south of Finnmark, people were invited by phone only. During the phone conversation, the study was presented, and if preliminary consent was obtained, time and place of the interview were fixed. Those who failed to attend scheduled interviews were contacted by phone to reschedule.

### Questionnaire

The core questionnaire consisted of 4 parts: the main questionnaire, 3 household charts – intended to facilitate responses on questions concerning household members – and a self-administered questionnaire used for sensitive questions. Finally, cue cards were used to efficiently present respondents with response choices. The core questionnaire was produced in collaboration with indigenous representatives and field tested in all countries/regions. English was used as a common language for questionnaire development. Country/region-specific questions were produced to address issues, items and perspectives relevant to the respective country/region. All fieldworkers in SLiCA were trained in interviewing techniques and procedures. An interview guide was produced to optimise standardisation and training. In Norway and Greenland, the core questionnaire was translated into Northern Sami and Kalaallisut (Greenlandic), respectively, while only the cue cards were translated into Iñupiaq in Alaska.

### Results

A total of 663, 1,197 and 445 individuals were interviewed in Alaska, Greenland and Norway, respectively (Table I). Herein, 135 participants in Greenland and 18 in Norway who reported non-indigenous backgrounds shall be excluded in future studies. Participation rates by age and sex are unavailable in Norway and Alaska due to the sampling methods used. Very high overall participation rates were obtained in Greenland and Alaska, while a more conventional rate was achieved in Norway. Tables II through IV present community- and regional-specific participation rates. Table V shows the distribution of participants by age and sex. A predominance of female respondents was obtained in Alaska. Overall, the Sami cohort is older than the samples from Greenland and Alaska.

### Discussion

In this article, we have presented the methods and design, overall regional- and community-specific participation rates, and the distribution of participants by age, sex and country/region in the SLiCA survey in Alaska, Greenland and Norway. High overall participation rates were obtained in Greenland and Alaska, while a more conventional rate was observed in Norway. A conventional participation rate and non-probability sampling may have introduced selection bias in the Sami sample.

**Table I.** Participation by region/country

Country	Original sample	Total participants (%)	Indigenous sample	Indigenous participants (%)
Alaska	1,151		797	663 (83.2)
Greenland	1,440	1,197 (83.1)		1,062
Norway	788	445 (56.5)		427

In Alaska non-indigenous persons were excluded prior to invitation. In Greenland and Norway, however, information on ethnic background was not known in advance. Thus, total participants include persons who did not report indigenous background. Of the 663 participants in Alaska, 67 in the Bering Strait and 2 in the Northwest Arctic reported exclusively Yupik background (data not shown).

Available literature stresses that person-to-person approaches usually give higher participation rates than initial telephone contacts (5, 22). The different methods used in the recruitment phase may, thus, explain some of the observed discrepancy in participation rates between the countries/regions. In Norway, the participation rates in Finnmark were systematically lower compared with the rates from Troms, Nordland and Trøndelag; the snowball sampling may have led us to the more motivated respondents in these 3 counties.

The only information on Sami non-responders available to us is their sex and place of residence. Nevertheless, it has been documented that the differences between responders and non-responders, generally, are important

**Table II.** Participation by region and town/village in Alaska, n = 663

Town/Village/Region	Sample	Participants	Participation rate (%)
Anaktuvuk Pass	15	10	66.7
Atqasuk	11	11	100.0
Barrow	122	100	82.0
Kaktovik	16	13	81.3
Nuiqsut	20	16	80.0
Point Hope	30	26	86.7
Point Lay	11	11	100.0
Wainwright	34	25	73.5
<i>North Slope totals</i>	259	212	81.9
Deering	27	20	74.1
Kivalina	22	20	90.9
Kotzebue City	142	106	74.6
Noorvik	23	21	91.3
Selawik	22	21	95.5
Shungnak	23	16	69.6
<i>Northwest Arctic totals</i>	259	204	78.8
Brevig Mission	21	21	100.0
Koyuk	23	20	87.0
Nome City	164	144	87.8
Savoonga	28	25	89.3
Stebbins	21	19	90.5
Unalakleet	22	18	81.8
<i>Bering Strait totals</i>	279	247	88.5

but seldom so great that studies are irrevocably undermined (23). Furthermore, the Sami sample is a non-probability sample. Those invited were not chosen at random; we cannot rule out the possibility that our participants differ systematically from the population we want our sample to reflect (24, 25). In terms of external validity, selection bias is generally a problem, if the priority is to describe the distribution of variables in the population (26). However, in the future, SLiCA data will be used to explore the relationships between health and related areas of living condition, and associated risk factors. Any association may well be biased, if the study participants have a different distribution of confounding factors than the non-participants (26). Given a large enough sample, however, this may be statistically corrected, by adjusting, for the known and relevant confounding variables. As all SAMINOR municipalities overlap with the municipalities visited in SLiCA, SAMINOR data may be used to assess possible skewed distributions of confounding variables in SLiCA in the relevant age strata. Assuming that SAMINOR is a plausible estimate of the total Sami population aged 30 and 36–79 years, discrepancies in distributions of comparable variables may be tested statistically. Significant statistical differences in distributions may be used for evaluating inclusions of covariates in the model. Also, if relevant, valid estimates of the distribution of variables in the Sami population may be produced by applying weights to skewed variables by using the same method (27, 28).

However, preliminary assessments suggest that selection bias in the Sami sample is plausible, but not a major threat when comparing education attainment with SAMINOR data. Based on previous research (29) and the U.S. Census 2000 (30, 31), few or no threats to validity are detected in the data from Alaska and Greenland. Probability sampling, in addition to high participation rates, explains this.

Because of funding issues, data collection was delayed in Greenland and Norway. As a consequence, the respective data-sets stem from different periods, which may challenge comparisons. Data collection was done within a 6-year period; this may result in confounding, due to period effects. Some of this effect may be

**Table III.** Participation by region and town/village in Greenland, n = 1,197

Town/Village/Region	Sample	Participants	Participation rate (%)
Qaqortoq	80	76	95.0
Nanortalik	73	67	91.8
Alluitsup Paa	38	29	76.3
Tasiusaq (Nan)	8	7	87.5
Aappilattoq (Nan)	14	11	78.6
Saarloq	4	4	100.0
Eqalugaarsuit	13	13	100.0
<i>South Greenland totals</i>	<i>230</i>	<i>207</i>	<i>90.0</i>
Paamiut	78	56	71.8
Nuuk	481	382	79.4
Arsuk	24	20	83.3
Kapisillit	16	15	93.8
Qeqertarsuatsiaat	63	54	85.7
<i>Mid Greenland totals</i>	<i>662</i>	<i>527</i>	<i>79.6</i>
Ilulissat	118	111	94.1
Aasiaat	101	40	39.6
Kitsissuarsuit	9	8	88.9
Akunnaaq	10	7	70.0
Ilimanaq	4	4	100.0
Oqaatsut	3	3	100.0
Qeqertaq	12	11	91.7
Saqqaq	16	11	68.8
<i>Disko Bay totals</i>	<i>273</i>	<i>195</i>	<i>71.4</i>
Upernavik	25	25	100.0
Kangersuatsiaq	37	37	100.0
Innaarsuit	19	19	100.0
Nuussuaq (Upernavik)	17	14	82.4
Kullorsuaq	55	55	100.0
<i>North Greenland totals</i>	<i>153</i>	<i>150</i>	<i>98.0</i>
Tasiilaq	53	53	100.0
Isortoq (Tas)	10	10	100.0
Kulusuk	14	13	92.9
Kuummiut	27	25	92.6
Sermiligaaq	18	17	94.4
<i>East Greenland totals</i>	<i>122</i>	<i>118</i>	<i>96.7</i>

controlled, by adjusting, for interview year. A strength is that data collection took place in parts of the respective populations across the year, which reduced possible bias due to seasonal effects. Seasonal effects are common for various health variables in epidemiological studies (23).

The involved peoples represent varied ways of life of unique histories, experiences, communities and languages. The goal of standardised measurements is central to survey research, and it has been considered essential to keep the wording of questions constant across respondents (32). But even the same question may mean different things to different people, which may produce differential respondent/reporting bias. Culture influences

**Table IV.** Participation by municipality and county in Norway, n = 445

Municipality/Region	Sample	Participants	Participation rate (%)
Kautokeino	192	99	51.6
Karasjok	207	99	47.8
Nesseby	81	46	56.8
<i>Finnmark totals<sup>a</sup></i>	<i>480</i>	<i>244</i>	<i>50.8</i>
Kåfjord	84	51	60.7
Gratangen	12	8	66.7
Lavangen	12	4	33.3
Skånland/Evenes <sup>b</sup>	26	22	84.6
<i>Troms totals<sup>a</sup></i>	<i>134</i>	<i>85</i>	<i>63.4</i>
Vassdalen <sup>c</sup>	5	3	60.0
Tysfjord	72	43	59.7
Grane/Majavatn	15	10	66.7
Hattfjelldal	27	24	88.9
<i>Nordland totals<sup>a</sup></i>	<i>119</i>	<i>80</i>	<i>67.2</i>
Snåsa	21	15	71.4
Røros	34	21	61.8
<i>Trøndelag totals<sup>a</sup></i>	<i>55</i>	<i>36</i>	<i>65.5</i>

<sup>a</sup>The 4 northernmost counties in Norway. Trøndelag is a joint category of the 2 counties, Nord-Trøndelag and Sør-Trøndelag.

<sup>b</sup>Evenes is located in the northernmost part of Nordland County. The Evenes Sami, however, are of the same people as the neighbouring Skånland Sami.

<sup>c</sup>Vassdalen is a small community in the Municipality of Narvik.

the ways in which information is processed and conceptualised (33), and by no means, meaning is determined by words alone (34). This issue has been addressed by SLiCA, and a joint effort from involved researchers and indigenous representatives have maximised consistency of meaning. Standardisation in SLiCA was also possible as the indigenous peoples involved share common concepts with regard to the role of household production, their strong ties to the environment and the continuing role of extended informal and formal social relationships (2). Despite different sampling and recruitment methods and sociocultural differences, a unique database has been generated, which shall be used to explore relationships between health and living condition variables.

### Ethics

Detailed information on the project was given to the participants orally and in writing, and written informed consent was obtained before interviews took place. For respondents younger than 18 years, who took part in the study, prior written informed consent from parents or legal guardians was obtained.

In Norway, the study was accredited by the Norwegian Social Science Data Service and the National Committee for Research Ethics in the Social Sciences and the Humanities. In Alaska, the study was approved by

**Table V.** Indigenous participation by age, sex and region/country, n = 2,146<sup>a</sup>

Sex	Age	Alaska		Greenland <sup>b</sup>		Norway <sup>b</sup>	
		n	%	n	%	n	%
Men	16–34	109	(38.7)	165	(32.5)	33	(15.6)
	35–59	119	(42.2)	267	(52.6)	117	(55.5)
	60–87	54	(19.1)	76	(15.0)	61	(28.9)
	Total	282	(100)	508	(100)	211	(100)
Women	16–34	140	(37.0)	181	(32.7)	43	(20.1)
	35–59	179	(47.4)	296	(53.5)	124	(57.9)
	60–87	59	(15.6)	76	(13.7)	47	(22.0)
	Total	378	(100)	553	(100)	214	(100)

<sup>a</sup>Numbers do not add up to total sample due to missing data on sex and/or age.

<sup>b</sup>Youngest participants were 15 years in Greenland and 17 years in Norway.

the University of Alaska Institutional Review Board (IRB). In Greenland, approval from the research ethics committee was not obtained, because this is required only for medical research projects. Being responsible for data collection, Statistics Greenland guaranteed an ethical handling of individual data and these rules and regulations ensuring confidentiality for respondents were followed.

The survey adheres to the Declaration of Helsinki and to IASSA's Guiding Principles for the Conduct of Research in the Arctic 1998. Representatives of the Inuit Circumpolar Conference, the Sami Council and the Russian Association of Indigenous Peoples of the North have formed advisory boards to oversee the study (1). Indigenous steering committees approved the final questionnaire (2).

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