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The self-reported health of the Sámi in Sweden: the SámiHET study

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Background: The Sámi are an ethnic minority and the only Indigenous people in the European Union. Population-based health studies among Sámi in Sweden are scarce and outdated. The aim of this study was to analyse the ethnic, Sámi vs. non-Sámi, health differences among men and women living in Sweden. **Methods:** This study combined two data sources: the national Health on Equal Terms (HET) survey and a similar study conducted among the Sámi population, the SámiHET study, both carried out during spring 2021. Twelve outcomes were used to capture different aspects of the population's health organized along four dimensions: general health, physical health, mental health and lifestyle behaviours. Prevalence ratios, *adjusted for age, civil status, education and income,* were used as the measure of effect with 95% confidence intervals to provide inference. Analyses were disaggregated by sex. **Results:** The prevalence of poor self-rated dental health (and chronically ill health among men), asthma and overweight were higher among the Sámi; however, the mental health outcomes were similar or lower among the Sámi participants. The Sámi ate less vegetables and fruits, but they were smoking and drinking alcohol less than the national Swedish population. These patterns were similar among both men and women. **Conclusion:** Poor self-rated dental health, asthma, overweight and a low consumption of vegetables and fruits were a concern among the Sámi population in both men and women. These areas therefore require specific targeted interventions to decrease the observed ethnic health inequalities in Sweden. The design of this study opens the possibility for continuous monitoring of the health of the Sámi but also offers the best possible comparison with Swedish population health data.

Introduction

The Sámi are an ethnic minority and the only Indigenous people in the European Union. Sápmi, the traditional Sámi homeland, stretches from mid-Sweden and Norway through northern Finland and into north-western Russia.[1] The Sámi demography is largely unknown as Nordic countries do not register ethnicity, but estimates vary between 50 000 and 100 000 individuals in total, and 20 000–40 000 in Sweden.[2]

Knowledge about the health status of the Sámi is limited, mostly coming from Norway where different research infrastructures for data collection have been created in the last two decades.[3–5] In these studies, Sámi are encouraged to self-identify and report the ethnicity and language competence of previous generations.

Population-based health studies among Sámi in Sweden are scarce and outdated. The last epidemiological studies on Sámi health utilized data collected in 2007 and 2008[6–9] and register-based health information is only available until the year 2000.[10] One of the greatest challenges has been the difficulty of identifying the Sámi population due to the absence of an ethnicity variable in national population registers.

Researchers have tried to overcome this problem, mainly through the utilization of the electoral roll of the Sámi Parliament. For example, several mortality and patient-based studies were conducted in the beginning of 2000s using this approach.[10,11] Similarly, cross-sectional studies conducted in the first decade of 2000 used this method to explore the health of young people (18–28 years)[6] or adults (18–84 years).[7] Other strategies have been to cooperate with Sámi civil society organizations such as *Sámiid Riikkasearvi* (which organizes Sámi reindeer herding communities and local Sámi associations) to explore specific topics among reindeer herders, including mental and behavioural health,[12–14] quality of life and access to health care.[15,16]

From the published literature, the overall health pattern among the Sámi population in Sweden appears to be rather similar to that of the general Swedish population with a few differences. While mental health and suicidal behaviour do not differ between Sámi and Swedish peers, subgroups of Sámi such as women and reindeer herders have reported a significantly higher odds of suicide plans and attempts.[6,17] Also, life expectancy and mortality patterns of the Sámi are similar to those of the majority of the Swedish population with small differences in the incidences of certain cancers and cardiovascular diseases.[10]

To have access to the updated health information on the Sámi in Sweden that allows a close monitoring of their health and the possibility of implementing targeted interventions it is necessary to create a research infrastructure that is feasible, legitimate and sustainable over time. This study presents the results of a first step in this direction by summarizing the results of the first SámiHET study, a national Sámi population-based health study conducted in 2021.

Thus, the aim of this study was to analyse the ethnic, Sámi vs. non-Sámi, self-reported health differences among men and women living in Sweden using an 'outcome-wide approach'.[18]

Methods

Study design

This study combined two data sources: the National Health on Equal Terms (HET) survey and a similar study conducted among the Sámi population, the SámiHET study, both conducted during spring 2021.

The national HET is a national public health survey conducted by the Public Health Agency of Sweden annually since 2004 and every second year since 2016. In 2021, an extra data collection was carried out due to the coronavirus disease 2019 pandemic. A random sample of 40 000 people, drawn from Statistics Sweden's population register, was selected in 2021. The overall participation rate was 44.1%, resulting in 17 578 individuals who answered the questionnaire.[19] Those who identified themselves as Sámi in this survey ($n = 127$) were excluded from the analysis rendering a final analytical sample of 17 221 participants.

The HET questionnaire mainly covers health behaviours, work, psychosocial and social circumstances and self-reported health conditions. In addition, using the unique personal identification number assigned to all Swedish citizens, the sample data are linked to national registers administered by Statistics Sweden to obtain demographical and socioeconomic information. For instance, data regarding education was collected from the education register, and data on income, economic support, sickness benefits and pensions from the income and taxation register.

The SámiHET survey followed a similar approach to previous studies to select the Sámi population. Since Swedish law does not allow registration of ethnicity, three registers were used to identify Sámi individuals and construct a sample population in Sweden, the Sámi electoral roll, the reindeer mark register and the 'Labour statistics based on administrative sources' register to identify reindeer herding businesses as defined by the Swedish Standard Industrial Classification.

All identified individuals (9249) were sent a postal invitation to participate in the study, being able to answer the questionnaire through a web- or paper-format. From those, 3779 answered the survey, corresponding to a participation rate of 40.9%. However, of these, 121 persons did not unequivocally self-identify as Sámi and were excluded from further analysis. In total, 3658 individuals constituted the analytical sample of the SámiHET study.

The SámiHET questionnaire was based on the same questions as the national HET survey to allow comparability. However, Sámi-specific sections were added including questions on access to health care, exposure to violence, discrimination and racism and Sámi identity and language.

The SámiHET data collection procedures mimicked those of the national HET, and Statistics Sweden oversaw the data collection process and the different register linkages in both surveys. More detailed information of the national HET can be found on the Public Health Agency of Sweden's webpage and elsewhere for the SámiHET.[20]

Measures

Health outcomes

Taking an 'outcome-wide epidemiological approach' where several health outcomes are explored simultaneously,[18] 12 outcomes were used to capture different aspects of the population's health status organized along four dimensions: general health, physical health, mental health and lifestyle behaviours.

Self-rated health, dental health and chronic health problems were included under the dimension of general health. Self-rated health and dental health were assessed with the question 'How would you rate your general health today?' and 'How would you rate your general dental health?'. Responses were coded on a five-point Likert scale from '1 = very good' to '5 = very bad'. The variables were dichotomized as good (very good and good = 0) and bad (moderate, bad and very bad = 1).[19] Chronic illness was captured by the question 'Do you have any long-term illness, discomfort following an accident, any reduced physical function or any other long-term health problem?' and the answer was dichotomized as yes or no.

Physical health included self-reported asthma, diabetes and body mass index (BMI). Asthma and diabetes were assessed with the question 'Have you one of these diseases?' Those who answered yes with mild or severe discomfort were classified as disease present, the rest as absent. BMI was computed as weight (kg) divided by height in metres squared (m^2). Participants were categorized as overweight (1) based on the standard cut-off point of $\geq 25\,kg/m^2$.

Three variables were used to capture different aspects of mental health. Stress was based on the answer to the question 'Do you feel stressed at present? By stress, we mean a condition where you feel tense, restless, nervous, uneasy or unable to concentrate'. The answers 'Not at all' and 'To some extent' were coded as 0 and the answers 'Quite a lot' and 'Very much' as 1. Anxiety was measured by the question 'Do you have this problem or disease: anxiety or worry?', while depression was measured by 'Have you ever been diagnosed with depression by a doctor?'. The last two questions were dichotomized into no (0) or yes (1).

Lifestyle variables included diet, smoking and risky alcohol consumption. Diet variability was coded based on the answer to the question 'How often do you eat vegetables, fruit or berries?'. One or more times per day was considered healthy, and less as an unhealthy behaviour. Smoking was coded based on the answer to the question 'Do you smoke every day?' with the question applying to tobacco products such as cigarettes, cigarillos, cigars and pipe tobacco. 'Yes' was coded as 1 and 'No' as 0. Risky alcohol consumption was based on three questions that originate from the Alcohol Use Disorder Identification Test (AUDIT). Alcohol was defined as light beer, medium/strong beer, alcoholic cider, wine, strong wine and spirits. The three included questions, all referring to the last 12 months, were: (i) 'How often have you been drinking alcohol?' where the answer options were: '4 times/week or more (=4); 2–3 times a week (= 3); 2–4 times/month (=2); once a month or seldom (=1); or never (=0); (ii) 'How many 'glasses' (see example) do you drink on a typical day when you drink alcohol?' and the response options were: 1–2 (=0); 3–4 (=1); 5–6 (=2); 7–9 (=3); 10 or more (=4); or Do not know (missing)'; (iii) 'How often did you drink six glasses or more on the same occasion?' The response options were: Daily or almost every day (=4); every week (=3); every month (=2); more seldom than once a month (=1); and Never (=0). These questions were then summed up to an index ranging from 0 to 12. Scores greater than 6 for men and 5 for women were considered high alcohol consumption (=1).

Covariates

In the analyses, age, civil status, education and economic level were used as covariates since they are well-known social determinants of health: (i) age was coded into four groups (18–29, 30–44, 45–64 and 65–84 years); (ii) marital status into married, unmarried and divorced/widower; (ii) the level of education divided into compulsory (low: codes 100–206), medium (codes 310–527) and postgraduate (high: codes 530–640) as characterized by Statistics Sweden; and (iv) the economic level was assessed by the individual's disposable income expressed in Swedish krona (~0.090 euro).

Statistical analysis

Frequency tables and percentages were used to present the descriptive characteristics of the population stratified by ethnicity. The prevalence of the different outcomes was then calculated and bivariate regression analyses between ethnicity and the 12 different health

outcomes were applied (model 0). Subsequent regression models including age (model 1) and the rest of the covariates (model 2) were then estimated. All regression models followed a log-binomial distribution. Prevalence ratios (PR) were used as the measure of effect with their 95% confidence intervals (95% CI) to provide inference. Given the differences between sex/gender across the health outcomes,[21] all regression analyses were conducted separately for men and women. All analyses were conducted using the R software.

Ethics

Both the use of the national HET survey in the present study and the SámiHET study were approved by the Swedish Ethical Review (Dnr 2021-02398 and Dnr 2020-04803, Ö 70-2020/3.1 and Dnr 2021-06372-02, respectively). The SámiHET study was commissioned by the Sámi Parliament in Sweden, and continuous consultations with mandated members of their board were held throughout the process.

Results

Table 1 shows the population characteristics of the samples stratified by ethnicity. In both groups, there was a quite similar distribution of participants regarding sex, age and education with a higher participation of women, older ages and those who had finished secondary school (middle level of education). Differences, however, were found in the compositions of the marital status and income variables. In the Sámi sample, a lower proportion of participants were married (42.67%) compared to the Swedish population (49.25%) with a similar proportion of divorced or widow(er) (around 16–17%). On average, the Sámi earned less money than the Swedish population.

The highest prevalence in the dimension of general health in both ethnic groups and sexes was found in chronic illness. Overweight and asthma were more common among the Sámi compared to the non-Sámi population while the mental health indicators were more frequent among women (both Sámi and non-Sámi) compared to men. Sámi (both men and women) ate less vegetables and fruit, drank less alcohol and more seldom smoked (men) (table 2).

Table 3 shows the ethnic differences in the health outcomes among men. In the adjusted model, a higher prevalence of poor self-rated dental health and a slight increase in long-term illness were found among the Sámi. Also, a statistically significant higher prevalence in asthma and overweight, but not in diabetes, were observed regarding physical health. While no differences in stress or anxiety were noted between groups, a lower prevalence of depression was found among the Sámi. In terms of lifestyle behaviours, the Sámi population reported consuming less vegetables but smoked less and had a lower risk of alcohol consumption compared to the Swedish population.

A similar pattern was found among women (table 4). Self-reported poor dental health, asthma and overweight were statistically significantly higher among Sámi compared to their Swedish counterparts. In addition, a lower prevalence of stress and anxiety but no difference in depression were found among Sámi compared to the non-Sámi population. Similar to men, less consumption of vegetables and lower risk of alcohol was reported regarding health behaviours, but no difference in smoking behaviour.

Table 1 Population characteristics in total and according to ethnicity, Sweden 2021

	Sámi (*n* = 3658)	Non-Sámi (*n* = 17 221)	Total (*n* = 20 879)
Sex/gender			
Men	1590 (43.47)	7909 (45.93)	9499 (45.50)
Women	2068 (56.53)	9312 (54.07)	11 380 (54.50)
Age			
18–29	364 (9.95)	1956 (11.36)	2320 (11.11)
30–44	768 (21.00)	3130 (18.18)	3898 (18.67)
45–64	1402 (38.33)	5953 (34.57)	7355 (35.23)
65–84	1124 (30.73)	6182 (35.90)	7306 (34.99)
Marital status			
Married	1561 (42.67)	8481 (49.25)	10 042 (48.10)
Unmarried	1507 (41.20)	5785 (33.59)	7292 (34.93)
Divorced/widower	590 (16.13)	2955 (17.16)	3545 (16.98)
Education level			
High	1043 (28.56)	5203 (30.44)	6246 (30.11)
Medium	2176 (59.58)	9529 (55.75)	11 705 (56.43)
Low	433 (11.86)	2360 (13.81)	2793 (13.46)
Income (mean)	270 968.6	306 060.6	299 898.2

Table 2 Prevalence (%) of the health outcomes by ethnicity in men and women, Sweden 2021

	Men		Women	
	Sámi	Non-Sámi	Sámi	Non-Sámi
General health				
Poor self-rated health	26.66	24.97	26.20	27.82
Poor self-rated dental health	35.28	25.96	27.85	21.47
Chronic ill-health	42.46	39.22	40.33	40.65
Physical health				
Asthma	18.81	9.80	22.09	12.81
Diabetes	10.38	9.37	5.11	5.92
Overweight	66.26	60.25	53.09	47.46
Mental health				
Stress	8.54	9.39	13.76	15.11
Anxiety	29.74	30.59	43.71	47.41
Depression	11.57	13.61	25.64	23.74
Lifestyle behaviors				
Lack of vegetables	51.52	40.24	31.93	23.94
Smoking	3.12	5.33	5.00	5.91
Alcohol risk consumption	13.77	18.36	9.91	12.20

Discussion

This study presents a broad perspective on the health of the Sámi population compared to their Swedish counterparts in 2021. While the prevalence of poor self-rated dental health, asthma and overweight were higher among the Sámi, the mental health outcomes were similar or lower (women) among the Sámi participants. The Sámi were eating fewer vegetables and fruits, but they were smoking and drinking alcohol less than the national Swedish population.

A high general good health of the Sámi in Sweden and Norway was previously reported with no ethnic differences in either country.[7,22] However, the poorer self-reported oral health in this study is concerning and could indicate diet-related aspects and/or difficulties accessing dental health care. Globally, Indigenous populations have a higher caries prevalence and severity than the non-Indigenous populations,[23] but no differences in the prevalence of caries and periodontitis between Sámi and non-Sámi were found in Norway.[24,25]

Asthma showed the largest difference in health between the two populations. Swedish studies have observed prevalences of reported asthma and physician-diagnosed asthma of 11% and 10%, respectively,[26] which resemble the data from the Swedish population in this study. Literature on asthma in Indigenous populations is limited but an Australian review found a prevalence ranging between 3.3% and 19%, though no aetiological clues were provided.[27] The reasons for the high asthma prevalence among the Sámi (18.8–22.1%) are unclear, and it would require further investigation to elucidate if mechanisms such as exposure to environmental toxins or dust, cold temperature, antigens during infancy or simply reporting bias could be involved.

While no ethnic differences were found regarding diabetes in this study, a higher prevalence of pre-diabetes (in women) and diabetes (in both sexes) of Sámi vs. non-Sámi participants has been reported

Table 3 Prevalence ratios of ethnicity and health outcomes adjusted for covariates in men, 'Health in equal terms' survey, Sweden 2021

Men	Model 0 PR (95% CI)	Model 1[a] PR (95% CI)	Model 2[b] PR (95% CI)
General health			
Poor self-rated health	1.07 (0.98–1.17)	1.06 (0.97–1.16)	–
Poor self-rated dental health	1.36 (1.26–1.47)	1.36 (1.26–1.47)	1.32 (1.22–1.42)
Chronic ill-health	1.08 (1.02–1.15)	1.07 (1.01–1.14)	1.06 (1.00–1.13)
Physical health			
Asthma	1.92 (1.70–2.17)	1.92 (1.70–2.17)	1.91 (1.68–2.16)
Diabetes	1.11 (0.94–1.30)	1.14 (0.98–1.34)	–
Overweight	1.10 (1.06–1.14)	1.09 (1.05–1.13)	1.08 (1.04–1.12)
Mental health			
Stress	0.91 (0.76–1.08)	0.94 (0.79–1.11)	–
Anxiety	0.97 (0.89–1.06)	0.99 (0.91–1.07)	–
Depression	0.85 (0.73–0.99)	0.85 (0.74–0.99)	0.87 (0.75–1.01)
Lifestyle behaviors			
Lack of vegetables	1.28 (1.21–1.35)	1.28 (1.21–1.35)	1.21 (1.15–1.28)
Smoking	0.58 (0.44–0.78)	0.59 (0.44–0.78)	0.55 (0.41–0.74)
Alcohol risk consumption	0.75 (0.66–0.86)	0.76 (0.66–0.86)	0.73 (0.64–0.83)

a: Model adjusted for age.
b: Model adjusted for age, civil status, education and income.

Table 4 Prevalence ratios of ethnicity and health outcomes adjusted for covariates in women, 'Health in equal terms' survey, Sweden 2021

Women	Model 0 PR (95% CI)	Model 1[a] PR (95% CI)	Model 2[b] PR (95% CI)
General health			
Poor self-rated health	0.94 (0.87–1.02)	0.95 (0.88–1.03)	–
Poor self-rated dental health	1.30 (1.20–1.40)	1.32 (1.21–1.42)	1.33 (1.23–1.44)
Chronic ill-health	0.99 (0.94–1.05)	1.00 (0.95–1.06)	–
Physical health			
Asthma	1.72 (1.56–1.90)	1.72 (1.56–1.90)	1.73 (1.56–1.90)
Diabetes	0.86 (0.70–1.06)	0.97 (0.80–1.19)	–
Overweight	1.12 (1.07–1.17)	1.13 (1.08–1.18)	1.14 (1.09–1.19)
Mental health			
Stress	0.91 (0.81–1.03)	0.89 (0.79–1.00)	0.89 (0.79–0.99)
Anxiety	0.92 (0.87–0.97)	0.94 (0.89–0.99)	0.94 (0.89–0.99)
Depression	1.08 (0.99–1.17)	1.07 (0.99–1.16)	–
Lifestyle behaviors			
Lack of vegetables	1.33 (1.24–1.43)	1.33 (1.24–1.43)	1.35 (1.26–1.45)
Smoking	0.84 (0.69–1.04)	0.87 (0.71–1.07)	–
Alcohol risk consumption	0.81 (0.71–0.94)	0.80 (0.70–0.92)	0.79 (0.69–0.91)

a: Model adjusted for age.
b: Model adjusted for age, civil status, education and income.

in Norway. The authors argued that a disparity in the waist-to-height ratio might be a plausible explanation for the observed difference.[28] Studies from Sweden have reported an increased prevalence of diabetes between 2007 and 2013, from 5.8% to 6.8%, with a projection to rise over the next 35 years as a result of demographic changes and improved survival among people with diabetes.[29] While Indigenous peoples throughout the world are facing an unprecedented epidemic of type 2 diabetes,[30] the situation among Sámi in Sweden seems to be different. Higher levels of health literacy and better socioeconomic status among the Sámi could explain the difference from other Indigenous groups.

Both populations had a high prevalence of overweight (more than 50%), with the differences in both Sámi men and women being statistically significant compared to the Swedish group. A previous population-based study among Sámi in Sweden found a similar self-reported BMI between Sámi and non-Sámi in certain regions, but higher among Sámi living in the Norrbotten region. Similar to our results, Sámi women were significantly less overweight than Sámi men.[7] This pattern has also been partly found in Norway where a higher obesity prevalence and a more sedentary lifestyle among Sámi compared to non-Sámi women, but not among men, was found.[31] However, in the Norwegian case, Sámi men were less obese than women.

The high prevalence of obesity in this study may be related to inadequate eating habits, where high-fat low-vegetable diets play a crucial role. Previous studies have reported a higher intake of fat among Sámi, both in Sweden and Norway, compared to the control populations.[32,33] This pattern can also be reflected in the low consumption of fruit and vegetables found among the Sámi compared to the Swedes in this study. Since overweight is a well-known risk factor for diabetes, a higher prevalence of diabetes would have expected among the Sámi. Future studies may reveal potential protective factors against diabetes among them.

Though women reported worse mental health compared to men in both populations, Sámi, particularly women, had better mental health outcomes than the non-Sámi population. Mental health is a major public health problem among the world's Indigenous peoples, especially those in the Arctic.[34,35] However, the different Indigenous groups of these regions often represent very different situations regarding socioeconomic position and health due to the specific history of each country. A study from Norway found ethnic differences in psychological distress, with Sámi men, but not women, reporting a

higher prevalence than the Norwegian population.[36] In Sweden, a cross-sectional study found significant differences in symptoms of depression and anxiety in reindeer-herding Sámi as compared to the general population.[12] Similarly, a study among young adult Sámi found slightly worse mental health (worries and stress) than among their Swedish peers.[6] Besides an improvement of the mental health among Sámi compared to previous studies, there are a number of potential explanations for the observed differences, including the use of different measurement tools and different Sámi populations (this being more representative of Sámi in general).

Overall, Sámi smoked less and drank less alcohol than the Swedish population, a pattern previously reported in Sweden.[7,13] Similarly, among youth in Norway, comparable rates of smoking but lower drinking rates were found between Sámi and non-Sámi peers.[37] These findings are distinct to patterns found in other Indigenous groups from high-income countries where polarizing trends of either abstinence or heavy episodic drinking have been found.[38,39]

Methodological considerations

Several issues should be considered when interpreting the results of this study. Both surveys had a moderate response rate (slightly above 40%) which could reflect selection bias. A difference however is that the SámiHET study was based on the total available Sámi population and not on a random sample. It is important nevertheless to be aware that the true Sámi population in Sweden is larger than the one captured by the three registers used in the SámiHET survey.

As with any population-based survey, the outcomes were self-reported which could lead to some reporting or even recall bias. For instance, in the case of BMI, self-reports most likely underestimate true weight and/or overestimate height.[40] Furthermore, it is possible that different cultural values and norms among Sámi and non-Sámi affected response behaviours, as talking openly about disease (especially mental health) has been described as inappropriate in Sámi culture. However, the extent or impact of these biases on the results is difficult to assess. It is interesting to note that neither age nor any of the covariates used had hardly any effect on the crude estimates of the different associations.

Finally, it is important to note that the reference population in this study—the non-Sámi—should not be equated with ethnic Swedes, since the group born outside Sweden in the present national survey was 15%.

Conclusion

This is the first epidemiological study covering the total possible Sámi population from Sweden. It is also the first time that a comparison with a national Swedish population has been done. Poor self-rated dental health (and chronic ill-health among men), asthma, overweight and a low consumption of vegetables and fruits were a concern among the Sámi population in both men and women. Therefore, these areas require specific targeted interventions to decrease the observed ethnic health inequalities in Sweden.

The approach used in this study opens the possibility for a continuous monitoring of the health of the Sámi but also offers the best possible comparison with Swedish population health data. The established collaboration between Umeå University, the Sámi Parliament and the Public Health Agency of Sweden leads the way to the sustainability of this Sámi health infrastructure.

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Conflicts of interest: None declared.

Data availability

The raw/processed data required to reproduce the above findings cannot be shared publicly due to legal and ethical reasons.

Key points

- Two population-based studies conducted in the Swedish and the Sámi populations during spring 2021 were used to assess ethnic inequalities in health in Sweden.
- While the prevalence of poor self-rated dental health, asthma and overweight were higher among the Sámi, the mental health outcomes were similar or lower (women) among the Sámi participants.
- The Sámi were eating fewer vegetables and fruits, but they were smoking and drinking alcohol less than the national Swedish population.
- The approach used in this study opens the possibility for a continuous monitoring of the health of the Sámi but also offers the best possible comparison with Swedish population health data.

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