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a latent class analysis**

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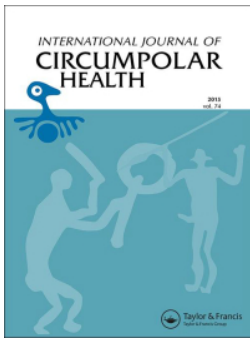
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Childhood conditions and mental health among youth and young adults in Greenland: a latent class analysis

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ABSTRACT

Poor mental health among youth in Greenland is a major challenge, childhood conditions are critical for mental health later in life. The study aimed to examine the clustering of childhood conditions by considering risk and protective factors for mental health among youth and young adults in Greenland and to explore the relationship between these clusters and mental health outcomes in youth. The study included 565 participants aged 15–34 living in Greenland. Seven indicators including childhood adversities (ACEs), childhood residence, language, and cultural indicators (protective factors) were used to define clusters via latent class analysis (LCA). The associations between clusters and mental health outcomes (satisfaction with life (Cantrill's ladder), self-esteem, self-efficacy, loneliness, psychological distress (General Health Questionnaire) and mental illness (Kessler 6)) were assessed by logistic regression. Four clusters were identified through LCA. While most participants reported positive childhoods, 40% (in two clusters) experienced ACEs. The two clusters differed as more participants in one cluster had experienced protective factors than the other. ACEs were associated with increased odds of negative aspects of mental health in youth. However, participants who faced high levels of adversity and few protective factors also had reduced odds of positive aspects of mental health in youth.

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Introduction

Poor mental health among youth in Greenland is one of the greatest public health challenges displayed in the alarmingly high suicide rates [1,2]. There are several risk factors for mental health, but studies have associated adverse childhood experiences (ACEs), such as physical, emotional, and sexual abuse in childhood, domestic violence, and substance abuse in the childhood home with mental health problems later in life [3,4]. Epidemiological research among Indigenous populations has often been centred around these risk factors [1,5–10], but a recent study stresses the importance of including protective factors, such as cultural activities and connectedness, in health research among Indigenous populations [11]. In the current study, we investigate mental health among youth and young adults in Greenland by including both risk and protective factors for mental health in an epidemiological study.

ACEs and mental health

Internationally, adverse childhood experiences (ACEs) have emerged as leading predictors of poor mental health outcomes [12,13]. ACEs have been linked to a multitude of mental health issues, including depression and increased suicide risk as between 64% and 80% of all suicide attempts can be attributed to one or more adversity in childhood, while four or more ACEs were associated to a 12-times higher risk of attempting suicide [12,14]. Among Indigenous populations, the prevalence of ACEs has been found to be significantly higher compared to western populations [15], and several studies have found an association between the number of ACEs and increased rates of suicidality and psychological distress among Arctic Indigenous People [16]. Although there is a substantial body of evidence on risk factors for good mental health, the research on protective factors is not as extensive. Emerging studies suggest that protective factors at the individual, family,

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and community levels can enhance Indigenous youth mental health. MacDonald et al. identified more than 40 protective factors at the individual, family, and community levels which enhance Indigenous youth mental health. These included practicing and holding cultural knowledge and skills, the desire to contribute meaningfully to one's community, and believing in oneself [17]. Likewise, a systematic review by Radford et al. [16] identified cultural identity and connectedness, education, social support, and psychological resilience as protective factors to reduce the impact of ACEs among Indigenous populations.

Greenland

Greenland, or Kalaallit Nunaat "Land of the Greenlandic People", has a population of 56,609 of whom 90% are Kalaallit (Greenlandic Inuit) [18]. The population is scattered in 17 large communities and approximately 60 smaller communities which are all situated on a narrow coastal strip [1]. The main language is Kalaallisut (Greenlandic), but due to the colonial history the Danish language is also widely used. Greenland was under Danish colonial rule until 1953, a process which started in 1721. Home Rule was instated in 1979, and Self Government in 2009. The Government of Greenland has for several years focused on improving the lives of children in the country. This work is currently guided by the public health strategy "Inuuneritta III (2020–2030)", which aims to improve the well-being and health of all children, emphasising secure childhood conditions free from violence, abuse, and substance harm.

In Greenland, adverse experiences in childhood have been monitored for 30 years by the Greenland Population Health Surveys, countrywide health surveys repeated every 4–6 years. The most prevalent childhood adversity in Greenland is alcohol problems in the childhood home. The Greenland Population Health Survey has shown that the prevalence peaked among those born in 1970–1974, where 33% reported that they often had experienced problems with alcohol in their childhood home and 36% had experienced it sometimes. This proportion has since decreased among younger birth cohorts, but overall 66% of all participants in the Greenland Population Health Survey 2014 had experienced either problems with alcohol or violence in their childhood home or had been sexually abused in childhood [19]. A similar high prevalence of childhood adversities was reported in a national youth population in 2011 where 83% had experienced at least one adversity in childhood and the most common adversities were psychological

violence (47%), losing a close relation to suicide (44%), and alcohol problems in the close family (26%) [9]. Studies in Greenland have linked these traumatic experiences in childhood to poor mental health, such as suicide and suicide behaviour [6,20–22].

Despite the high prevalence of ACEs in Greenland 68% of the participants were categorised as having good mental health in 2014 assessed by the General Health Questionnaire [19]. The high proportion of Kalaallit who have good mental health suggests that many individuals demonstrate resilience [23,24]. Resilience is defined as "overcoming adversities" and is driven by protective factors which are suggested to modify the association between risk factors and negative health outcomes [24–26]. While the importance of protective factors in supporting youth and communities is evident from other Arctic regions, there is a notable lack of epidemiological research on these factors in Greenland, as pointed out in a recent systematic literature review by Seidler, Hansen, et al. [2]. This study aims to address this gap, exploring the interplay between childhood adversities and childhood protective factors to enhance the understanding and support of mental health among Kalaallit.

Objective

The objective of this study was to examine the clustering of childhood conditions by considering risk factors and protective factors in childhood for mental health among youth and young adults in Greenland. Second, to explore the relationship between the identified clusters and mental health outcomes in youth.

Methods

Data and sample

Data is drawn from the most recent nationwide cross-sectional health survey in Greenland, conducted between 2017 and 2019. A comprehensive description of the study is available elsewhere [27]. Two survey questionnaires were used: (1) an interviewer-administered questionnaire designed for participants younger than 35 years and (2) a self-administered questionnaire containing sensitive questions (about, e.g. suicide, alcohol, violence, sexual abuse, etc.). The questionnaires were available in Kalaallisut and in Danish; the majority (90%) answered in Kalaallisut [27]. The sample includes 620 youth and young adults aged 15–34 years, representing 3.5% of the population in this age group and 39% of the overall sample. Due to changes in the questionnaire following the pilot

phase, 55 participants from the town Qaanaaq were excluded from the sample. This resulted in a final sample of 565 participants.

Measures of childhood conditions

To define different clusters of childhood conditions, seven indicators associated with mental health were selected based on (1) the scientific literature, (2) through a continued dialogue with the Greenlandic communities and (3) informed by the Greenlandic public health strategy “Inuuneritta III”, which highlights the central risk and protective factors for health among children and youth in Greenland [28]. The seven indicators are shown in Table 1 including all response options for each question in the survey questionnaire, the indicators were dichotomised for later analyses. The indicators are divided into three overall themes: Childhood adversities; residence in childhood and proficiency in speaking Danish; and protective factors. All indicators were dichotomised as described below.

Childhood adversities include three adverse experiences in childhood (1) Problems with alcohol in the childhood home, (2) Problems with violence in the childhood home and (3) sexual abuse in childhood. These three childhood exposures are widely viewed as adverse in the literature and the negative mental health effects have been documented [14,29]. The high prevalence of these three adversities in a Greenlandic youth population has recently been confirmed by Ottendahl et al. [9], as these have been validated for use in a Greenlandic ACE-scale. Questions regarding problems with violence or alcohol in the childhood home were asked in two separate questions “*Were there problems with alcohol in your childhood home?*” and “*Were there problems with violence in your childhood home?*” with three response categories: “*Yes, often*”, “*Yes, sometimes*” or “*No, never*”. Participants who answered “*Yes, often*” or “*Yes, sometimes*” were categorised as having experienced the adversity. Sexual abuse was included by the following questions: “*Have you ever been forced to any kind of sexual activity as a child (younger than 13 years)?*” and “*Have you ever been forced to any kind of sexual activity when you were young (between 13 and 17 years)?*” with the response options of “*yes*” or “*no*”. A positive answer to any of the questions was categorised as childhood sexual abuse.

Residence in childhood and Danish language skills were included as these describe the level of urbanisation in childhood. Evidence shows that urbanisation is associated with mental health in a Greenlandic context [5]. Residence in childhood was identified by asking:

“*Where did you live when you were 10 years old?*” This was a free-text question, and answers were coded into “*capital*”, “*larger community*” and “*smaller community*”. This measure has previously proven robust in determining urbanisation level in childhood in the population, despite it being one measure in time [30,31]. The protective factors were defined by two cultural indicators: (1) Participation in cultural activities in childhood, by the question “*As a child have you had the opportunity to see and learn traditional Greenlandic activities? e.g. Hunting, fishing, berry picking, being in nature, skinning, handicrafts, etc*” and (2) having a relationship with elders in the community, by the question: “*Do you feel a close connection to elders in your community? For example, grandparents or other elders in the community who means something to you*”. Both questions had the following answer categories: “*Yes, to a great extent*”, “*yes, to some extent*”, “*to a less extent*” and “*no, not at all*”. Participants who answered “*Yes, to a great extent*” were categorised as having experienced the cultural indicator to a great extent. These cultural indicators were chosen as others have identified activities on the land, connectedness and having a relationship with older generation as protective factors for mental health among Indigenous populations [16,17,24,25].

Covariates

Sex, age and socioeconomic position were included as covariates in the analyses. Sex and age were derived from the participant’s civil registration number [32]. Socioeconomic status was measured by an index of material wealth. The index was assessed by the ownership of six household items (video/DVD player, microwave, computer, washing machine, dishwashing machine, internet) resulting in a household asset score ranging from 0 to 6. The applicability of the index in the population has previously been studied by Bjerregaard, Dahl-Petersen, and Larsen [33] and was assessed to be valid as a socioeconomic indicator among Kalaallit.

Measures of mental health

Seven dichotomized mental health measures were used to assess mental health in youth and young adulthood:

Satisfaction with life (Cantril’s ladder)

Satisfaction with life was assessed by “*Cantril’s Ladder*” [34]. Cantril’s Ladder is a widely used instrument among children and youth and has shown good reliability and validity [35,36]. Cantril’s Ladder was assessed by the following question: “*On a scale where 10 means ‘the*

Table 1. Childhood conditions among youth and young adults (15–34 years) in Greenland. Greenland Population Health Survey 2018. *N* = 565.

Childhood conditions	n (%)
Childhood Adversities	
<i>Problems with alcohol in the childhood home</i>	
Yes, often	96 (17.0)
Yes, sometime	186 (32.9)
No, never	264 (46.7)
Missing	19 (3.4)
<i>Violence in the childhood home</i>	
Yes, often	36 (6.4)
Yes, sometime	159 (33.8)
No, never	275 (48.7)
Missing	95 (16.8)
<i>Sexual abuse in childhood (before 18 years of age)</i>	
Yes	146 (25.8)
No	328 (58.1)
Missing	91 (16.1)
Residence and language	
<i>Residence in a small community at the age of 10 years</i>	
Yes	165 (29.2)
No	382 (67.6)
Missing	18 (3.2)
<i>Proficiency in speaking Danish</i>	
Without difficulty	200 (35.4)
Almost no difficulty	166 (29.4)
With some difficulty	156 (27.6)
Do not speak Danish	43 (7.6)
Missing	–
Cultural indicators (protective factors)	
<i>Participation in cultural activities in childhood (e.g. going hunting or fishing, collecting berries and being in nature or skinning, handicrafts etc.)</i>	
Yes, to a great extent.	277 (49.0)
Yes, to some extent.	151 (26.7)
To a lesser extent.	65 (11.5)
Never	71 (12.6)
Missing	<5
<i>Relationship with elders in the community</i>	
Yes, to a great extent.	266 (47.1)
Yes, to some extent.	115 (20.4)
To a lesser extent.	70(12.4)
Never	113 (20.0)
Missing	<5

best possible life', and 0 means 'the worst possible life'. Where do you think you are now?" The answers were scored from 0 to 10, and a score of 7 or above was classified as a high degree of life satisfaction [36].

Self-esteem

Self-esteem is the subjective sense of overall personal worth or value and has been associated with depression, suicidal ideation, loneliness, etc., [37]. Self-esteem was defined by the question "How do you agree or disagree with the following statement? I'm good enough as I am?" with the possible answers: "Strongly agree", "agree", "neither agree or disagree", "disagree", or "strongly disagree". Participants who answered "strongly agree" or "agree" were classified as having a high level of self-esteem.

Self-efficacy

Self-efficacy impacts the feeling of being able to handle challenges in everyday life [38]. Self-efficacy was

estimated by the question: "How often can you accomplish your goals?" with the possible answers: "Very often", "often", "sometimes", "rarely", or "never". Participants who answered "very often" or "often" were classified as having a high degree of self-efficacy.

Loneliness

Loneliness have been associated with greater anxiety, stress, depression and general poor mental health [39]. Loneliness was assessed by the following question: "Do you feel lonely?", with the possible answers: "Very often", "often", "sometimes" or "no". Participants answering "Very often" or "often" was categorised as being lonely.

Psychological distress (General health questionnaire)

The 12-item General Health Questionnaire (GHQ) was used to assess psychological distress, the scale has previously been validated in the population [40]. The questions refer to the past 14 days and were originally

developed as a screening tool for mental distress in the general population [41]. The 12 questions centre around feelings and other challenges that affect mental health such as: ability to concentrate, sleep, usefulness, decision-making, strain, the ability to overcome difficulties, the ability to enjoy day-to-day activities, problem facing, unhappiness/depression, confidence, thinking oneself as worthless and happiness. Each of the 12 items was rated on a four-point scale: “More so than usual”, “the same as usual”, “less than usual”, “much less than as usual”. The score was coded by the caseness method. A score of 1 was attributed to reports of experiencing negative symptoms more than usual or the same as usual and experiencing positive symptoms less than usual or much less than usual, for each of the 12 items, creating a scale ranging from 0 to 12. The GHQ scale was analysed as a dichotomous measure; a cut-off at ≥ 3 indicates that an individual has experienced psychological distress [40,42].

Mental illness (Kessler 6)

To measure signs of mental illness the scale “Kessler 6” (K6) was used [43]. K6 has been developed to measure signs of non-specific mental illness in large population studies and is based on six questions concerning the following emotions within the last month: nervousness, hopelessness, restlessness and impatience, depression, if everything feels like a struggle and worthlessness [43]. Each question with the possible answers: “Very often”, “often”, “sometimes”, “rarely” or “never”, scored from 0 to 4. Finally, summed up to one score ranging from 0 to 24, where a total score above 13 indicates signs of mental illness [43].

Statistical analyses

The clustering of childhood conditions was assessed by latent class analysis (LCA) with seven observed indicators for childhood conditions (Table 1). Class enumeration was based on guidelines from Nylund-Gibson and Choi [44] and the following criteria: Model information-based criteria (namely, Bayesian Information Criterion (BIC) and the Akaike information criterion (AIC)); acceptable fit of the model to the data (determined by a likelihood ratio test); and presence of distinct and meaningfully interpreted classes. A maximum of five classes were evaluated. The BIC value was lowest at the 3-class model, and the AIC value was lowest at the 5-class model. Model fitness, determined by a likelihood ratio test, was best at the 4-class model where classes were also distinct and meaningfully interpreted. Accordingly, the 4-class model was chosen. Individuals were subsequently assigned to the latent

class with the highest posterior class membership probabilities, the mean posterior probabilities of each class were: 0.43; 0.21; 0.20 and 0.16, model entropy was 0.71. Naming of classes was based on the level of childhood adversities and cultural connectedness in the class: low adversity (class 1), moderate adversity (class 2), high adversity and high cultural connection (class 3), high adversity and low cultural connection (class 4).

Differences in demographic factors between classes were tested using Pearson Chi-Square test and the one-way ANOVA test and displayed by p-values, where a p-value lower than 0.05 indicates a statistically significant result. Missing data on indicator variables was handled by using full information maximum likelihood estimation, as recommended by Sinha, Calfee and Delucchi [45]. Initially, LCA was run as a complete case analysis. These results were not used in further analyses as it excluded 27% of the participants from the sample and would have provided further selection to the dataset as missing data was expected to be not-at-random. To investigate the selection of missing data, sensitivity analyses were conducted through Pearson Chi-Square test and two-sample t-test to assess the differences between complete cases and cases with missing information (results not tabulated).

To test the association between the four classes of childhood conditions and mental health outcomes, binary logistic regression was used. Each mental health outcome was analysed in a separate model where the class “Low adversity” was used as reference. The models were adjusted for sex, age, and socioeconomic status and results are presented for the fully adjusted model. Analyses were conducted in Stata/BE 18 [46].

Ethics

The Population Health Survey in Greenland 2018 was approved by the Scientific Ethics Committee in Greenland (KVUG 2017–05). All participants were informed orally and in writing about the content and process of the survey and signed an informed consent form. Parental consent was not required for participants aged 15 years and older.

Results

Table 1 shows the distribution of childhood conditions in the population. Half of the respondents had often or sometimes experienced problems with alcohol in the childhood home, 40% had often or sometimes experienced problems with violence, and 26% had been sexually abused in childhood. Just under a third grew up in a smaller community, 65% spoke Danish with little or no difficulty and 50% had

Table 2. Characteristics of the study population. Greenland Population Health Survey 2018. *N* = 565.

Sex [n (%)]	
Female	277 (49.0)
Age	
Mean (SD)	24.7 (5.5)
Median; range	25.0; 15-34
Occupation [n (%)]	
Work which requires a medium or long education	36 (6.4)
Skilled work	77 (13.6)
Unskilled work	186 (32.9)
Hunter or fisherman	26 (4.6)
Student	79 (14.0)
Unemployed	78 (13.8)
Missing	83 (14.7)
Region [n (%)]	
Nuuk	122 (21.6)
Central towns in West Greenland	79 (14.0)
Peripheral towns in West Greenland	191 (33.8)
Smaller communities in West Greenland	104 (18.4)
East Greenland	69 (12.2)
Assets (material wealth)	
Mean (SD)	4.43 (1.25)
Median; range	5; 0-6
Satisfaction with life [n (%)]	
High level of satisfaction with life	445 (78.8)
Missing	<5
Self-esteem [n (%)]	
High level of self esteem	452 (80.0)
Missing	<5
Self-efficacy [n (%)]	
High degree of self-efficacy	374 (66.2)
Missing	<5
Loneliness [n (%)]	
Experiencing loneliness	53 (9.4)
Missing	<5
Psychological distress (GHQ) [n (%)]	
Yes	158 (28.0)
Missing	10 (1.8)
Mental illness (K6) [n (%)]	
Yes	55 (9.7)
Missing	<5

experienced a great extent of protective factors in childhood in the form of cultural activities or had relationships with elders. Table 2 shows the characteristics of the study population. Half of the participants were women and the mean age was 25 years. The majority reported high levels of satisfaction with life (79%), high levels of self-esteem (80%) and a high degree of self-efficacy (66%). In addition, 10% were identified as having poor mental health via the Kessler 6 scale, 9% reported feeling lonely very often or often, and 28% experienced psychological distress measured by the GHQ-scale.

Figure 1 shows the results of the latent class analysis, with the characteristics of the four classes presented by average proportions. In summary, the two initial classes, class 1 "Low adversity" (*n* = 247, 44%) and class 2 "Moderate adversity" (*n* = 87, 15%) were characterised by a low to moderate proportion of childhood adversity. In class 2 39% had experienced sexual abuse in childhood. The two classes differed with respect to residence in childhood and fluency in

Danish, where participants in class 2 grew up in smaller communities, where the Danish language is not used as widely as in larger communities. Concerning protective factors, the average proportion of endorsement was around 50% in class 1, while higher proportions were found among participants in class 2 (67% for cultural activities and 71% for relationship to older generations).

The two remaining classes; class 3 "High adversity, high cultural connection" (*n* = 117, 21%) and class 4 "High adversity, low cultural connection" (*n* = 114, 20%) were characterised by high probabilities of childhood adversity. In class 3, 91% had experienced alcohol problems in the childhood home, 99% had experienced violence in the childhood home, and 41% had experienced sexual abuse in childhood. Similar proportions were found in class 4 with 84% for alcohol problems, 82% for violence and 57% for sexual abuse in childhood. Class 3 was characterised by participants who grew up in a larger community and class 4 was characterised by participants who grew up in smaller communities with a notable difference in Danish fluency: 90%

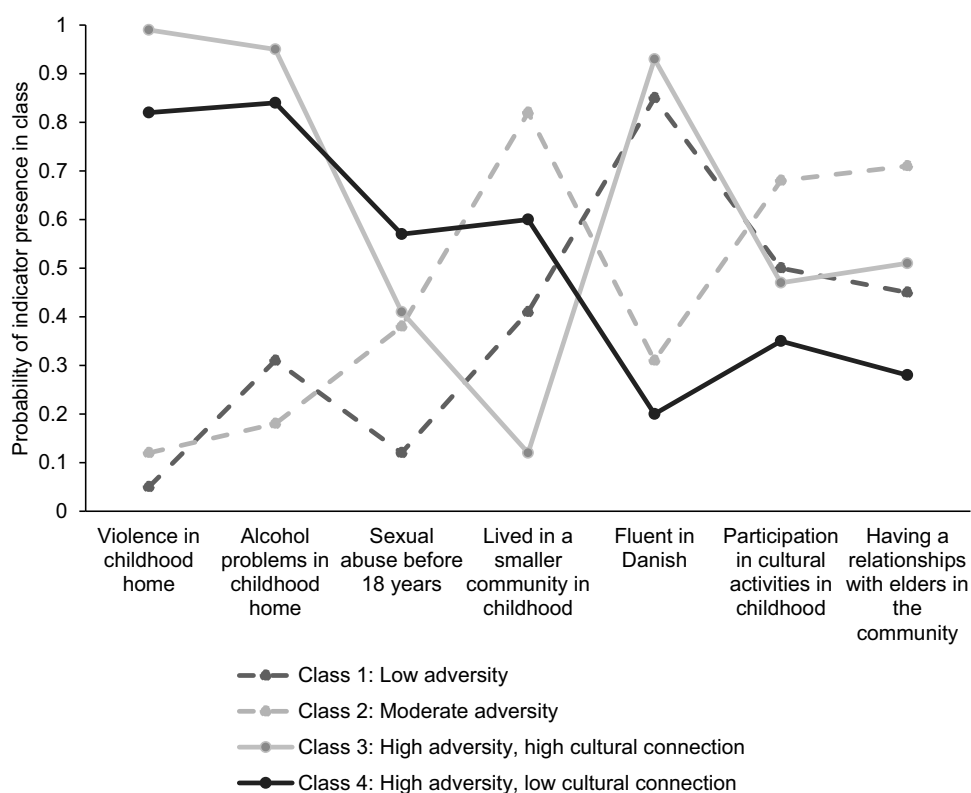


Figure 1. Characteristics of the four clusters of childhood conditions. Greenland Population Health Survey 2018. $N = 565$.

Table 3. Demographic characteristics of the four clusters of childhood conditions. Greenland Population Health Survey 2018. $N = 565$.

	Low adversity (class 1)		Moderate adversity (class 2)		High adversity, high cultural connection (class 3)		High adversity, low cultural connection (class 4)		p-value ^a
Total n (%)	247	(43.7)	87	(15.4)	117	(20.7)	114	(20.2)	
Sex n (%)									0.009
Female	103	41.7	49	56.3	58	49.6	67	58.8	
Male	144	(58.3)	38	(43.7)	59	(50.4)	47	(41.2)	
Age									<0.001
Mean (SD)	23.6	(5.6)	25.5	(5.7)	26.3	(5.0)	24.7	(5.3)	
Median; range	23;	15-34	26	15-34	27	16-34	25	15-34	
Occupation n (%)									<0.001
Work which requires a medium or long education.	21	(8.5)	<5	–	9	(7.7)	<5	–	
Skilled work.	33	(13.4)	10	(11.5)	23	(19.7)	11	(9.7)	
Unskilled work.	63	(25.5)	33	(37.9)	48	(41.0)	42	(36.8)	
Hunter or fisherman.	7	(2.8)	14	(16.1)	<5	–	<5	–	
Student.	50	(20.2)	6	(6.9)	13	(11.1)	10	(8.8)	
Unemployed.	29	(11.7)	8	(9.2)	14	(12.0)	27	(23.7)	
Missing.	44	(17.8)	13	(14.9)	9	(7.7)	17	(14.9)	
Region n (%)									<0.001
Nuuk	82	(33.2)	7	(8.1)	27	(23.1)	6	(5.3)	
Central towns in West Greenland.	52	(21.1)	<5	–	13	(11.1)	13	(11.4)	
Peripheral towns in West Greenland.	92	(37.3)	18	(20.7)	46	(49.3)	35	(30.7)	
Villages in West Greenland.	6	(2.4)	49	(56.3)	9	(7.7)	40	(35.1)	
East Greenland.	15	(6.1)	12	(13.8)	22	(18.8)	20	(17.5)	
Assets (material wealth)									<0.001
Mean (SD)	4,8	(1.1)	3,9	(1.2)	4,5	(1.2)	3,9	(1.3)	
Median; range	5;	1-6	4;	1-6	5;	1-6	4;	1-6	

^aBased on one-way ANOVA for continuous measures and χ^2 for categorical measures.

in class 3 compared to 20% in class 4. Protective factors also differed between the classes, with class 3 showing higher proportions: 50% participated in traditional activities and 50% had a relationship to elders in their community, compared to 40% and 30%, respectively, in class 4.

In addition, Table 3 shows significant differences between the four classes concerning sex, age, occupation, region and material wealth.

Childhood conditions and mental in youth and young adulthood

Figure 2 shows the results of six logistic regression analyses testing the associations between the four LCA classes and six mental health outcomes by using class 1 “Low adversity” as reference. In general, the results show that class 4 characterised by high levels of adversity and

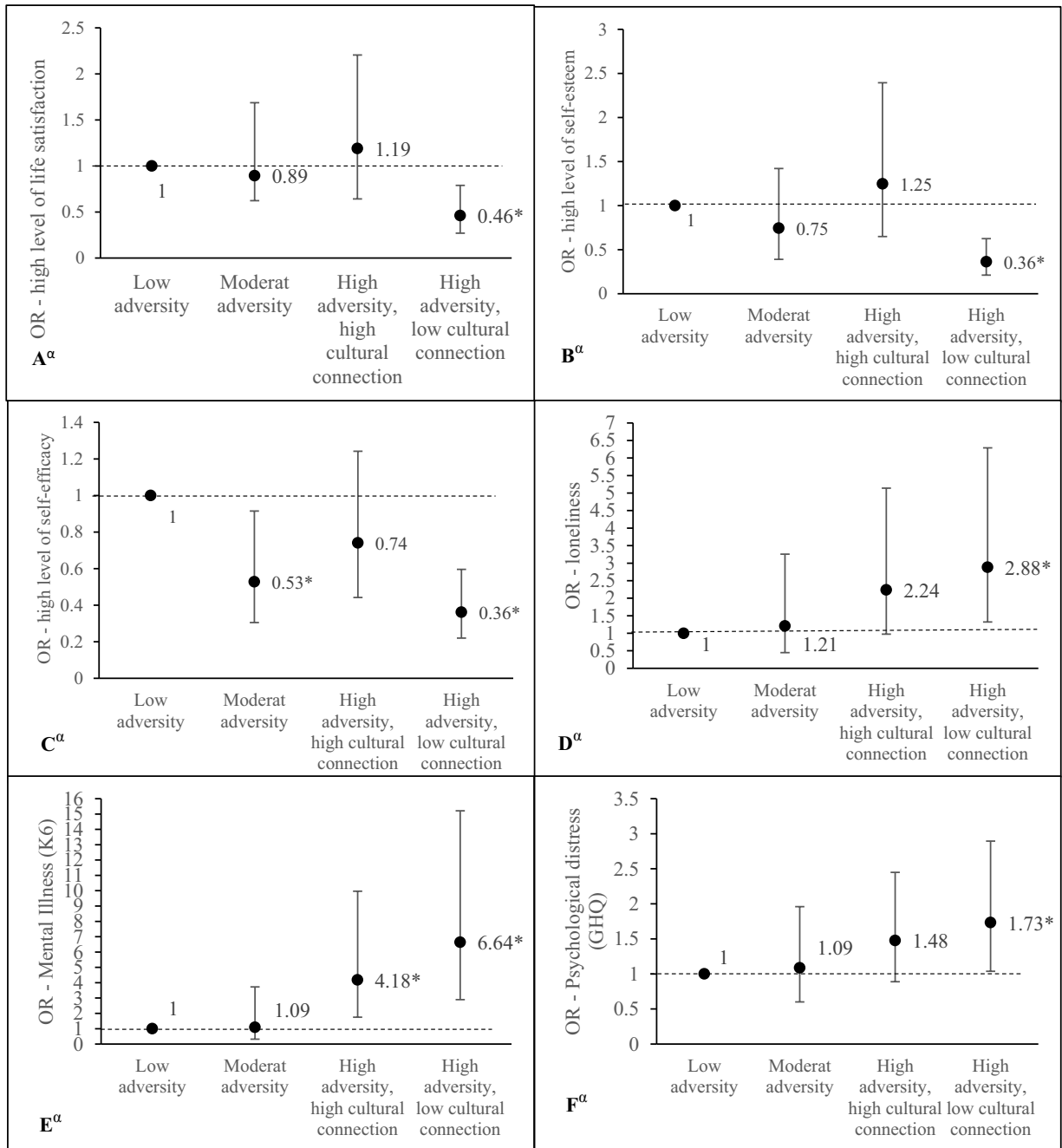


Figure 2. Odds ratio and 95% confidence intervals for the association between the four LCA classes of childhood conditions and measures of mental health (A: a high level of satisfaction with life, $n = 564$. B: a high level of self-esteem, $n = 564$. C: a high level of self-efficacy, $n = 564$. D: loneliness, $n = 564$. E: mental illness (K6), $n = 564$. F: psychological distress (GHQ), $n = 555$. Greenland Population Health Survey 2018. ^aAdjusted for age, sex, and socioeconomic status. * $p < 0.05$.

lower levels of protective factors had significantly lower odds of experiencing good mental health measured by a high level of life satisfaction (OR = 0.46 [CI 95% 0.3; 0.8]), a high level of self-esteem (OR = 0.36 [CI 95% 0.2; 0.6]) and a high level of self-efficacy (OR = 0.36 [CI 95% 0.2; 0.6]), compared to class 1 “Low adversity” (see [Figures 2a, b](#) and [c](#)). Participants in class 2 “Moderate adversity” also had significantly lower odds of having a high level of self-efficacy (OR = 0.53 [CI 95% 0.3; 0.9]) compared to the reference.

Furthermore, [Figure 2](#) shows that participants in classes 3 and 4 had higher odds of experiencing poor mental health measured by loneliness, mental illness (K6), and mental distress (GHQ) compared to class 1 “Low adversity” (see [Figures 2d, e](#) and [f](#)). The highest odds were found among participants in class 4 “high adversity, low cultural connection” who had significantly elevated odds of loneliness (OR = 2.88 [CI 95% 1.3; 6.3]), mental illness (K6) (OR = 6.6 [CI 95% 2.9; 15.2]) and psychological distress (GHQ) (OR = 1.73 [CI 95% 1.03; 2.9]) compared to the reference. Class 3 also had significantly elevated odds for experiencing mental illness (K6) (OR = 4.2 [CI 95% 1.8; 10.0]) compared to the reference.

Discussion

The main result of the present study was the identification of four clusters of childhood conditions based on information from 565 youths and young adults in Greenland using LCA. The analysis confirmed that most of the young population (60%) grow up in homes with a moderate to low prevalence of childhood adversity, they have been part of traditional activities and have a close relationship with elders in their community. Such positive results are often not reported in the scientific literature as risk groups often are the focal point. In contrast, 40% of the population was in a vulnerable position as they had experienced frequent problems with alcohol and violence in the childhood home and had been subjected to sexual abuse in childhood. These 40% comprised youth and young adults who grew up in both smaller and larger settlements, indicating that childhood adversities occur across different settlement types. Unfortunately, the high prevalence of adverse childhood experiences is not surprising, as this is in accordance with previous studies in the population [9,19,47,48].

A second important finding was that conditions in childhood were found to be associated with mental health later in life. Childhood adversities, especially prevalent in the two vulnerable groups (class 3 and class 4), increased odds of poor mental health in youth and

young adulthood. These findings are in accordance with previous studies which show that childhood adversities are strongly associated with poor mental health outcomes and suicide [3,4,12,14,49]. Among Indigenous populations, a systematic review found that similar to other populations, higher ACE scores for Indigenous participants were associated with increased rates of suicidality and psychological distress [16]. Others have found similar results in studying Sami and Inuit youth, where suicidal thoughts and attempts were significantly associated with violence and sexual abuse [50]. In Greenland, Karsberg et al. [21] found that schoolchildren were 6 times more likely to have attempted suicide if exposed to violence, neglect and bullying compared to peers who had not experienced these potentially traumatic events.

Furthermore, the results show a particular vulnerability of class 4 “high adversity, low cultural connection” (20%) as this group had the lowest odds for good mental health and the highest odds for poor mental health. The differences in mental health between the two vulnerable groups (class 3 and 4) could be explained by the different levels of protective factors in the groups. This suggests a potential moderating effect of protective factors on the association between adverse childhood experiences and mental health outcomes, which should be further investigated in future studies. Additionally, the two groups differ concerning residence in childhood and the vulnerability of class 4 suggests that children from smaller communities are a particularly vulnerable group when it comes to coping with adversities in childhood.

Strengths and limitations

Including protective factors in this epidemiological study is a notable strength. By including protective factors, this study contributes with new knowledge about the role of protective factors concerning mental health among youth and young adults as few have included these in a similar study design [16,17,23,24]. The research area of protective factors is on the rise also among Arctic Indigenous populations. For this purpose, Cueva et al. [11] have developed a framework which suggests other relevant protective factors for community health and well-being in the Arctic such as: Access to traditional food, strength of family ties, cultural and spiritual beliefs, connection to land and place, etc. Additionally, Healey [51] identified culture and traditional knowledge as key determinants of health for Canadian Inuit women [51]. Few have investigated the role of protective factors in Greenland, but Steenholdt found that “going on the land” was a very important factor for enhancing quality of life and that

nature was often perceived as providing psychological resources [52,53]. Further studies should explore the role of other protective factors for health in Greenland and how to include these in epidemiological research.

Another strength of the current study is the use of LCA to determine clusters of childhood conditions as the categorisation of participants was solely based on patterns in data. A limitation of this method is that individuals are subsequently assigned to the latent class that they have the highest posterior class membership probabilities to, which means that participants can have similarities to more than one class. This method was chosen as it produces interpretative results applicable in public health settings, but it may have introduced bias in the analysis. We argue that it is unlikely that this discrepancy is associated with mental health or any of the indicators included in the LCA, furthermore it is unlikely that this has influenced the results in a significant extent. The successful assignment of class membership is reflected in the posterior probabilities for each class (0.43; 0.21; 0.20 and 0.16), which were lower than preferred, even though model entropy was at an acceptable level (0.7).

The inclusion of multiple measures for mental health, both measures of positive and negative aspects of mental health, is a strength of this study as poor mental health according to one parameter does not rule out experiencing good mental health in other parameters. A study by Keyes [54] confirmed that mental health and mental illness are not at opposite ends of a single continuum; rather, they constitute distinct but correlated axes [54]. By including several measures of mental health, the results of the present study embodies the complexity of mental health and emphasises that one instrument is unlikely to cover all aspects.

A limitation of the current study is a relatively small sample of 565 participants which is reflected in the wide confidence intervals shown in Figure 2. A larger sample would potentially have allowed for more clear differences in mental health outcome across the four LCA groups. As there are just under 57,000 people living in Greenland, small sample sizes are evidently a circumstance in research which cannot be avoided. The Greenland Population Health Survey is the largest health-related survey in the country and is the most representative data source for describing mental health and mental health disparities in the population. The survey from 2018 had difficulties recruiting young participants, resulting in a participation rate of 39% for participants under 35 years. This selection has been further investigated and showed that among women the participation rate was 50% and 32% for men. Furthermore, the youngest (15–19-year-olds) were

more hesitant to participate in the survey with a participation rate of 31%. This bias introduced by selection means that the study results may represent the older part of the sample and women to a greater extent.

Furthermore, the results showed that 27% of the sample had missing information on indicator variables used in the LCA. Missing data was especially prevalent regarding violence in the childhood home and sexual abuse in childhood. Sensitivity analyses showed that participants with missing information more often lived in the northern and eastern parts of Greenland and were significantly younger compared to complete cases. There are substantial differences in living conditions across Greenland and the northern and eastern regions experience lower socioeconomic standards and poorer mental health. This disparity might have led to an underestimation of childhood adversities within the population and as a result underestimated the association between the clusters of childhood conditions and mental health outcomes [55].

Finally, another limitation is that 55 participants were excluded from the analyses as they were not given the opportunity to answer questions regarding cultural indicators used in the LCA. These participants all lived in Qaanaaq which is the largest town in the most northern part of Greenland Avanersuaq (the Thule area), consequently the results of the current study might not be representative for this area in Greenland.

Public health implications

This study has identified four groups of youth and young adults in Greenland with respect to childhood conditions and found that most of the population have experienced good conditions in childhood and good mental health in youth and young adulthood. Despite these findings, a significant portion of the population has experienced an unsafe childhood impacted by ACEs, leading to severe mental health challenges. Poor childhood conditions are the source of many mental health challenges, but the results of the present study indicate that the negative effect of poor childhood conditions might be moderated by protective factors such as cultural connectedness. Additionally, the results reveal that children from smaller communities who experience ACEs are a special vulnerable group, who needs further support to thrive in youth and young adulthood.

To promote mental health and wellbeing among youths and young adults it is important to ensure safe and healthy childhoods for all children in Greenland by preventing adverse experiences. Furthermore, it is important to consider that children from different places in Greenland experience different needs. The

prevention of adverse experiences in childhood is already a part of the national public health strategy, Inuuneritta III's first benchmark: "All children must live a life of good mental health and have access to healthy and inclusive communities where they thrive and can develop their abilities, deal with challenges and can socialize". In addition to this continued work the promotion of protective factors for mental health are important to further support good mental health among youth and young adults in Greenland. This study provides initial evidence for introducing interventions such as land-based camps for health promotions and similar initiatives which builds culture and other protective factors in an Indigenous context for children and youth. Further studies should investigate how to include protective factors in epidemiological research and investigate the potentially moderating effect of protective factors through mediation analysis.

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References

- [1] Bjerregaard P, Larsen CVL. Three lifestyle-related issues of major significance for public health among the Inuit in contemporary Greenland: a review of adverse childhood conditions, obesity, and smoking in a period of social transition. *Public Health Rev.* 2018;39(1):5. doi: [10.1186/s40985-018-0085-8](https://doi.org/10.1186/s40985-018-0085-8)
- [2] Seidler IK, Hansen NL, Bloch AP, et al. A systematic review on risk and protective factors for suicide and suicidal behaviour among Greenland Inuit. *Int J Circumpolar Health.* 2023;82(1):2226284. doi: [10.1080/22423982.2023.2226284](https://doi.org/10.1080/22423982.2023.2226284)
- [3] De Venter M, Demyttenaere K, Bruffaerts R. The relationship between adverse childhood experiences and mental health in adulthood. A systematic literature review. *Tijdschr Psychiatr.* 2013;55(4):259–268.
- [4] Serafini G, Muzio C, Piccinini G, et al. Life adversities and suicidal behavior in young individuals: a systematic review. *Eur Child Adolesc Psychiatry.* 2015;24(12):1423–1446. doi: [10.1007/s00787-015-0760-y](https://doi.org/10.1007/s00787-015-0760-y)
- [5] Bjerregaard P, Curtis T. Cultural change and mental health in Greenland: the association of childhood conditions, language, and urbanization with mental health and suicidal thoughts among the Inuit of Greenland. *Soc Sci Med.* 2002;54(1):33–48. doi: [10.1016/s0277-9536\(01\)00005-3](https://doi.org/10.1016/s0277-9536(01)00005-3)
- [6] Curtis T, Larsen FB, Helweg-Larsen K, et al. Violence, sexual abuse and health in Greenland. *Int J Circumpolar Health.* 2002;61(2):110–122. doi: [10.3402/ijch.v61i2.17443](https://doi.org/10.3402/ijch.v61i2.17443)
- [7] Granheim IPH, Silviken A, Larsen CVL, et al. Socio-demographic, psychosocial and environmental factors associated with suicidal behaviour in indigenous Sami and Greenlandic Inuit adolescents; the WBYG and NAAHS studies. *Int J Circumpolar Health.* 2021;80(1):1913939. doi: [10.1080/22423982.2021.1913939](https://doi.org/10.1080/22423982.2021.1913939)
- [8] Niclasen B, Bjerregaard P. Review article: child health in Greenland. *Scand J Public Health.* 2007;35(3):313–322. doi: [10.1080/14034940600975781](https://doi.org/10.1080/14034940600975781)
- [9] Ottendahl CB, Seidler IK, Beck A, et al. Developing the aceig-scale: an adverse childhood experience scale for Inuit youth in Greenland. *Child Abuse Negl.* 2023;148:106471. doi: [10.1016/j.chiabu.2023.106471](https://doi.org/10.1016/j.chiabu.2023.106471)
- [10] Seidler IK, Tolstrup JS, Bjerregaard P, et al. Time trends and geographical patterns in suicide among Greenland Inuit. *BMC Psychiatry.* 2023;23(1):187. doi: [10.1186/s12888-023-04675-2](https://doi.org/10.1186/s12888-023-04675-2)
- [11] Cueva K, Rink E, Lavoie JG, et al. Diving below the surface: a framework for arctic health research to support thriving communities. *Scand J Public Health.* 2021;51(7):1086–1095. doi: [10.1177/14034948211007694](https://doi.org/10.1177/14034948211007694)
- [12] Dube SR, Anda RF, Felitti VJ, et al. Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the adverse childhood experiences study. *JAMA.* 2001;286(24):3089–3096. doi: [10.1001/jama.286.24.3089](https://doi.org/10.1001/jama.286.24.3089)
- [13] Merrick MT, Ports KA, Ford DC, et al. Unpacking the impact of adverse childhood experiences on adult mental health. *Child Abuse Negl.* 2017;69:10–19. doi: [10.1016/j.chiabu.2017.03.016](https://doi.org/10.1016/j.chiabu.2017.03.016)
- [14] Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The adverse

- childhood experiences (ACE) study. *Am J Prev Med.* 1998;14(4):245–258. doi: [10.1016/s0749-3797\(98\)00017-8](https://doi.org/10.1016/s0749-3797(98)00017-8)
- [15] Madigan S, Deneault AA, Racine N, et al. Adverse childhood experiences: a meta-analysis of prevalence and moderators among half a million adults in 206 studies. *World Psychiatry.* 2023;22(3):463–471. doi: [10.1002/wps.21122](https://doi.org/10.1002/wps.21122)
- [16] Radford A, Toombs E, Zugic K, et al. Examining adverse childhood experiences (ACEs) within indigenous populations: a systematic review. *J Child & Adolesc Trauma.* 2022;15(2):401–421. doi: [10.1007/s40653-021-00393-7](https://doi.org/10.1007/s40653-021-00393-7)
- [17] MacDonald J, Ford J, Willox A, et al. A review of protective factors and causal mechanisms that enhance the mental health of indigenous circumpolar youth. *Int J Circumpolar Health.* 2013;72(1):21775–21775. doi: [10.3402/ijch.v72i0.21775](https://doi.org/10.3402/ijch.v72i0.21775)
- [18] Statistics Greenland. Befolkningen 1. January 2023. Population January 1st 2023]. Retrieved from 2023. Available from: https://bank.stat.gl/pxweb/da/Greenland/Greenland_BE_BE01_BE0120/BEXSTA.px/table/tableViewLayout1/
- [19] Dahl-Pedersen I, Larsen CVL, Nielsen N, et al. *The health survey in Greenland 2014*. Retrieved from 2016. Available from: https://mitsdu.dk/sif/-/media/images/sif/udgivelser/2017/29_b2014+metoderapport+final+rev.pdf
- [20] Grundsøe TL, Pedersen ML. Risk factors observed in health care system 6 months prior completed suicide. *Int J Circumpolar Health.* 2019;78(1):1617019. doi: [10.1080/22423982.2019.1617019](https://doi.org/10.1080/22423982.2019.1617019)
- [21] Karsberg S, Armour C, Elklit A. Patterns of victimization, suicide attempt, and posttraumatic stress disorder in Greenlandic adolescents: a latent class analysis. *Soc Psychiatry Psychiatr Epidemiol.* 2014;49(9):1389–1399. doi: [10.1007/s00127-014-0890-4](https://doi.org/10.1007/s00127-014-0890-4)
- [22] Lindholm J, Pleisner JJ. Psykologisk autopsistudie af de 7 selvmord i Tasiilaq i 2011. [Psychological autopsy study of the 7 suicides in Tasiilaq in 2011. In Danish]. *Nakorsanut.* 2013;38(1):22–23.
- [23] Bethell C, Gombojav N, Solloway M, et al. Adverse childhood experiences, resilience and mindfulness-based approaches: common denominator issues for children with emotional, mental, or behavioral problems. *Child Adolesc Psychiatr Clin N Am.* 2016;25(2):139–156. doi: [10.1016/j.chc.2015.12.001](https://doi.org/10.1016/j.chc.2015.12.001)
- [24] Crouch E, Radcliff E, Stropolis M, et al. Safe, stable, and nurtured: protective factors against poor physical and mental health outcomes following exposure to adverse childhood experiences (ACEs). *J Child Adolesc Trauma.* 2019;12(2):165–173. doi: [10.1007/s40653-018-0217-9](https://doi.org/10.1007/s40653-018-0217-9)
- [25] Moore KA, Ramirez AN. Adverse childhood experience and adolescent well-being: do protective factors matter? *Child Indic Res.* 2016;9(2):299–316. doi: [10.1007/s12187-015-9324-4](https://doi.org/10.1007/s12187-015-9324-4)
- [26] Rutter M. Resilience in the face of adversity: protective factors and resistance to psychiatric disorder. *The Br J Psychiatry.* 1985;147(6):598–611. doi: [10.1192/bjp.147.6.598](https://doi.org/10.1192/bjp.147.6.598)
- [27] Bjerregaard P, Larsen CVL, Olesen I, et al. The Greenland population health survey 2018 - methods of a prospective study of risk factors for lifestyle related diseases and social determinants of health amongst Inuit. *Int J Circumpolar Health.* 2022;81(1):2090067. doi: [10.1080/22423982.2022.2090067](https://doi.org/10.1080/22423982.2022.2090067)
- [28] Naalakkersuisut. *INUUNERITTA III - Naalakkersuisuts strategi for samarbejdet om det gode børneliv 2020-2030 [The government of Greenland strategy for the collaboration for creating good lives for all children, in Danish]* Retrieved from Nuuk 2020. Available from: https://naalakkersuisut.gl/~/_media/Nanoq/Files/Publications/Familie/DK/Inuuneritta%20III%20SEP20%20naal%20DA%20web.pdf
- [29] Finkelhor D, Shattuck A, Turner H, et al. A revised inventory of adverse childhood experiences. *Child Abuse Negl.* 2015;48:13–21. doi: [10.1016/j.chiabu.2015.07.011](https://doi.org/10.1016/j.chiabu.2015.07.011)
- [30] Bjerregaard P. Childhood conditions and education as determinants of adult height and obesity among Greenland Inuit. *Am J Hum Biol.* 2010;22(3):360–366. doi: [10.1002/ajhb.20999](https://doi.org/10.1002/ajhb.20999)
- [31] Bjerregaard P, Svartá DL, Ottendahl CB, et al. Increasing health inequality among Inuit in Greenland from 1993 to 2018: different patterns for household assets, urbanization and a sociocultural index as indicators of social position. *SSM Popul Health.* 2024;25:101635. doi: [10.1016/j.ssmph.2024.101635](https://doi.org/10.1016/j.ssmph.2024.101635)
- [32] Pedersen CB. The Danish civil registration system. *Scand J Public Health.* 2011;39(7 Suppl):22–25. doi: [10.1177/1403494810387965](https://doi.org/10.1177/1403494810387965)
- [33] Bjerregaard P, Dahl-Petersen IK, Larsen CVL. Measuring social inequality in health amongst indigenous peoples in the Arctic. A comparison of different indicators of social disparity among the Inuit in Greenland. *SSM Popul Health.* 2018;6:149–157. doi: [10.1016/j.ssmph.2018.08.010](https://doi.org/10.1016/j.ssmph.2018.08.010)
- [34] Cantril H. *The pattern of human concerns*. New Brunswick: Rutgers University Press; 1965.
- [35] Currie C, Nic Gabhainn S, Godeau E, et al. The health behaviour in school-aged children: WHO collaborative cross-national (HBSC) study: origins, concept, history and development 1982–2008. *Int J Public Health.* 2009;54(Suppl 2):131–139. doi: [10.1007/s00038-009-5404-x](https://doi.org/10.1007/s00038-009-5404-x)
- [36] Levin KA, Currie C. Reliability and validity of an adapted version of the Cantril ladder for use with adolescent samples. *Soc Indic Res.* 2014;119(2):1047–1063. doi: [10.1007/s11205-013-0507-4](https://doi.org/10.1007/s11205-013-0507-4)
- [37] Kernis MH. Measuring self-esteem in context: the importance of stability of self-esteem in psychological functioning. *J Pers.* 2005;73(6):1569–1605. doi: [10.1111/j.1467-6494.2005.00359.x](https://doi.org/10.1111/j.1467-6494.2005.00359.x)
- [38] Bandura A, Freeman WH, Lightsey R. Self-efficacy: the exercise of control. *J Cogn Psychother.* 1999;13(2):158–166. doi: [10.1891/0889-8391.13.2.158](https://doi.org/10.1891/0889-8391.13.2.158)
- [39] Richardson T, Elliott P, Roberts R. Relationship between loneliness and mental health in students. *J Public Ment Health.* 2017;16(2):48–54. doi: [10.1108/JPMH-03-2016-0013](https://doi.org/10.1108/JPMH-03-2016-0013)
- [40] Lyngø I. Psykiske lidelser i det grønlandske samfund [Psychological disorders in the Greenlandic society, in Danish]. 2000;8790017633. Available from: https://www.gmsnet.dk/Dokumenter/IngeLyngøDisp_Full.pdf
- [41] Goldberg P, Gater R, Sartorius N, et al. The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med.* 1997;27(1):191–197. doi: [10.1017/S0033291796004242](https://doi.org/10.1017/S0033291796004242)
- [42] Hansen C, Larsen C, Bjerregaard P, et al. The effect of household crowding and composition on health in an Inuit cohort in Greenland. *Scand J Public Health.*

- 2020;1403494820929496(8):921–930. doi: [10.1177/1403494820929496](https://doi.org/10.1177/1403494820929496)
- [43] Kessler RC, Green JG, Gruber MJ, et al. Screening for serious mental illness in the general population with the K6 screening scale: results from the WHO world mental health (WMH) survey initiative. *Int J Methods Psychiatr Res.* 2010;19 (Suppl 1), S1):4–22. doi: [10.1002/mpr.310](https://doi.org/10.1002/mpr.310)
- [44] Nylund-Gibson K, Choi A. Ten Frequently asked questions about latent class analysis. *Transl Issues In Psychological Sci.* 2018;4(4):440–461. doi: [10.1037/tps0000176](https://doi.org/10.1037/tps0000176)
- [45] Sinha P, Calfee CS, Delucchi KL. Practitioner’s Guide to latent class analysis: methodological considerations and common pitfalls. *Crit Care Med.* 2021;49(1):e63–e79. doi: [10.1097/ccm.00000000000004710](https://doi.org/10.1097/ccm.00000000000004710)
- [46] StataCorp. Stata statistical software: release 18. *College station, TX: StataCorp LLC.* Retrieved from 2023. Available from: <https://www.stata.com/company/>
- [47] Bjerregaard P, Larsen CVL, Sørensen IK, et al. Alcohol in Greenland 1950–2018: consumption, drinking patterns, and consequences. *Int J Circumpolar Health.* 2020;79 (1):1814550. doi: [10.1080/22423982.2020.1814550](https://doi.org/10.1080/22423982.2020.1814550)
- [48] Ingemann C, Larsen CVL. Well-being among indigenous children and youth in the Arctic—with a focus on Sami and Greenland Inuit: a scoping review. 2018;9289353856. Available from: <https://www.diva-portal.org/smash/get/diva2:1184520/FULLTEXT01.pdf>
- [49] Centers for Disease Control and Prevention. About behavioral risk factor surveillance system ACE data. Retrieved from 2016. Available from: <https://www.cdc.gov/violenceprevention/childabuseandneglect/acestudy/ace-brfss.html>
- [50] Høilo Granheim IP, Kvernmo S, Silviken A, et al. The association between suicidal behaviour and violence, sexual abuse, and parental substance abuse among Sami and Greenlandic adolescents: the WBYG study and the NAAHS. *Scand J Child Adolesc Psychiatr Psychol.* 2023;11(1):10–26. doi: [10.2478/sjcapp-2023-0002](https://doi.org/10.2478/sjcapp-2023-0002)
- [51] Healey GK. Tradition and culture: an important determinant of Inuit women’s health. *Int J Indigenous Health.* 2008;4(1):25–33. doi: [10.18357/ijih41200812312](https://doi.org/10.18357/ijih41200812312)
- [52] Steenholdt NC. Subjective well-being and the importance of nature in Greenland. *Arct Anthropol.* 2021;58 (1):66–79. Available from: <https://aa.uwpress.org/content/58/1/66>
- [53] Steenholdt NC. Subjective well-being in East Greenland. *Polar Geogr.* 2021;44(1):20–36. doi: [10.1080/1088937X.2021.1881646](https://doi.org/10.1080/1088937X.2021.1881646)
- [54] Keyes CLM. Mental illness and/or mental health? Investigating axioms of the complete state model of health. *J Consult Clin Psychol.* 2005;73(3):539–548. doi: [10.1037/0022-006X.73.3.539](https://doi.org/10.1037/0022-006X.73.3.539)
- [55] Bjerregaard P, Larsen CVL. Time trend by region of suicides and suicidal thoughts among Greenland Inuit. *Int J Circumpolar Health.* 2015;74(1):26053. doi: [10.3402/ijch.v74.26053](https://doi.org/10.3402/ijch.v74.26053)