Avoiding healthcare during the COVID-19 pandemic

A multilevel analysis based on the Swedish national public health survey 2021

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Abstract

Introduction: Healthcare has been disrupted during the COVID-19 pandemic due to overburdened healthcare services and a decline in utilization due to people avoiding the care settings. Avoiding healthcare could affect peoples' health, and there are possibly many individual and contextual factors involved in that outcome. Little is known about what determinants influence the decision in the Swedish context. This study therefore aims to assess the individual and municipality level factors associated with avoiding healthcare during the COVID-19 pandemic among the Swedish population.

Method: This study had a cross-sectional design and used data from the Health on Equal Terms (HET) survey issued in Sweden 2021, complemented by demographic data from the official population registry. The individual data was collected by Statistics Sweden (SCB) by random sampling in the population registry and consisted of 17076 participants between the ages of 18- to 84-year-old. The variables representing the municipality level were created from population registry public statistics. Analysis was done by multilevel logistic regression that accounted for individual and municipality factors.

Result: About 33% of the total sample had avoided healthcare, with women being more likely (OR 1.29, CI 1.21-1.38) to have avoided care compared to men. People belonging to a risk group had 1.32 times higher odds (CI 1.23-1.42) of avoiding care. People born within Europe and North America were more likely (OR 1.3 CI 1.12-1.5) than Swedish born to have avoided care, as were people born outside of that area (OR 1.48, CI 1.29-1.71). Belonging to the lowest income group meant having higher odds of avoiding healthcare (OR 1.22, CI 1.08-1.38) than the highest income group. People with low or medium education were less likely (OR 0.75, CI 0.67-0.85 and OR 0.91, CI 0.85-0.99 respectively) of avoiding healthcare than the highly educated. The general municipality variance in avoiding healthcare was small, with 1,3% of the variance attributed to the municipality differences.

Conclusion: The results presented that women, migrants born outside the Nordic countries, people belonging to risk groups, and those having the lowest income were more likely to avoid care and this needs to be consideration in future policies aimed at maintaining healthcare utilization during a pandemic.

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Introduction

Disruption of healthcare during the pandemic

The global pandemic of COVID-19 has had well-known effects on people's health and the economy of most countries since its outbreak in 2019. While the pandemic has caused harm and deaths, the disruption of basic health care services has been an issue globally(1). This pattern has been described in earlier pandemics, with the decline of non-pandemic healthcare utilization in Taiwan during the SARS- and in West Africa during the Ebola outbreak, where the decline had possible connections to avoidance of healthcare because of fear of transmission and overloaded care facilities (2,3). The World Health Organization (WHO) indicated early during the pandemic that the increased burden the pandemic would put on the system was important to address and that keeping basic health services running was a high priority (4). The organisation also highlighted that vulnerable groups and communities would be highly susceptible to decreased services and needed extra focus.

During the pandemic, global reports pointed out that basic care like vaccinations and treatment of non-communicable diseases declined, and Sweden followed a similar pattern with reports of both planned and emergency care being delayed (5–9). Explanations for that pattern could be that treatments were being delayed or cancelled by the caregiver, and because of the individual's fear of infection and burdening an already overwhelmed healthcare system(1).

The Swedish COVID-19 strategy

The Swedish government commissioned the Public Health Agency of Sweden (PHAS) to take the overall responsibility for issuing recommendations to the public concerning the COVID-19 pandemic. The overall pandemic strategy got global attention because of its voluntary nature with recommendations about hand hygiene, physical distancing, testing, and staying at home when sick, compared to mandatory regulations with lockdowns and facemasks seen in other countries (10–12). Although taking on a different strategy, Swedish healthcare faced similar consequences as other countries, being pressured both by high numbers of infected people in need of care and staffing shortages because of the rapid spread of COVID-19 in workplaces and schools(13). If the strategy had a desirable outcome has been questioned since Sweden had higher infection and mortality rates than its neighbouring Nordic countries, and instead shared similarities with some of the worse off countries in the European union with larger populations (10,12). In evaluation reports and discussions, the Swedish strategy has been to some extent appreciated for retaining the sense of personal freedom among the citizens, and criticized for measures being both too few and too late and its failure to protect the elderly population (11–14).

Avoiding healthcare from the individual's perspective

Avoiding healthcare despite having a need for the services could have many different explanations on an individual level. In the European context during the COVID-19 pandemic, several individual factors have shown to be related to delaying or avoiding healthcare. Women report avoiding healthcare to a greater extent than men, low income and education suggest a higher probability of having avoided care, as does unemployment (15,16). In Sweden, similar reports show that women, migrants, and the unemployed have avoided or delayed healthcare to a greater extent, with reasons for avoiding healthcare described as fear of burdening the overcrowded hospitals or fear of infection in the hospital setting (9).

More than 19% of the population in Sweden are regarded as migrants, here defined as being born abroad (17). According to the PHA, the highest incidence of COVID-19 was among migrants (between Mars-May 2020), with about 753 cases per 100.000 people, compared to the incidence for Swedish born which was 189 per 100.000(18). Adding to the higher incidence of COVID-19 infection, migrants are reported to face greater challenges in accessing health services in general in Sweden (19–21). High rates of infections in a community could possibly affect the fear of infection and affect the choice to seek care, and affect the already existing access difficulties.

While economic factors related to unemployment and income can be important barriers to healthcare in some contexts, the Swedish system has the advantage of relative universal healthcare and low out-of-pocket costs. Nevertheless, as in countries with higher individual healthcare costs, socioeconomic differences affect your healthcare seeking and health in Sweden(22). Therefore, income could explain differences in choosing to avoid or not avoid healthcare.

In Swedish hospitals and elderly homes during the pandemic, all visitors not seeking care were banned to prevent the spread of infection (13,14). Overall, the measures were directed at protecting the elderly and keeping the infection rate at a level that would not overwhelm the care settings. High age, obesity, and many non-communicable diseases, such as diabetes and high blood pressure, were proposed as enhancing the risk of getting severely ill from the infection, which is why people in those risk groups were recommended to isolate themselves from crowds and other people to a greater extent than healthy individuals (12,23). This could mean that people who have those conditions, even if it is medically well-treated, could perceive their risk of severe outcomes from infection as high, and could be more inclined to avoid healthcare.

Migrant background, medical conditions, gender, income, and education are all factors that can affect health outcomes, and have in common that they exist within a system that

includes, but is not limited to, different economic, political and social conditions(24). These conditions affect the socioeconomic position (SEP) that the individual will have in their context.

Avoiding healthcare from the contextual perspective

The Swedish healthcare system

Sweden is divided into 21 regions that have the main responsibility for providing primary and specialized healthcare services. The regions are in turn divided into 290 municipalities that have the responsibility for the local social services, such as elderly care with nurses providing medical care at their homes or retirement homes, schools, and other social services within the municipality borders(25). Regions and municipalities are independent governances within their mandate, with democratically chosen representatives, and are funded by taxes independent from the state tax. Healthcare is mainly tax-funded (86%) and by patient fees and other costs(26). Although the governing bodies aim at offering equal healthcare and social support regardless of people's place of residence(27), differences in the conditions between them could affect to what extent they manage to fulfill that obligation.

Structural conditions of the municipalities

The primary health services are the main providers of non-specialized care in Sweden. Distances to the nearest healthcare centre differ between municipalities, with vast distances both to primary and more specialized care for people living in sparsely populated areas, and the budget for healthcare differs because of the independent governance of regions and municipalities(28). Out of the 290 municipalities, 148 are counted as rural municipalities, classified as having 50% or more of the population living in sparsely populated areas, and 50% or less having more than 45minutes travel to the closest city and that can sometimes also be the distance to the closest healthcare (28,29). Apart from population density predisposing your distance to care, living in areas that are highly affected by the pandemic could mean that you avoid healthcare more according to some literature (1,30). Some municipalities had a high incidence of infections while others kept to low levels throughout (31). This could possibly create a climate of high risk in the hardest hit municipalities. The number of people in an area could therefore affect the choice of going to the healthcare centre in different ways, either by making healthcare less or more accessible in terms of distance or by increasing the feeling of risk.

As earlier mentioned, income can play a factor in healthcare avoidance for the individual. Overall, the general loss of income in the population in Sweden during the pandemic was kept fairly low because of the existing welfare system and social security, and also from temporary benefit measures (13). Nevertheless, some groups were hit harder by income loss,

including people already having low income, those living in areas with low income levels or in largely populated cities, and those working in occupations heavily affected by the restrictions(13). Since the municipalities have different compositions and conditions that could affect work opportunities and vulnerability to infection and effects of restrictions, this could also influence the healthcare avoidance.

Aim

The COVID-19 pandemic has put pressure on the system, affecting both the economy and healthcare and the individual's daily life conditions. Although research suggests that different socioeconomic determinants affect a person's choice of avoiding care, there is a lack of knowledge on how the individual and contextual factors in the Swedish setting during the COVID-19 pandemic have affected people's health behaviours in relation to avoiding care. Therefore, **the aim of this study is to assess the individual and municipality level factors associated with avoiding healthcare during the COVID-19 pandemic among the Swedish population.**

Framework

The Commission on Social Determinants of Health (CSDH) framework by WHO is based on theories related to both micro and macro perspectives on inequalities in health (32). The framework emphasizes that while individual health can be affected by (intermediate) social determinants of health (SDH) related to living conditions, mental stress, behaviour etcetera, these determinants are affected by the structural determinants that condition them. These structural determinants that form the social determinants of inequity include the socioeconomic positions that are related to exposures such as occupation and income, which are produced within the context of for example political structures, policies, and culture.

The individual's beliefs, expectations, and needs in relation to their socioeconomic position could reflect why they choose to avoid seeking health care during the pandemic. Furthermore, the context in which they live, with its different socioeconomic and political conditions, may affect this choice beyond their individual position in society. Through that perspective, the framework guided both the process of choosing relevant independent variables in the analysis and the final interpretation of the results.

Methods

Study design

This is a cross-sectional study using and analysing data from the Health on Equal Terms (HET) survey of 2021, complemented by population data from SCB and the PHAS. The HET survey examines different aspects of health, living habits, and living conditions in the nation and is done every other year with the objective of keeping up to date with the population's health and changes in health over time (33). In 2021, the survey was extended due to the ongoing COVID-19 pandemic and asked questions about how people's health and daily life had been affected by it. The survey is also complemented with population registry data from SCB that provides information about country of birth, education, income, and other demographic data of interest.

Sampling

The sample population of the HET survey was selected by simple random sampling from the population registry of 2021 from SCB. People between 18-84 years old were eligible to participate and the sample size was 40000 people. The PHAS also sampled the participant's demographic information from the population registry data from SCB.

The municipality level data includes the whole registered population, sampled by the author of this thesis from the official registry data from SCB and the PHAS website (31,34). The data included was from 2020 or 2021 based on availability, and all variables were based on the whole population except the municipality income variable which only included individuals 20 years or older. The HET survey only included people who are registered as living in Sweden, and this also applies to the sampled data from SCB and PHAS, therefore the data by default excluded asylum seekers and other people living in Sweden who at the time of collection had not received a residence permit.

Data collection

The HET questionnaire was distributed in February 2021 by SCB via national post service, and had the option of being filled in and posted back or answered online via a web link included in the survey material. A total of four post mailings related to the questionnaire were done, firstly materials containing the questionnaire, information, and web log-ins, and secondly and onwards reminders and copies of the questionnaire.

The questionnaire featured 66 numbered questions, with several of them having sub-questions. The questions covered subjects such as self-reported health status and social life in general and during the COVID-19 pandemic (stated as from mars 2020 and onwards), and

the questionnaire is available on the PHAS website (35). Data collection ended in May 2021. A total of 17578 people answered the questionnaire which was about 44% of the total sample.

Ethical considerations

The data on individuals included in this study is secondary data, originating from the HET survey. In the information letter about the survey, participants were made aware that their personal data would be collected from the population registry, performed by SCB, and that all data would be de-identified before it was shared with PHAS. All participants consented to the data being used for research purposes.

The data included as municipality level factors were retrieved directly from SCB as it is publicly available on their official website with all personal information de-identified.

Variables

Dependent variable

The dependent variable and outcome in this study is avoiding healthcare during the COVID-19 pandemic. Having avoided healthcare was regarded as having a need for healthcare and actively choosing not to seek medical care. This was measured from question 58 of the HET questionnaire which is illustrated below in figure 1(35).

58. During the COVID-19 pandemic, have you avoided seeking medical care

(e.g. healthcare, dental care, mental healthcare or antenatal/postnatal care)?

- No
- Yes, at some point
- Yes, several times

Figure 1. Question about avoiding healthcare from the HET questionnaire

To create a binary outcome the variable was encoded so that if the participant had answered "Yes, at some point" or "Yes, several times" this was categorized and coded as 1="Yes", and not having avoided healthcare coded as 0=" No".

Independent variables

The CSDH framework, evidence from the literature, and data availability guided the selection of independent variables for this study.

Individual level variables

Sex – Information about sex was taken from the population registry, where a unique personal number indicates biological sex. This variable was categorised as 1=men and 2=women, with men as the reference category.

Age – The age of the participant was based on their registered age in the population registry at the time of their inclusion in the survey. The variable was grouped as 18-25, 26-44, 45-64, and 65-85, with 18-25-year-olds as the reference group.

Country of birth – This variable was based on what region of birth that was registered for the participant in the population registry and was treated to symbolize if the person had a migrant background. The variable was categorized into four groups, “Sweden”, “Nordic”, “Europe & North America” and “Other”. Born in Sweden was used as the reference group.

Risk group – In the questionnaire, participants were asked if they had diabetes, asthma, or high blood pressure and the answers to each were coded as yes or no. Body Mass Index (BMI) was calculated from self-reported weight and height and BMI >25 was categorized as overweight. A new variable “risk group” was generated, where people who did not have any of the conditions and were not counted as overweight were categorised as “No” and those who had any of the conditions or were classified as overweight were categorized as “Yes”. Those who did not belong to a risk group were used as the reference.

Income – Exact numbers of yearly income for the participants had been retrieved from the tax registry via the personal number of each participant. The income was then split into 5 quintiles with 1= lowest income, 2=low income, 3=middle income, 4=high income, and 5=highest income. The group with the highest income was used as the reference.

Education – Education level was self-reported from the questionnaire, where participants were asked “What is your highest completed level of education?”. In Sweden, education is divided into three levels. First comes elementary school or primary school which is 9 years of education, followed by secondary/high school which includes 3-4 years of education, and then comes university or college which constitutes 3 or more years. Besides this, it is possible to study different programs that can be considered equivalent to high school or college but are of varying length and classified as other education. In the analysis the variable education was therefore categorized as follows, *low*= education less than or equivalent to elementary school or primary school, *medium*= high school or university/college equivalent studies <2years, and *high*= university/college equivalent studies >2years or university/college 3years or more. The category of high education was chosen as the reference variable.

Municipality level variables

The data at the municipality level were all collected from the public population registry and consisted of all 290 municipalities. The variables included are as follows:

COVID cases – Total number of COVID cases per 10 000 people in the period Mars 2020, which is referred to as the starting point of the pandemic period in the HET survey, to May 2021 which was the end of the survey data collection.

Low economic standard – the percentage of people living with a low economic standard in 2020, which according to SCB are people having an income below 60% of the median income on the national level(36).

Population density – The number of people per square kilometre in each municipality in 2020.

Statistical analysis

The analysis was computed using Stata 17 (37). The characteristics of the sample were investigated and presented through descriptive data analysis. The individual characteristics in relation to the outcome were explored using contingency tables.

The data had a hierarchical build, with individuals (level 1) nested within municipalities (level 2), which provided adequate prerequisites for building a multilevel model to examine relationships of individual and contextual level factors in avoiding healthcare. The outcome variable was binominal and therefore a multilevel logistic regression model was applied. Statistically significant associations were determined as those having a p-value<0.05. Missing data in the analysis were excluded from the analysis by listwise deletion which reduced the sample size to 17,076 (a 2% loss of data).

Building the model

In multilevel logistic regression, we account for individual probabilities to be statistically dependent on the respondents' residence area(38). In the first step, a "null" model (model 0) that only included a random intercept was estimated to assess if there were any contextual elements present in avoiding healthcare. Therefore, none of the explanatory variables were included. This model was based on the following formula:

$$logit(\pi_{ij}) = \log odds = log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_0 + u_{0j}$$

In this for formula i represents the individual level units and j the municipality level units. π_{ij} signifies the odds of having avoided care in an average municipality, and is dependent on the overall intercept for all municipalities (β_0) and the level 2 residual of any given municipality (u_{0j})

In the next step, the individual characteristics, and socioeconomic determinants (sex, age, country of birth, risk group, income, and education) were included in the model (model 1) to see how much variance in municipality level was explained by the individual composition nested within the municipalities.

$$logit(\pi_{ij}) = \beta_0 + \beta_i x_{ij} + u_{0j}$$

β_i represents the regression coefficients for the individual variables, and x_{ij} represents the level 1 variables in any given municipality.

In the final step, the level 2 variables, (COVID cases, population density, and low economic standard) were added to allow for a simultaneous examination of how individual and municipality characteristics were related to the variances in avoiding care between municipalities (model2). The formula for this model reads as follows:

$$logit(\pi_{ij}) = \beta_0 + \beta_i x_{ij} + \beta_j x_j + u_{0j}$$

In this formula, β_j stands for the regression coefficient for the municipality variables, and x_j is the level 2 variables in any given municipality. This final model accounts that individual factors and the individual's municipality of residence all influence the probability of the person avoiding care.

Fixed effects were expressed in the results as odds ratios (ORs) with 95% confidence intervals (CIs). The random effects were reported as the variance on the municipality level with standard errors (SE). Intraclass correlation (ICC) was calculated from the variance in the random effects:

$$ICC = \frac{VA}{(VA + 3.29)}$$

VA in this calculation represents the municipality level variance. The calculation is based on the latent variable method that assumes that every individual has a certain disposition to having avoided care, but that only some individuals whose disposition exceeds a specific threshold actually do so(38). Therefore, 3.29 represents the individual level variance, derived from $\pi^2/3$. The ICC is the proportion of the variation (VA) that is due to municipality level differences. An ICC close to 1 would suggest that all of the individual difference are at the municipality level, and a value close to 0 suggest the opposite(39).

The median odds ratio (MOR) was estimated and reported for each model and represents the median odds ratio between a municipality with the highest risk of having avoided care and

the municipality with the lowest risk when two municipalities are randomly picked (38). In other words, it estimates to what extent the probability of the individual avoiding care is determined by what municipality they live in. To illustrate how the models' variations changed as independent variables were added the proportional change in variance (PCV) was calculated for each model, using the null model variance as the reference.

In order to secure that the independent variables did not have an excessive correlation problem, all variables were assessed via the variance inflation factor (VIF), where a VIF of more than 5 was considered evidence of collinearity being present. All independent variables had a VIF <5, therefore having limited risk for fitting problems and suitable to include in the model.

Results

Descriptive analysis

Characteristics of the sample

The characteristics of the participants in the study are presented in Table 1. Women had a higher representation than men in the sample with a proportion of 54.1% and age groups 45-64 and 65-84 were the largest by 34.9% and 35.9% respectively. The mean age of the sample was 54.9. A majority of the sample population were born in Sweden (86.6%) with the second largest country of birth group being "Other" (5.5%)

In regard to completed education, 13.8% had low education background, while the highest proportion of the sample, 55.8%, had reported finished medium education level. 19.6% belonged to the lowest income group. Of the total sample, 39,1% belonged to a risk group.

Table 1. Sample characteristics

	All, n(%)
Characteristics	
Sex	
Men	7,847 (45.95)
Women	9,229(54.05)
Age (*Age mean 54.8, SD 17.8***)**	
18-25	1,227(7.19)
26-44	3,768(22.07)
45-64	5,953(34.86)
65-84	6,128(35.89)
Country of birth	
Sweden	14,793(86.63)
Nordic except Sweden	489(2.86)
Europe & North America	848(4.97)
Other	946(5.54)
Risk group	

	No	10,413(60.98)
	Yes	6,663(39.02)
Income		
	highest income	3,441(20.15)
	high income	3,437(20.13)
	middle income	3,435(20.12)
	low income	3,411(19.98)
	lowest income	3,352(19.63)
Education		
	High education	5,198(30.44)
	Medium education	9,525(55.78)
	Low education	2,353(13.78)

Individual characteristics and avoiding healthcare

The individual variables and their relationship to avoiding healthcare are presented in Table 2 below. About 33% of the sample reported having avoided healthcare during the pandemic. Women reported having avoided care to the highest extent (35.2%), in comparison to men where 29.4% had reported avoidance. Among the different age groups, the oldest group had avoided healthcare to the highest extent (34.8%) and was closely followed by the age group 26-44 years (33.2%).

People born outside the Nordic had avoided healthcare the most with 38.8% of people born within Europe and North America having avoided care and 40.6% amongst those born in Other countries. Among people born in Sweden, 31.6% reported that they had avoided healthcare.

Income groups varied in their avoidance of healthcare, among the lowest income group 36.3% had avoided healthcare, while in the high income group 28.8% reported avoiding care compared to the highest income group that had avoided healthcare at 31.9%. While the lowest income group reported the highest avoidance of care, people with low education had avoided healthcare less than medium and high education groups at 30.2%, 32.1% and 34.4% respectively.

Table 2. Relationship between outcome and independent variables

Independent variables	Avoided healthcare during the pandemic	
	No N(%)	Yes N(%)
Total	11,523 (67.48)	5,553 (32.52)
Sex/gender		
Men	5,544 (70.65)	2,303 (29.35)
Women	5,979 (64.78)	3,250 (35.22)
Age		
18-25	835 (68.05)	392 (31.95)
26-44	2,519 (66.85)	1,249 (33.15)
45-64	4,173 (70.10)	1,780 (29.90)
65-84	3,996 (65.21)	2,132 (34.79)
Country of birth		
Sweden	10,122 (68.42)	4,671 (31.58)
Nordic except Sweden	320 (65.44)	169 (34.56)
Europe & North America	519 (61.20)	329 (38.80)
Other	562 (59.41)	384 (40.59)
Risk group		
No	7,257 (69.69)	3,156 (30.31)
Yes	4,266 (64.03)	2,397 (35.97)
Income		
highest income	2,342 (68.06)	1,099 (31.94)
high income	2,447 (71.20)	990 (28.80)
middle income	2,363 (68.79)	1,072 (31.21)
low income	2,234 (65.49)	1,177 (34.51)
lowest income	2,137 (63.75)	1,215 (36.25)
Education		
High education	3,407 (65.54)	1,791 (34.46)
Medium education	6,473 (67.96)	3,052 (32.04)
Low education	1,643 (69.83)	710 (30.17)

Multilevel analysis

Model 0, "null" model

The null model included only the level 2 municipality variance and estimated a random effect equation which showed a variance of 0.042. To test the null hypothesis that there was no variance between different municipalities, the likelihood ratio test was performed in the model and generated a chi-square value of $p<0.00$, indicating that although variance was a low 0.042, variance between municipalities exists. The variance was used to calculate the ICC which was 0.013, indicating that 1.3% of the variance in avoiding healthcare could be attributed to municipality level differences. The MOR of 1.216 indicates that there is a 21%

risk (in median) of avoiding healthcare during the pandemic if a person moves from a low risk municipality to a high risk municipality. The multilevel models are presented in Table 3.

Model 1

In this model, the level 1 individual variables were included. The variance between different municipalities marginally decreased from the null model, from 0.042 to 0.041, indicating that the inclusion of individual level variables contributed little to the municipality level variance. This was mirrored in the PCV which was 2.4%, representing that those individual characteristics accounted for a 2.4% of the municipality variance of having avoided healthcare. The ICC decreased to 0.012, which meant that when taking the individual variables into account, the extent to which variance in avoiding healthcare was attributed to municipality level differences decreased. This marginal pattern also applied to the MOR.

The odds of avoiding healthcare were higher for women, with 1.3 times higher odds (CI 1.22-1.39) than men. People born outside of Sweden and the Nordic countries had higher odds of having avoided care, with people belonging to the Other countries group having 1.49 times higher odds (CI 1.29-1.71) than people born in Sweden of having avoided healthcare. Belonging to a risk group meant having 1.32 times higher odds (CI 1.23-1.42) of avoiding healthcare when adjusted for all other individual variables. Income had a varied result, with only two groups obtaining considerable odds compared to the reference group. People in the lowest income group had higher odds of avoiding healthcare (OR 1.19, CI 1.05-1.34) while the high income group was less likely to avoid care (OR 0.87, CI 1.05-1.34) than the highest income group. Having medium or low education had lower odds of avoiding healthcare compared to the highly educated group, with odds ratios of 0.91 (CI 0.84-0.98) and 0.75 (CI 0.66-0.84) respectively.

Table 3. Multilevel logistic regression of the association between avoiding healthcare and individual and municipality level variables.

Fixed effects	**Model 0**	**Model 1**	**Model 2**
Level 1 variables		OR(95% CI)	OR(95% CI)
Sex/gender			
Men		1	1
Women		1.30*(1.22-1.39)	1.29*(1.21-1.38)
Age			
18-25		1	1
26-44		1.07(0.92-1.25)	1.07(0.92-1.25)
45-64		0.95(0.82-1.11)	0.96(0.83-1.12)
65-84		1.14(0.99-1.32)	1.15(0.99-1.33)
Country of birth			
Sweden		1	1
Nordic except Sweden		1.05(0.87-1.27)	1.05(0.87-1.28)
Europe & North America		1.30*(1.13-1.51)	1.30*(1.12-1.50)
Other		1.49 *(1.29-1.71)	1.48*(1.29-1.71)
Risk group			
No		1	1
Yes		1.32*(1.23-1.42)	1.32*(1.23-1.42)
Income			
highest income		1	1
high income		0.87*(0.78-0.97)	0.88*(0.79-0.98)
middle income		0.95(0.85-1.06)	0.97(0.87-1.08)
low income		1.06(0.94-1.18)	1.08(0.96-1.21)
lowest income		1.19* (1.05-1.34)	1.22*(1.08-1.38)
Education			
High education		1	1
Medium education		0.91*(0.84-0.98)	0.91*(0.85-0.99)
Low education		0.75*(0.66-0.84)	0.75*(0.67-0.85)
Level 2 variables			
Low economic standard			0.98*(0.97-0.99)
Population density			1.00(1.00-1.00)
COVID cases			0.99 (1.00-1.00)
Random Effects			
Municipality variance (SE)	0.042(0.011)	0.041(0.012)	0.025(0.010)
ICC	0.013	0.012	0.008
MOR	1.216	1.212	1.162
PCV	-	2.4%	40.5%

OR= odds ratio, CI= confidence interval, 1=reference category, SE=standard error, ICC=intraclass correlation, MOR=median odds ratio, PCV=proportional change in variance. *= P-value< 0.05.

Model 2

Both individual and municipality level variables were included in model 2. This combination decreased the municipality variance and resulted in a PCV of 40.5%. That meant that 40.5% of the variances in avoiding healthcare across the municipalities were explained by the

individual and municipality level factors included in the analysis. The ICC decreased to 0.008, indicating that when adjusting for the level 2 variables, 0.8% of the total variance of avoiding healthcare could be attributed to municipality differences. The MOR also decreased, so that with both level 1 and level 2 characteristics adjusted for, the odds of avoiding healthcare increased by 16% when moving from a low risk area to a high risk area. The proportion of people living in low economic standard was associated with avoiding care (OR 0.98, CI 0.97-0.99), but that was not the case for population density and COVID cases (OR 1.00 and 0.99 respectively and CI 1.00-1.00 for both).

Adjustment for the level 2 variables only marginally affected the individual level variables. Women's odds of avoiding healthcare were 1.29 times higher (CI 1.21-1.38) than men. Avoiding healthcare was considerably more likely among people belonging to a risk group (OR 1.32, CI 1.23-1.42). High income earners still had lower odds (OR 0.88, CI 0.79-0.98) than the highest earners, and the odds of avoiding healthcare among the lowest income group was 1.22 (CI 1.08-1.38) times higher than the highest income group. The odds ratio of the medium and low education groups remained the same in model 2, still having lower odds of avoiding healthcare compared to the high educated group, with some minor changes in the confidence intervals (CI 0.85-0.99 and 0.67-0.85 respectively).

Discussion

The results in this study suggest that there are several individual characteristics that affect if people have or have not avoided healthcare during the pandemic. Women in this study had significantly higher odds than men to have avoided care during the pandemic, which is a pattern also found in the literature (15,16,40,41). Adherence to pandemic recommendations, like social distancing and hand hygiene, was found to be more likely among women than men in a large study involving Europe and North America (42). In relation to this, recommendations and information during the pandemic also involved not burdening the hospitals with unnecessary visits, and this may have been more reflected in women's care seeking behaviour. A collection of literature indicates that men report better health and utilize care services less than women(43–46). If men do not perceive their healthcare needs as big as women, it could also be likely that they do not perceive having avoided care to the same extent.

Furthermore, findings in this study suggest a strong association between being born outside of the Nordic countries (with emphasis on people born outside Europe and North America) and avoiding care. This links to existing research, that describe that migrants have avoided healthcare to a greater extent during the pandemic (9,15,16). The association was significant

even though adjustment was made for income and education, which relates to other studies that have shown that socioeconomic position does not even out possible cultural or discriminatory factors related to migration when it comes to migrants' health behaviour or avoidance of healthcare (19,47,48). This indicates that migrants have a double burden and their choice to avoid healthcare can be affected both by their socioeconomic position and potential discrimination because of origin. As described earlier, migrants in Sweden already before the pandemic face difficulties in accessing healthcare, which could lead to avoiding healthcare despite having a need. Reasons for this challenge in accessing healthcare could be that some migrants might be unfamiliar with the healthcare system, or have a language barrier and cultural beliefs and norms that affect healthcare usage (49). This, in combination with a healthcare system that fails to acknowledge the culturally sensitive adaptions that could facilitate migrants' care seeking, could act as barriers to seeking healthcare.

The analysis adjusted for "risk group", which was having conditions that could both mean that you have greater health needs and that you could consider yourself as being more vulnerable to having severe outcomes of a COVID-19 infection. The analysis showed that those belonging to this group had significantly higher odds of having avoided healthcare. This finding is in line with other studies that have presented that higher risk perception and poor self-rated health could mean being more likely to avoid care (15,16,40). The oldest age group in this thesis' analysis, 65-84-year-olds, did not have significantly higher odds of avoiding healthcare, which is both contrary and compatible with findings in other studies (15,16,50). This finding is probably explained by the adjustment for "risk group" since this group with increasing age is more prone to have health related issues.

Income and education, which are both related to the socioeconomic position of the individual, had contrasting results in this study. People with the lowest income avoided healthcare to a higher extent than the highest income group, while people with low or medium education avoided healthcare less than the highest educated. Income as a predictor of healthcare avoiding behaviour was seen in the United States and Portugal during the pandemic, where low-income groups had a tendency to avoid or delay healthcare more based on financial barriers in the healthcare system and strained income due to the situation (15,50). There are to this author's knowledge no other studies discussing this connection in the Swedish context during the pandemic, but earlier studies have presented that people in Sweden have delayed or avoided healthcare and buying medicine for economic reasons and that income affects Swedish healthcare utilization (51–53).

As mentioned, having low or medium educational level meant being less likely to have avoided healthcare in this study. The existing literature about this phenomenon is inconsistent, where some research present higher avoidance among the lower education

groups (16,54) and some the opposite(50), and some have not found any strong relationship between education and avoiding healthcare(15). In a systematic review by Lueckmann and colleagues socioeconomic inequalities in the utilisation of different levels of healthcare within several countries, including Sweden, were compared (55). Although SEP was measured by both income and education in some studies, belonging to the less advantaged SEP group, which often included low education, could predict using primary healthcare more, although this differed depending on what services were provided. While Lueckmann et al. found that some studies pointed to higher utilisation of specialized care for the advantaged SEP group, another review that focused on the elderly population, found an overall higher usage of healthcare services among the advantaged groups(55,56). Nevertheless, the individual's educational level could be considered to affect the choice to avoid care, and since the literature presents a variety of directions about this association, it is something that should be investigated further, especially in what form it takes in the Swedish context.

According to the CSDH framework, socioeconomic and political contexts are important parts of the determinants that create inequities in health(24). In this study, the municipality variables explained a fair amount of the municipality variance, but the variance itself was very small which makes the findings of the individual factors in this study more important for further public health work. Nevertheless, the individual variables are dependent and shaped by their context, and the municipality borders may not correspond with the boundaries that define the relevant context that affect the individual specific health outcome. Because the Swedish government provides important conditions for health, such as relative universal healthcare, education free of charge, and broad social support, there are favourable conditions for municipalities to be on an equal footing. At the same time, this study shows that these conditions are not allowing for equity at the individual level.

Limitations and strengths

This study had one of its strengths in the overall multilevel method which is highly suited for investigating factors at different levels. It is, to this author's knowledge, the first study to analyse Swedish municipality differences in avoiding healthcare and to examine and describe how individual factors are associated with avoiding healthcare during the pandemic.

The study also had some limitations. The participation rate of 44% in the HET survey is a limitation to the external validity of the findings in this thesis. This rate is similar to previous Swedish national health surveys (33) and the author of this thesis had no influence over this rate because of being a secondary user of the data.

At the municipality level, the only healthcare related variable was the number of COVID cases. The number of, or distance to, primary healthcare centres or the number of doctors

could have been another healthcare related component, but these were not included because of a lack of data. Population density could to some extent mirror distance to healthcare centres which could be longer in sparsely populated areas.

The outcome variable, avoiding healthcare, has some limitations in its interpretation since it does not fully capture if the individual actually needed healthcare. Since the outcome variable was collected from secondary data, there are limited actions that could be taken regarding this. This thesis therefore relied on the assumption that if you state that you have avoided care, you could be considered to have had a need that you chose not to seek help for.

Conclusions

This study examined the municipality and individual factors associated with avoiding healthcare and found that several individual factors affect this behaviour. Women, people with a migrant background, and people with health issues or low income were more likely to avoid healthcare during this pandemic. Municipality differences were small and therefore the findings suggest that a focus on the individual factors could be important for facilitating healthcare utilization during the COVID-19 pandemic. Future research should examine both qualitative and quantitative aspects of healthcare avoidance in the time of this pandemic and after, with a special focus on the groups presented here, in order to produce equitable recommendations for policymakers.

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