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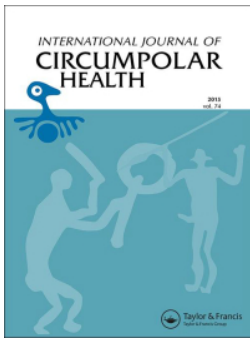
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## Patterns in contacts with primary health care centres in Greenland

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### ABSTRACT

The aim of this study was to evaluate the activity within the primary health care (PHC) in Greenland by identifying the patterns of all registered contacts made by patients in 2021, and to compare the most frequently used types of contacts and diagnostic codes in Nuuk to the rest of Greenland. The study was designed as a cross-sectional register study using data from the national electronic medical records (EMR) and diagnostic codes from the ICPC-2-system. In 2021, 83.7% (46,522) of the Greenlandic population were in contact with the PHC, resulting in 335,494 registered contacts. The majority of the contacts with PHC was made by females (61.3%). On average, females were in contact with PHC 8.4 times per patient per year, while males were in contact with PHC 5.9 times per patient per year. The most frequently used diagnostic group was "General and unspecified", followed by "Musculoskeletal" and "Skin". The results are in line with studies from other northern countries and indicate an easily accessible PHC system, with a predominance of female contacts.

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Greenland; primary health care; ICPC-2; medical records; contacts

## 1. Introduction



According to the World Health Organization (WHO), primary health care (PHC) consists of complex interactions between three components: engagement and empowerment of people and communities, multi-sectoral policies and actions to address the upstream and wider determinants of health, and essential public health functions as the core of integrated health care services [1]. It is of great importance to monitor and evaluate the efficacy and functionality of the primary healthcare system to improve health strategies and prevent disease.

In Greenland, the ambition is to deliver PHC of high quality to the entire population, regardless of age, socio-economic status, and place of residence [2]. However, this is a major challenge in Greenland due to the enormously large land area, dispersed population, and lack of educated health care personnel. A previous study found that approximately 80% of the Greenlandic population was in annual contact with the national PHC, which is similar to other Nordic countries [3]. Previously, registration of health care related contacts to PHC in Greenland has been

unsystematic and scattered, detailed information regarding contact patterns among the Greenlandic population remain scars.

However, by January 2021, it became mandatory for all medical doctors in Nuuk to attach a diagnostic code from the International Classification of Primary Care version 2 (ICPC-2) coding-system [4], to all health care related contacts in PHC. Since then, mandatory usage of ICPC-2 coding-system has slowly spread across the country. Consequently, it is now possible to elucidate the extent of various health problems within the PHC in Greenland based on high quality data generated by diagnostic codes. However, it is still only mandatory for health care professionals in Nuuk to systematically use the ICPC-2 coding system.

The purpose of this study was to evaluate the activity within the PHC in Greenland by identifying the number of contacts, and possible patterns of registered contacts, registered by healthcare professionals in 2021. Furthermore we aim to compare the types of contacts with PHC and associated diagnostic codes in relation to age, gender and place of residence: Nuuk or the rest of Greenland.

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## 2. Materials and methods

### 2.1. Design

The study was designed as a register-based cross-sectional study based on data from the national electronic medical record (EMR).

### 2.2. Settings

Greenland is the largest island in the world with an area of 2.2 million square kilometres, mostly covered by thick ice. The population of approximately 55,500 people is distributed in towns and settlements along the ice-free coastline. The capital city Nuuk is located on the south-west coast, with approximately 19,300 inhabitants [5]. The five largest towns in Greenland are Nuuk, Sisimiut, Ilulissat, Aasiaat and Qaqortoq. Together, they inhabit approximately 60% of the population.

The majority of the population is of Greenlandic origin, while 2.4% are immigrants from the Philippines, Thailand, and Iceland. The gender distribution in Greenland per. 1<sup>st</sup> of January 2023, were 26,738 (47.2%) women and 29,871 (52.8%) men [6]. The estimated life expectancy in Greenland is approximately 68 years for men and 73 years for women [5].

The Government of Greenland is responsible for the national public healthcare system. All health care services in Greenland are free of charge, including prescribed medicine. The Greenlandic healthcare system is obliged to offer equal free care to all inhabitants of Greenland, regardless of their place of residence. All registered citizens in Greenland are automatically affiliated with a regional healthcare centre [7,8].

In the period of 2015–2017, a new national electronically medical record system (EMR) was introduced to all PHC in Greenland. Nevertheless, Tasiilaq and its surrounding settlements in Eastern Greenland, have not yet implemented the ICPC-2 coding system due to insufficient internet supply and political decisions. Since 2017, it has been possible to for all PHC providers in Greenland to register health care related contacts with an ICPC-2 diagnostic code in the EMR-system. However, it did not become mandatory for all doctors to consequently use the ICPC-2 coding system until 2021, and only in Nuuk. Hence, it is still not mandatory for doctors working in PHC's in the other Greenlandic regions to use the coding system. In this study, EMR-data from PHC in the five largest cities: Nuuk, Sisimiut, Ilulissat, Aasiaat and Qaqortoq have been extracted and analysed. There are no data from health care contacts

outside of the PHC, e.g. home visits, retirement/nursing homes, social institutions, schools, orphanages, prisons, or accidental scenes.

### 2.3. Study population

All citizens from the five largest cities who have been in contact with PHC within the study period from January 1st, 2021, to December 31st, 2021, were identified in the EMR-system. The EMR-system is controlled by The Agency of Health and Prevention in Greenland and contains data of all citizens who have been in contact with the PHC in Greenland. Contacts are registered in the EMR-system with a date and classification of diagnostic code from the 17 chapters (A-Z) of the ICPC-2, and furthermore contained information on the patients' age, gender, place of residence and type of contact with the health care centre (including administrative, mail, personal, telephone, video, or unspecified consultation). The diagnostic codes for each chapter are divided in two groups: symptom (number 1 to 29) or diagnose (number 70–99). All data used in this study was extracted with approval by The Agency of Health and Prevention in Greenland.

The background population was extracted from Statistics Greenland [4] and included all people living in Greenland (except the village Tasiilaq) by January 1st, 2022 ( $N = 53,732$ ).

### 2.4. Statistics

Proportions were calculated using the background population as denominator. All estimates were calculated with 95% confidence intervals (CI) and p-values below 0.05 were considered significant. Chi-square tests were used to compare frequencies. All statistical analyses were performed in IBM SPSS Statistics 27.

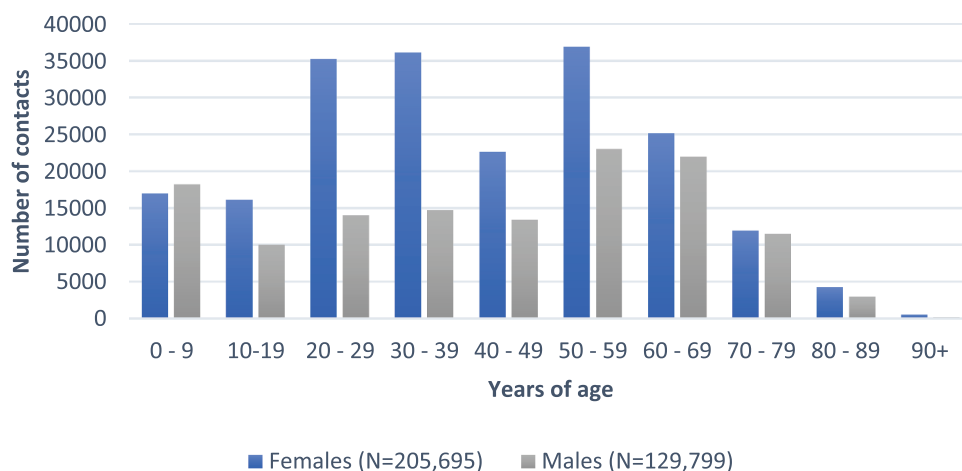
### 2.5. Ethics

The study was approved by the Ethics Committee for Scientific Research in Greenland (application number: KVUG 2020–24) and The Agency of Health and Prevention in Greenland.

## 3. Results

### 3.1. Activity in 2021

Figure 1 shows the frequency and distribution of contacts, stratified by age and gender. A total of 335,494 contacts were registered in 2021, of which 61.3% (205,695) of were made by females and 38.6%



**Figure 1.** All contacts made with primary health care (PHC) in Greenland in 2021 stratified by age- and gender.

(129,799) by males. For both genders, the age group most frequently in contact with PHC were the 50–59-year-olds. The age groups second and third most frequently in contact with the PHC were the 30–39- and 20–29-year-olds for females, and the 60–69- and 0–9-year-olds for males.

### 3.2. Types of contacts with PHC in Greenland

Figure 2 illustrates the distribution and frequency of the different types of contacts with PHC in Greenland. Overall, six types of registered contacts: “administrative”, “mail correspondence”, “personal consultation”, “telephone consultation”, “video consultation” or “unspecified” were registered. For all patients in Nuuk, the most frequently used type of contact with PHC was ‘telephone contact’, followed by ‘personal consultation’, and ‘mail correspondence’. In the rest of Greenland, the most frequently used type of contact with PHC was ‘personal consultation’, followed by “telephone contact” and ‘unspecified’.

### 3.3. Average number of contacts with PHC in Greenland

Table 1 shows the average number of contacts with PHC per patient per year, stratified by age, gender, and place of residence in Greenland. In 2021, 46522 (83.7%) of the Greenlandic inhabitants were in contact with the PHC of which 52.6% (24,450) were made by females and 47.4% (22,072) made by men. This corresponds to 91.4% of all females and 73.7% of all males currently living in Greenland.

For females and females in Nuuk and the rest of Greenland, the average number of contacts with PHC was highest among people aged 70 years or older. In

total, females were in contact with PHC 8.4 times on average, while males were in contact with PHC 5.9 times on average.

In total, patients in Nuuk were in contact with the PHC 8.3 times per patient per year, while patients in the rest of Greenland were in contact with the PHC 6.4 times, on average. Across age groups, patients in Nuuk had a significantly higher number of contacts with the PHC compared to patients in the rest of Greenland ( $p < 0.001$ ).

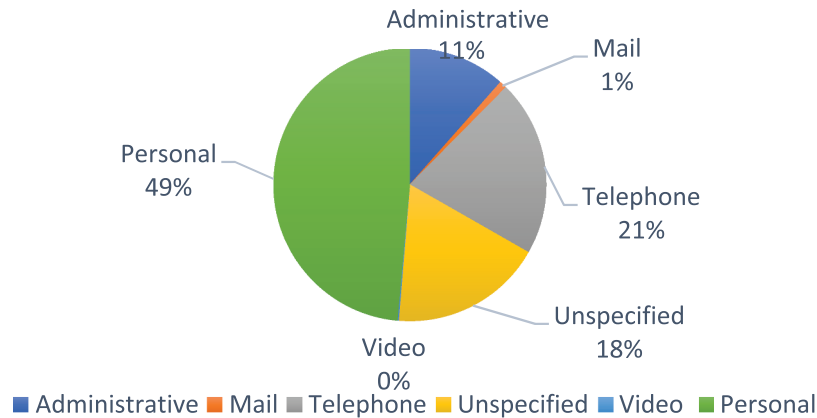
### 3.4. Diagnostic groups in PHC in Greenland

Of the 335,494 contacts, 33% of them (110,724 contacts) were registered with a diagnostic code. Table 2 shows the frequency and distribution of diagnostic groups, stratified by gender and place of residence.

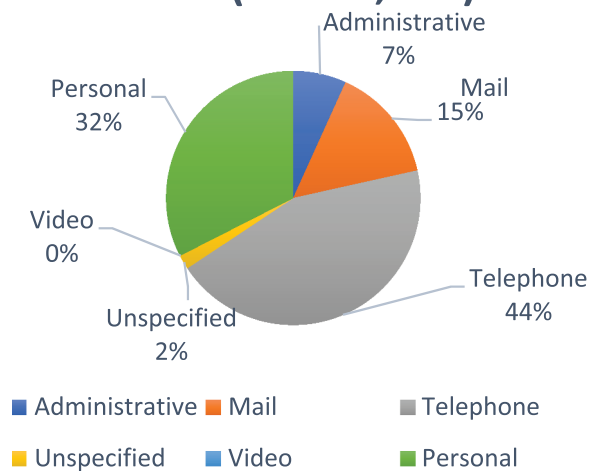
In the total Greenlandic population, the most frequently used diagnostic group was “General and unspecified” (19.1%), followed by “Musculoskeletal” (14.0%), and “Skin” (11.8%). This pattern was observed regardless of gender, or place of residence.

A gender-specific difference was observed in some of the less frequently used diagnostic groups used. In accordance, a significant higher proportion of females were found within the diagnostic groups: “Blood, blood-forming organs, lymphatics, spleen”, “Digestive”, “Neurological”, “Psychological”, “Urology”, “Pregnancy, childbirth, family planning”, and “Female genital system and breast” ( $p < 0.01$ ). Similarly, a significant higher proportion of males were diagnosed with the less commonly used diagnostic groups: “General and unspecified”, “Eye”, “Ear”, “Circulatory”, “Musculoskeletal”, “Skin”, “Endocrine, metabolic and nutritional”, and “Male genital system” ( $p < 0.001$ ). Nevertheless, there was no gender difference

## The rest of Greenland (N=177,317)



## Nuuk (N=158,177)



**Figure 2.** Types of contacts with PHC in Greenland in 2021.

regarding the diagnostic groups “Respiratory” or “Social problems”.

A geographical difference in diagnostic groups was found when comparing Nuuk to the rest of Greenland. The frequency of the diagnostic groups “General and unspecified”, “Psychological”, “Respiratory”, “Skin” and “Female genital system and breast” used were significantly higher in Nuuk ( $p < 0.001$ ) compared to the rest of Greenland. A significantly higher frequency of the diagnostic groups: “Blood, blood-forming organs, lymphatics, spleen”, “Digestive”, “Eye”, “Circulatory”, “Musculoskeletal”, “Endocrine, metabolic and nutritional”, “Pregnancy, childbirth, family planning” and “Social problems” ( $p < 0.001$ ) was found in the rest of Greenland compared to Nuuk. There was no significant difference between Nuuk and the rest of Greenland regarding the diagnostic groups “Neurological”, “Urology” nor “Male genital system”.

## 4. Discussion

In 2021, 46522 inhabitants were in contact with the PHC corresponding to 83.7% of the total Greenlandic population. A diagnostic code had been assigned to 33.8% (123,529) of the contacts, and of these, 74.0% (91,686) were made by patients in Nuuk and 26.0% (31,843) from the rest of Greenland. During 2021, the average number of contacts with the PHC was significantly higher for patients from Nuuk compared to patients from the rest of Greenland. Hence, patients in Nuuk were more frequently in contact with PHC compared to the rest of Greenland. This pattern is in accordance with previous studies comparing health-seeking behaviour in PHC in urban vs. rural areas [9,10].

However, in the capital Nuuk, most patients used the telephone or email to contact the PHC, while personal consultation was the most frequent approach

**Table 1.** Average number of contacts with the primary health care (PHC) per patient per year in Greenland stratified by age, gender, and place of residence.

Age group	Females (n/N)	Males (n/N)	p-value	Nuuk (n/N)	Rest of Greenland (n/N)	p-value	Total (n/N)
0–9 years	5.6 (16,952/3,045)	5.6 (18,188/3,236)	p = 0.372	6.9 (17,173/2,477)	4.7 (17,967/3,804)	<b>p &lt; 0.001</b>	5.6 (35,140/6,281)
10–19 years	5.6 (16,123/2,862)	3.9 (9,998/2,543)	<b>p &lt; 0.001</b>	5.6 (11,929/2,122)	4.3 (14,192/3,283)	<b>p &lt; 0.001</b>	4.8 (26,121/5,405)
20–29 years	8.4 (35,208/4,175)	4.5 (14,001/3,081)	<b>p &lt; 0.001</b>	7.4 (24,622/3,312)	6.2 (24,587/3,944)	<b>p &lt; 0.001</b>	6.8 (49,209/7,256)
30–39 years	9.0 (36,128/4,023)	4.8 (14,662/3,066)	<b>p &lt; 0.001</b>	8.0 (26,732/3,323)	6.4 (24,058/3,766)	<b>p &lt; 0.001</b>	7.2 (50,790/7,089)
40–49 years	8.7 (22,602/2,595)	5.6 (13,352/2,397)	<b>p &lt; 0.001</b>	8.1 (18,017/2,231)	6.5 (17,937/2,761)	<b>p &lt; 0.001</b>	7.2 (35,954/4,992)
50–59 years	9.7 (36,902/3,791)	6.5 (22,990/3,525)	<b>p &lt; 0.001</b>	10.0 (28,356/2,823)	7.0 (31,536/4,493)	<b>p &lt; 0.001</b>	8.2 (59,892/7,316)
60–69 years	9.9 (25,131/2,533)	7.9 (21,961/2,781)	<b>p &lt; 0.001</b>	10.6 (21,166/1,988)	7.8 (25,926/3,326)	<b>p &lt; 0.001</b>	8.9 (47,082/5,314)
70–79 years	11.4 (11,924/1,043)	10.0 (11,494/1,153)	<b>p &lt; 0.001</b>	13.5 (8,048/595)	9.6 (15,370/1,601)	<b>p &lt; 0.001</b>	10.7 (23,418/2,196)
80–89 years	12.3 (4,215/342)	11.1 (2,974/269)	<b>p &lt; 0.001</b>	15.4 (1,846/120)	10.9 (5,343/491)	<b>p &lt; 0.001</b>	11.8 (7,189/611)
90+ years	12.4 (510/41)	8.5 (179/21)	<b>p &lt; 0.001</b>	13.7 (288/21)	9.8 (401/41)	<b>p &lt; 0.001</b>	11.1 (689/62)
Total	8.4 (205,695/ 24,450)	5.9 (129,799/ 22,072)	<b>p &lt; 0.001</b>	8.3 (158,177/ 19,012)	6.4 (177,317/ 27,510)	<b>p &lt; 0.001</b>	7.2 (335,494/ 46,522)

**Table 2.** Diagnostic groups of the diagnosed contacts, stratified by gender and place of residence.

Contacts within each diagnostic group, % (n)	Females N = 68,393	Males N = 42,331	p-value	Nuuk N = 78,814	Rest of Greenland N = 31,910	p-value	Total N = 110,724
A – General and unspecified	18.7 (12,775)	19.7 (8,351)	<b>p &lt; 0.001</b>	20.1 (15,803)	16.7 (5,323)	<b>p &lt; 0.001</b>	19.1 (21,126)
B – Blood, blood-forming organs, lymphatics, spleen	0.7 (462)	0.5 (219)	<b>p &lt; 0.001</b>	0.5 (373)	1.0 (308)	<b>p &lt; 0.001</b>	0.6 (681)
D – Digestive	7.1 (4,856)	6.7 (2,816)	<b>p &lt; 0.01</b>	6.6 (5,231)	7.6 (2,441)	<b>p &lt; 0.001</b>	7.0 (7,672)
F – Eye	2.6 (1,776)	3.0 (1,283)	<b>p &lt; 0.001</b>	2.6 (2,021)	3.3 (1,038)	<b>p &lt; 0.001</b>	2.8 (3,059)
H – Ear	2.4 (1,637)	2.9 (1,248)	<b>p &lt; 0.001</b>	2.6 (2,025)	2.7 (860)	p = 0.234	2.6 (2,885)
K – Circulatory	5.0 (3,446)	7.4 (3,136)	<b>p &lt; 0.001</b>	5.6 (4,414)	6.8 (2,168)	<b>p &lt; 0.001</b>	5.9 (6,582)
L – Musculoskeletal	13.0 (8,917)	15.5 (6,567)	<b>p &lt; 0.001</b>	13.4 (10,526)	15.5 (4,958)	<b>p &lt; 0.001</b>	14.0 (15,484)
N – Neurological	3.4 (2,306)	3.0 (1,251)	<b>p &lt; 0.001</b>	3.2 (2,526)	3.2 (1,031)	p = 0.824	3.2 (3,557)
P – Psychological	6.2 (4,232)	4.7 (1,972)	<b>p &lt; 0.001</b>	6.0 (4,724)	4.6 (1,480)	<b>p &lt; 0.001</b>	5.6 (6,204)
R – Respiratory	9.7 (6,657)	9.9 (4,170)	p = 0.522	10.3 (8,100)	8.5 (2,727)	<b>p &lt; 0.001</b>	9.8 (10,827)
S – Skin	10.8 (7,389)	13.3 (5,635)	<b>p &lt; 0.001</b>	12.2 (9,580)	10.8 (3,444)	<b>p &lt; 0.001</b>	11.8 (13,024)
T – Endocrine, metabolic and nutritional	4.7 (3,201)	7.6 (3,217)	<b>p &lt; 0.001</b>	5.5 (4,301)	6.6 (2,117)	<b>p &lt; 0.001</b>	5.8 (6,418)
U – Urology	2.9 (1,955)	2.4 (1,012)	<b>p &lt; 0.001</b>	2.6 (2,073)	2.8 (894)	p = 0.110	2.7 (2,967)
W – Pregnancy, childbirth, family planning	4.6 (3,173)	0.0 (15)	<b>p &lt; 0.001</b>	2.5 (1,931)	3.9 (1,257)	<b>p &lt; 0.001</b>	2.9 (3,188)
X – Female genital system and breast	7.7 (5,249)	0.0 (3)	<b>p &lt; 0.001</b>	5.0 (3,961)	4.0 (1,291)	<b>p &lt; 0.001</b>	4.7 (5,252)
Y – Male genital system	0.0 (9)	2.9 (1,245)	<b>p &lt; 0.001</b>	1.1 (891)	1.1 (363)	p = 0.920	1.1 (1,254)
Z – Social problems	0.5 (353)	0.5 (191)	p = 0.133	0.4 (334)	0.7 (210)	<b>p &lt; 0.001</b>	0.5 (544)

in rural areas in the rest of Greenland. This pattern is contrary to patterns seen in other countries [9,10], where personal consultations (physical attendances) are more frequently used in urban areas and vice versa. This might be explained by the current organisation in Nuuk, where the primary health seeking approach to the PHC is via telephone consultation. All medical inquiries and requests from patients are answered by health care professionals who may provide the patients with a medical advice and/or a prescription, and/or personal consultation with

a doctor at the PHC. In accordance, almost all patients in Nuuk will get two diagnostic codes for the same medical problem; one diagnostic code during telephone consultation, followed by one diagnostic code during personal consultation.

Furthermore, a noticeable number of the contacts coded in the rest of Greenland were lacking. This might be a result of insufficient ICPC-2 coding-education of health care professionals, or the remarkably low density of physicians and nurses in Greenland [11].

An almost equal number of females and males were in contact with the PHC during 2021 (52.6% vs. 47.4%, respectively). However, as females contacted the PHC a significantly higher number of times during 2021 compared to males, the majority of the 335,494 contacts with PHC were made by females. Our study is thus in line with reports from other western countries showing that females are more frequent users of PHC [9]. This gender-based difference is believed to be related to a greater number of chronic health problems and lower self-reported health status among females compared to males [9]. Furthermore, females may have more frequent contact with PHC than men due to several female-related health issues, such as sexual prevention, abortion, and pregnancy, but also domestic violence [12].

In Nuuk, most of the contacts with PHC in 2021 was by telephone consultation and the most frequently used diagnostic group was “General or Unspecified”. The same diagnostic group was most frequently used in the rest of Greenland, where the most common type of contact with PHC was personal consultation. Hence, this diagnostic group was the far most used, regardless of actual physical attendance or consultation at a distance. This might be due to the vast diversity of patients, with unspecified or general symptoms. Furthermore, PHC in Greenland is responsible for the management of a considerable variety of preventive inquiries such as child development appointments, vaccinations, advice regarding physical and mental health, blood pressure and diabetes monitoring [2]. It may be speculated that the diagnostic group “General or Unspecified” was used for any kind of preventive measure. It is also possible that this diagnostic group was overrepresentation due to inadequacy of the ICPC-2 system or time constraints.

The second most frequent used diagnostic group was “Musculoskeletal”, counting for 14% of all contacts. This is in line with a previous register-based study in Greenland, where the most frequent diagnostic group was musculoskeletal with 15% of all contacts [3]. Furthermore, international studies of consultations and patterns in a PHC settings have reported similar results [13,14].

The third most frequently used diagnostic group was “Skin”. Although Botvid et al. recently found a low prevalence of the chronic skin disease psoriasis in Greenland [15], we believe psoriasis in Greenland is both underdiagnosed and undertreated. A previous study found that 13% of all consultations in PHC in Greenland was related to problems with the skin [2]. Furthermore, a meta-analysis of atopic dermatitis (AD)

among children and adolescents in the Arctic region, found AD to be highly prevalent [16].

The fourth most frequently used diagnostic group was “Respiratory”. This is in line with previous results from Greenland, where 13% of all consultations were related to the respiratory system [13]. Moreover, a recent international questionnaire study states respiratory diseases as a significant source of morbidity and mortality in PHC [17]. Further contributing to the high frequency of respiratory health problems among the Greenlandic population is smoking. Approximately 50% of the general adult population in Greenland are daily smokers, and the use of medication targeting obstructive lung disease is high [18]. Finally, the COVID-19 pandemic affecting Greenland during the past half of 2021 have also influenced the number of registered codes associated with symptoms from the respiratory system [19].

Another frequently registered diagnostic group was “Psychological”. According to a systematic review and meta-analysis, Greenland had the world’s third highest age-standardised incidence rate of major depression in 2017 [20]. Furthermore, the rate of suicide attempts in Greenland is high among both young females and males [21,22].

The diagnostic groups “Female genital system and breast” and “Male genital system” were also frequently registered in our study. The incidence of sexually transmitted infections (STI’s), such as syphilis, gonorrhoea and chlamydia is high, and further increasing, in Greenland [23,24]. According to data from the Government of Greenland, the abortion rate per 1,000 women aged 15–49 years in Greenland was 71.8 in 2017. Thus, in 2017, approximately every 14th woman aged 15–49 had a provoked abortion, medical or surgical [25]. The high incidence of STI’s in combination with a high provoked abortion rate might affect the many registered contacts associated with the female and male genital system.

#### **4.1. Strengths and limitations**

A major strength of this study was the use of electronically extracted data from the national EMR-system used in around 95% of all PHC settings in Greenland. However, it has only become mandatory for medical doctors in primary care in Nuuk to register contacts in PHC with an ICPC-2 code, explaining why most of the registered diagnostic codes originate from Nuuk. Registration of diagnostic codes in rural areas of Greenland were deficient. This might have a considerable impact on the results of this study:



notably when comparing results from urban Nuuk with results from the rural areas of Greenland.

The study period was twelve months. Patients with well-treated chronic diseases might not have been in contact with PHC during the relatively short study period. An important and highly relevant future perspective could be to investigate the patient satisfaction and safety regards of the different types of contacts with PHC, both in Nuuk and in the rest of Greenland.

## 5. Conclusions

A substantial proportion of the Greenlandic population were in contact with the PHC in 2021. Hence, PHC in Greenland is accessible despite major challenges with a geographically dispersed population. The patterns in use of PHC in Greenland is in line with results from other Nordic countries, with a majority of contacts from the capital region by female patients. Furthermore, the most common health issues are unspecified yet related to the musculoskeletal- and respiratory system and the skin. Future studies should investigate the and safety and effectiveness of the Greenlandic PHC system and the patient contentment.

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## Author contributions

All authors have made substantial contributions to the conception of the work; including design, analysis, or interpretation of data, and have drafted the work and substantively revised it. All authors have approved the submitted version.

## Data availability statement

The data that support the findings of this study are available on request from the corresponding author SHCB.

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