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Published in:
Library and Information Science Research

DOI:
[10.1016/j.lisr.2023.101253](https://doi.org/10.1016/j.lisr.2023.101253)

Published: 01/07/2023

Document Version
Final published version

Document License
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[Link to publication](#)

Please cite the original version:
Ahmadinia, H. (2023). Breaking the barriers: The impact of health information and cultural factors on immigrant health in the Nordic countries. *Library and Information Science Research*, 45(3), Article 101253. <https://doi.org/10.1016/j.lisr.2023.101253>

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Breaking the barriers: The impact of health information and cultural factors on immigrant health in the Nordic countries

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ARTICLE INFO

Keywords:

Cultural influences
Health information access
Immigrant health behaviors
Information professionals
Nordic countries

ABSTRACT

Immigrants encounter cultural adaptation challenges impacting their health behaviors and outcomes, with health information and cultural factors influencing their actions. A survey of 340 participants from Finland, Norway, and Sweden was conducted, and the data were analyzed using structural equation modelling. Results show that health beliefs and access to health information, mainly via the Internet, significantly predict immigrants' intentions to engage in health-related actions, while perceived barriers negatively affect their adoption of healthy behavior. The findings underscore the importance of information professionals in providing culturally relevant health information and resources to immigrants and emphasize the need for policymakers to consider cultural factors and information sources in health promotion efforts targeting immigrant populations. This study adds value to the information science literature by highlighting the role of information access and cultural context in shaping health-related actions among immigrants in Nordic countries.

1. Introduction

The rapid increase in immigration to the Nordic countries, with over three and a half million immigrants seeking better economic prospects, education, and public health for their families (Norden, 2022), has brought about diverse religious and racial backgrounds, shaping various perspectives on health issues. Consequently, this diversity results in different health information needs and challenges in accessing healthcare services in their host countries (Elliott et al., 2018; Medina et al., 2023; Pandey et al., 2022). While it is crucial to recognize that immigrant groups encompass a spectrum of experiences, it is also essential to acknowledge that certain immigrant groups may also include highly privileged individuals, often referred to as “expats” (Spadavecchia & Yu, 2021). Despite the Nordic countries' healthcare systems striving for equal treatment, healthcare organizations face difficulties in meeting cultural competency and accessibility requirements for immigrant populations (Haj-Younes et al., 2022; Laugesen et al., 2021).

Understanding the role of health beliefs and information-seeking behaviors among immigrants is crucial for the development of culturally relevant information resources and services within the field of library and information science (LIS). This knowledge can assist in disease prevention and health promotion and informing policymakers on potential strategies to enhance public health (Diener et al., 2009; Frey &

Stutzer, 2002). Cultural factors shape protective behaviors, making it essential to examine perceptions and behaviors within their specific contexts (Fischer & Karl, 2022). Given that the Nordic welfare states often have greater equality and more universal access to services, it has often been seen as a paradox that the Nordic countries do not have the smallest inequalities in health (Greve, 2016).

1.1. Problem statement

Immigrants' dietary and exercise patterns may change as they adapt to a new culture and its norms, with health information playing a pivotal role in the adoption and maintenance of healthy behaviors (Abraído-Lanza et al., 2005; Lin et al., 2020; Ramirez et al., 2013; Shi et al., 2004; Šüpule, 2021; Zhang & Jiang, 2021). The health belief model (HBM) has been a widely utilized framework in immigrant behavioral health research for predicting improvements in health-related behaviors (Bateman et al., 2022; Lim et al., 2009; Lin et al., 2005; Scarinci et al., 2012; Tuzcu et al., 2016; Wu et al., 2020). However, despite the integration of various dimensions into the original HBM to enhance its predictive capabilities, it does not explicitly evaluate the impact of health information on healthy behavior adoption (Orji et al., 2012; Reece, 2003).

The purpose of this study is to examine how beliefs and health

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information impact the likelihood of first-generation immigrants in Finland, Norway, and Sweden, from both vulnerable and privileged communities, to engage in health-related activities. By conducting this study in these specific Nordic countries, insights into the health beliefs and information-seeking behaviors of immigrant populations in this particular context may be discovered. Employing partial least squares structural equation modelling (PLS-SEM) to analyse empirical data, this research contributes to the library and information science literature by examining the role of health beliefs, cultural context, and health-seeking behaviors among immigrant populations. The findings will enrich our understanding of the subject and offer valuable insights for designing effective health information resources and services for immigrant communities.

2. Literature review, theoretical framework, and hypotheses

This study employs an extended Health Belief Model (HBM), incorporating a cultural psychology perspective and integrated health information-seeking as new antecedents to the research model, to assess and evaluate the antecedents of intention to take health action among immigrants in Nordic countries (Abraham & Sheeran, 2007; Banai, 2022; Doucerain, 2019; Orji et al., 2012). The subsequent subsections provide the rationale and justification for the conceptual framework and hypotheses, illustrating the study model’s pathway relationships (see Fig. 1).

2.1. Health belief model and its components

The Health Belief Model (HBM) is a framework developed to explain health-related behaviors. It comprises three key components: moderating variables, perceptions of health and illness, and individual health-seeking behavior outcomes (Glanz et al., 2008). The HBM posits that individuals are more likely to engage in preventative actions against disease if they perceive themselves as susceptible to the disease (perceived susceptibility), if they believe their health concern’s potential severity is high (perceived severity), and if they consider the benefits and barriers of taking action (perceived benefits and perceived barriers) (Orji et al., 2012). Moreover, internal and external cues may prompt health-related behavior (cues to action), while an individual’s self-efficacy in executing preventative behavior is also considered (Glanz et al., 2008).

2.2. Perceived susceptibility and health concerns in immigrant populations

Research on immigrants in Norway, Finland, and Sweden has highlighted the role of beliefs in perceiving health concerns, such as a lack of knowledge about preventative services and therapy (Hjelm et al., 2018, 2003; Johnsdotter et al., 2011; Mbanya et al., 2019; Mölsä et al., 2019). Likewise, previous studies on native and immigrant populations have found that poor health habits increase susceptibility to health problems (Deshpande et al., 2009; Elliott et al., 2018; Johnsdotter et al., 2011;

Kamimura et al., 2017; Saghafi-Asl et al., 2020). Vulnerable populations, including immigrants and certain native residents, encounter heightened health risks associated with their living or working conditions. In particular, some native residents who engage in physically demanding work or find themselves in jobs that do not align with their physical fitness levels may face additional vulnerabilities. (Byrow et al., 2019; Holtermann et al., 2010; Lim et al., 2009; Mikkola et al., 2019). Trauma, including experiences such as divorce or losing a loved one, has also been associated with increased susceptibility to mental health problems (Byrow et al., 2019; Greene, 2018). Lastly, genetic and family medical history are additional factors that may elevate susceptibility to health problems (Acheson et al., 2010; Ye et al., 2021). This study examines the relationship between the proposed construct of perceived susceptibility (PSUS) and healthy behavior. The following hypothesis is proposed:

H1. PSUS significantly affects the intention to engage in health actions among immigrants.

2.3. Perceived severity and health concerns in immigrant populations

The present study draws on previous research suggesting that individuals from vulnerable populations perceive a health concern as serious when they anticipate significant negative effects on their lives or social well-being (Brainard & Zaharlick, 1989; Gilman et al., 1992; Kamimura et al., 2017; Kennedy & Rogers, 2009; Saadi et al., 2015). This study examines the impact of perceived severity (PSEV) on health behavior among immigrant populations. Accordingly, the following hypothesis is proposed:

H2. PSEV significantly affects the intention to engage in health actions among immigrant populations.

2.4. Perceived benefits and health concerns in immigrant populations

Several studies have identified various perceived benefits (PBEN) related to health behaviors among immigrant populations, including risk reduction, the efficacy of Western biomedicine over traditional remedies, safer hospital deliveries in cases of complications, financial savings, and enhanced understanding of health problems (Brainard & Zaharlick, 1989; Kamimura et al., 2017; Saadi et al., 2015). This study investigates the influence of PBEN on the intention to engage in health actions among immigrant populations as a factor in health behavior. Therefore, the following hypothesis is proposed:

H3. PBEN significantly affects the intention to engage in health actions among immigrant populations.

2.5. Perceived barriers and health concerns in immigrant populations

Perceived barriers (PBAR) to healthcare access encompass cultural barriers, racism, language barriers, cultural insensitivity among health professionals, and structural barriers (Hacker et al., 2015; Kamimura et al., 2017; McIntyre & Chow, 2020; Mölsä et al., 2019; Nickerson et al., 2020; Papadopoulos et al., 2003; Saadi et al., 2015; Shaheen et al., 2020). Immigrants in Norway and Sweden have reported barriers such as a preference for doctors with immigrant backgrounds, dissatisfaction with healthcare providers, stigmatization of mental illness, anxiety about immigration authorities discovering their health issues, perceived lack of attention from healthcare providers, and communication difficulties (Akhavan, 2012; Hjelm et al., 2018, 2003; Johnsdotter et al., 2011; Mbanya et al., 2019; Nkulu Kalengayi et al., 2012). This study examines the relationship between perceived barriers and health behavior among immigrant populations, as reflected in the hypothesis:

H4. PBAR significantly affects the intention to engage in health actions among immigrant populations.

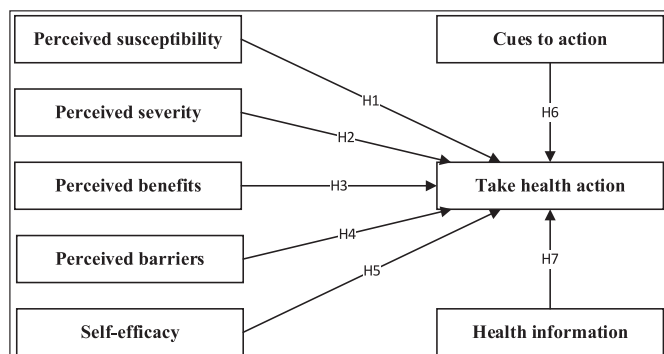


Fig. 1. Research model.

2.6. Self-efficacy and health concerns in immigrant populations

Self-efficacy (SEL) has been identified in previous research as an individual's belief in their own ability as well as their overall willingness and confidence to undertake actions required to address health issues, such as attending medical appointments, recognizing health threats, possessing knowledge and the ability to explain health results to others, and adopting health-promoting behaviors (Gilman et al., 1992; Kennedy & Rogers, 2009; Papadopoulos et al., 2003; Saadi et al., 2015; Savic et al., 2016; Simmelink et al., 2013). This study investigates the mediating role of self-efficacy in the relationship between health behavior and the intention to engage in health actions among immigrant populations. Specifically, this hypothesis is proposed:

H5. SEL significantly affects the intention to engage in health actions among immigrant populations.

2.7. Cues to action and health concerns in immigrant populations

Drawing on research involving diverse local and immigrant populations, key internal factors motivating individuals to engage in health-promoting behaviors encompass concerns about disease symptoms, appearance, self-image, and mortality among family and friends (Cleveland Clinic, 2020; Meillier et al., 1997; Orji et al., 2012). External influences, such as recommendations from family, acquaintances, and healthcare providers in their home country or local area, access to free healthcare check-ups, and exposure to health-related information through various media channels, further encourage individuals to take health action (Biswas et al., 2011; Clarke et al., 2021; Gilman et al., 1992; Jones et al., 2015; Korda & Itani, 2013; Meillier et al., 1997; Piran, 2004; Savic et al., 2016; Simmelink et al., 2013).

Investigations of immigrants in Finland, Norway, and Sweden have revealed that seeking advice from traditional healers, utilizing alternative traditional treatments, adhering to medical professionals' guidance, engaging in discussions with family and friends, and receiving community recommendations all contribute to motivating these vulnerable populations to adopt health-promoting behaviors (Åkerman et al., 2017; Hedemalm et al., 2008; Hjelm et al., 2018, 2003; Mbanya et al., 2019). This study explores how the "cue to action" (CUE) moderates the relationship between health perceptions and healthy behavior, as articulated in the following hypothesis:

H6. CUE significantly influences the intention to engage in health-promoting behaviors among immigrant populations.

2.8. Health information-seeking behavior and immigration

The impact of immigration as a life event has been widely explored in terms of its effects on individuals' beliefs, lifestyles, quality of life, and engagement with health-related information (Casali et al., 2015; Kasl & Berkman, 1983; Zhang & Jiang, 2021). Research has demonstrated that health information-seeking behaviors can facilitate the adoption and maintenance of healthy lifestyles among native and immigrant populations (Lambert & Loiselle, 2007; Manafa & Wong, 2012).

Health information (HI) encompasses a range of topics related to mental and physical health, illness, diet, and general well-being (Liu, 2022). A variety of health information sources have been identified among vulnerable populations, including healthcare professionals, the media, individuals, the Internet and social media, published or digital materials, and educational workshops and meetings (Esmailzadeh et al., 2018; Hancher-Rauch et al., 2019; Jang et al., 2018; Roble et al., 2022). Factors such as accessibility, reliability, affordability, and confidentiality are frequently cited as key considerations in the selection of health information sources among immigrants (Garnweidner et al., 2013; Kington et al., 2021; Mårtensson et al., 2020; Ojwang, 2020).

The motivations underlying individuals' pursuit of health information are closely tied to the perceived validity and accuracy of the

information, which can profoundly influence their capacity to adhere to healthy routines (Chen et al., 2018; Viviani & Pasi, 2017). Criteria used to evaluate validity and accuracy may include truthfulness, recommendations from family or friends, publication date, readability, audience consideration, publisher or author reputation, and simplicity (Esmailzadeh et al., 2018; Hancher-Rauch et al., 2019; Helitzer et al., 2009). This study examines the mediating role of the proposed construct for obtaining health information in relation to healthy behavior as a key factor in health behavior. Consequently, the following hypothesis is proposed:

H7. The acquisition of health information significantly influences the intention to engage in health-promoting actions among immigrant populations.

3. Methodology

3.1. Measures and survey instruments

Theoretical concepts were outlined using validated items from earlier studies (see Appendix 3), with modest revisions made to better fit the setting of this study.

PSUS (10 items), PSEV (6 items), PBEN (6 items), PBAR (15 items), and SEL (6 items) were developed based on previous studies' validated and reliable statements (Deshpande et al., 2009; Greene, 2018; Saghafi-Asl et al., 2020). The survey's creation and development involved four expert consultations in the fields of behavioral studies in healthcare, psychological aspects of information interactions, information practice, and social science research design. Before releasing the final version of the proposed survey, a pilot study was conducted with 15 individuals with immigration backgrounds in the studied countries to get their feedback on the clarity of the survey's questions.

Ten statements were developed based on previous studies' validated surveys. These were included for measuring the information sources used by the studied participants (Esmailzadeh et al., 2018; Hancher-Rauch et al., 2019; Jang et al., 2018). Four items were adapted for measuring common criteria for selecting health information sources among studied participants (Esmailzadeh et al., 2018; Hancher-Rauch et al., 2019; Kington et al., 2021). Seven items that were used in previous studies on local and minority populations' health information-seeking behaviors were also included. Ten items were adapted from the previous studies on local and minority cues to take health action surveys, with insights from health communication and health promotion practice.

CUE as predictor of prompts to take health action among the survey population, the current study's survey included ten items adapted from the previous studies on local and immigrant cues to take health action surveys with insights from health communication and health promotion practice (Greene, 2018; Jones et al., 2015; Meillier et al., 1997; Orji et al., 2012; Saghafi-Asl et al., 2020; Simmelink et al., 2013).

For measuring take health action, the present study included six different statements measuring features of various health actions among the survey population. "Prevent a health problem", "control a health problem", "cure a health problem", "reduce disease symptoms", and "screen or check-up" were common responses to the independent variable "take health action" in prior surveys (Greene, 2018; Saghafi-Asl et al., 2020).

The data were analyzed utilizing structural equation modelling (SEM) with SmartPLS, and all questions were scored on a 7-point Likert scale, with "1" representing "strongly disagree" and "7" representing "strongly agree".

3.2. Data collection

The survey was distributed online among over 50 different immigrant, asylum seeker, and refugee social media communities in Finland, Norway, and Sweden. All first-generation immigrants living in the

studied countries, regardless of gender, race, or nationality, were invited to participate in the survey since this was exploratory research. The survey included three main sections: questions about demographic backgrounds (e.g., age, gender, education), questions about health beliefs and cultural practices adapted from an extended HBM, and questions about health information (e.g., health information needs and information sources).

3.3. Data analysis

The data were analyzed utilizing structural equation modelling (SEM) with SmartPLS (Ringle et al., 2022). A comprehensive non-response bias test was performed on the first 25% and the last 25% of respondents for all survey questions to ensure unbiased results. This analysis included a Chi-Square test (Hair et al., 2011), an independent *t*-test for numerical data (De Winter, 2013), and a Mann-Whitney *U* test for ordinal data (Vargha & Delaney, 2000). The rigorous approach strengthened the analysis by testing the bias across different types of data. Across all tests, the results revealed no significant differences between early and late respondents, reinforcing the conclusion that the data are not subject to significant nonresponse bias. However, it is important to note that while significant efforts were made to minimize potential biases, it is impossible to eliminate them completely. Therefore, while there was no evidence of significant bias in the data according to the results of statistical analysis, the potential for minor, uncontrolled biases remain.

3.4. Structural modelling

Path analysis was used to examine the influence of a set of predictors, including HBM constructs and health information, on taking health action as an independent variable; the analysis of the resulting path relationships included both the measurement and structural models (Allen, 2017; Gefen & Straub, 2005).

4. Findings

4.1. Descriptive statistics

From May to October 2022, 340 immigrants living in the studied counties responded to an online survey. In this study, 62.65% of respondents identified as female, while 34.71% identified as male. Eight respondents identified as non-binary, and one did not indicate their gender. Among the participants, the majority (265 out of 340) were under the age of 44, with ages ranging from 18 to 65. When it comes to living arrangements, 65.88% of respondents selected living with someone else, while 34.11% selected living alone. In terms of employment status, the majority (61.41%) were employed, while 21% were enrolled in school. Regarding the duration of residence in the studied countries, 48.52% of participants had lived there for less than five years. Additionally, 24.41% indicated having a moderate or significant level of religious engagement. The educational attainment of the majority of participants was a bachelor's degree (80.59%), and 208 individuals reported being in excellent or good health (see Appendix 1).

4.2. Healthcare information or service utilization

Oral health (67.65%), mental health (54.71%), and nutrition and diet (45%) were the top three categories of healthcare services and/or health information that participants had ever used or believed they might need. With 97 respondents, incidents and injuries (accidents, falls from height, injuries, etc.) ranked as the fourth highest health-related need or use. In addition, this group frequently mentioned women's health ($n = 146$), pregnancy and prenatal health ($n = 87$), child health ($n = 64$), and sexual health and HIV ($n = 64$) (see Appendix 2).

4.3. Measurement model results

After ensuring that each indicator (survey item) was accurately represented in the model, outer loadings, composite reliability, and average variance extracted (AVE) analysis were used to evaluate the items' reliability and validity (Sarstedt et al., 2022). All primary loadings on the respective constructs of the indicators were at least 0.70; however, deletion of items was only considered if the results demonstrated an increase in composite reliability or average variance extracted (AVE) over the recommended value (Hair et al., 2011; Latif et al., 2020). Due to the reflective nature of the items in this study model, a change in one does not affect the overall significance of the scale, and a low factor loading indicates that an item does not adequately measure the target construct. The composite reliability (CR) test was used to determine internal consistency, and all calculated values were greater than or equal to 0.896 (Hair et al., 2011). In addition, a convergent validity test was conducted by computing the AVE values for each construct; all of the values were above the minimum threshold of 0.50 (Bagozzi & Yi, 1988), with PSEV having the highest value at 0.830.

Cronbach's alpha values were calculated to investigate the internal consistency of latent constructs, and the findings indicated that all constructions had values above the 0.852 threshold. Table 1 provides detailed information about the reliability and validity of the constructs.

Following two distinct techniques, the common method bias (CMB) was also examined to see whether any bias attributable to the measurement method could be identified. Harman's one-factor test was calculated, and the result indicated that none of the constructs accounted for more than 50% of the variation (Podsakoff et al., 2003). In the second method, the CMB was evaluated using the concept of common latent factors (CLF). The CLF, according to Podsakoff et al. (2012), gives a more robust understanding of the CMB than Harman's one-factor test. Comparing the chi-square values of two models, including an unconstrained model and a model in which all the pathways were limited to zero, revealed that no model path was influenced by CMB. Finally, the discriminant validity test was calculated to evaluate the uniqueness of a measuring construct using the square root of AVE in each latent variable (Henseler et al., 2015). The findings suggested that there were no discriminant validity difficulties with the data (Fornell & Larcker, 1981) and provided evidence that the data have acceptable discriminant validity (see Table 2).

The heterotrait-monotrait (HTMT) ratio of correlations was also used to find out if a reflective construct has the strongest relationships with its own indicators. The results of HTMT showed that the research data didn't have discriminant validity issues (see Table 3).

4.4. Structural model results

The structural equation modelling technique was used to test the research hypotheses and examine the path relationships between model constructs; the results revealed that taking health actions among immigrants living in three Nordic countries explained 76.70% of the variance. The SEM results showed that the proposed constructs, including HI, had all significant effects on TAK; therefore, H1 to H7 were supported by the model (see Fig. 2).

4.5. Model comparison

Addition SEM techniques were also employed to examine the path relationships between constructs in the original HBM model (composed of PSU, PSEV, PBAR, and PBEN), edited HBM (composed of PSU, PSEV, PBAR, PBEN, and C2A), and extended HBM (composed of PSU, PSEV, PBAR, PBEN, C2A, and SEL). The SEM results showed that the proposed model has a better explanatory ability to explain taking health action among the studied population in the countries compared to the original HBM (6.50% improvement), modified HBM (4.90% improvement), and extended HBM (0.80% improvement). Table 4 compares path

Table 1
Reliability and validity.

Construct	Items	Factor loadings	Mean	StD ^a	Cronbach's α^b	CR ^c	AVE ^d
Perceived Susceptibility	PSU-2	0.766	3.106	2.251	0.852	0.896	0.638
	PSU-5	0.878	2.971	2.434			
	PSU-6	0.596	3.132	2.321			
	PSU-9	0.870	2.982	2.442			
Perceived Severity	PSU-10	0.848	3.129	2.314	0.932	0.951	0.830
	PSE-1	0.877	4.253	1.847			
	PSE-2	0.944	3.956	1.918			
	PSE-4	0.911	4.188	1.985			
	PSE-5	0.912	4.068	1.914			
Perceived Benefits	PBE-1	0.913	3.435	1.816	0.897	0.928	0.764
	PBE-2	0.847	3.474	1.721			
	PBE-3	0.888	3.521	1.853			
	PBE-4	0.846	3.485	1.999			
Perceived Barriers	PBA-10	0.741	4.224	2.036	0.895	0.920	0.657
	PBA-11	0.891	4.585	2.187			
	PBA-13	0.792	4.329	2.103			
	PBA-14	0.834	4.553	2.230			
	PBA-3	0.738	4.179	2.302			
Self-efficacy	PBA-5	0.855	4.444	2.427	0.882	0.919	0.74
	SLE-1	0.875	3.138	2.155			
	SLE-3	0.887	3.165	1.969			
	SLE-4	0.893	3.168	1.886			
Cue to Action	SLE-6	0.782	3.471	1.999	0.867	0.908	0.713
	C2A1	0.768	3.029	1.795			
	C2A4	0.885	3.494	1.768			
	C2A5	0.851	3.015	1.962			
	C2A6	0.868	3.471	2.015			
Health Information	HI-Q3	0.769	3.347	1.911	0.917	0.934	0.669
	HI-Q5	0.826	3.409	1.787			
	HI-Q6	0.748	3.244	1.717			
	HI-Q7	0.901	3.285	2.110			
	HI-R3	0.837	3.259	2.162			
	HI-R4	0.851	3.103	2.124			
Take Action	HI-S5	0.784	3.232	2.031	0.909	0.936	0.786
	TAK-2	0.927	3.379	1.984			
	TAK-3	0.894	3.203	2.023			
	TAK-4	0.822	3.671	2.132			
	TAK-5	0.900	3.391	1.94			

^a StD = Standard deviation

^b Cronbach's α = Cronbach's alpha coefficient

^c CR = Composite reliability

^d AVE = average variance extracted

Table 2
Discriminant validity - Fornell-Larcker Criterion.

Construct	C2A ^a	HI ^b	PBA ^c	PBE ^d	PSE ^e	PSU ^f	SLE ^g	TAK ^h
Cue to Action	0.845							
Health Information	0.762	0.818						
Perceived Barriers	-0.597	-0.642	0.810					
Perceived Benefits	0.759	0.748	-0.564	0.874				
Perceived Severity	0.155	0.201	0.087	0.082	0.911			
Perceived Susceptibility	0.486	0.566	-0.569	0.475	-0.051	0.799		
Self-efficacy	0.722	0.777	-0.690	0.720	0.099	0.575	0.860	
Take Action	0.741	0.793	-0.656	0.757	0.204	0.554	0.808	0.887

^a C2A = Cues to action

^b HI = Health information

^c PBA = Perceived barriers

^d PBE = Perceived benefits

^e PSE = Perceived severity

^f PSU = Perceived susceptibility

^g SEL = Self-efficacy

^h TAK = Take health action

coefficients and coefficients of determination among the original HBM model, the edited HBM, the extended HBM, and the proposed HMB.

4.6. Demographic relationships

The SEM technique was employed to explore the path relationships

between the constructs in the model, the demographic information of respondents, and their intentions to engage in health actions. A positive correlation was found between PSUS and respondents over the age of 44 and their intention to engage in health actions ($\beta = 0.156, t = 2.523, p < 0.01$). In relation to PSEV, there was a positive correlation with female respondents ($\beta = 0.131, t = 3.200, p < 0.001$) and respondents under 44

Table 3
Discriminant validity - Heterotrait-monotrait ratio (HRMT).

Construct	C2A	HI	PBA	PBE	PSE	PSU	SLE	TAK
Cue to Action								
Health Information	0.844							
Perceived Barriers	0.651	0.68						
Perceived Benefits	0.849	0.819	0.606					
Perceived Severity	0.164	0.206	0.158	0.085				
Perceived Susceptibility	0.546	0.629	0.633	0.534	0.123			
Self-efficacy	0.811	0.86	0.761	0.806	0.127	0.654		
Take Action	0.815	0.862	0.703	0.833	0.212	0.618	0.899	

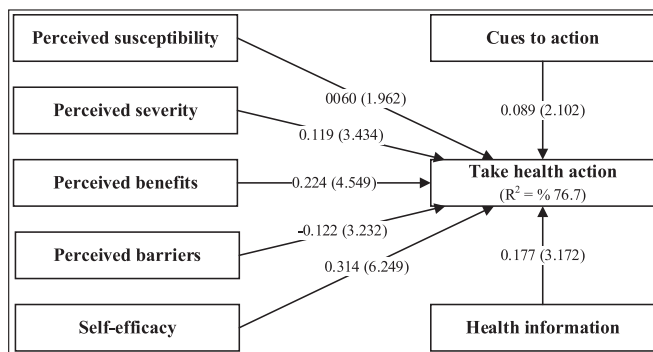


Fig. 2. Conceptual model results.

($\beta = 0.135, t = 3.038, p < 0.0001$) intending to take health actions. PBAR exhibited a negative relationship with female respondents ($\beta = -0.103, t = 2.171, p < 0.01$) and those living alone ($\beta = -0.191, t = 3.067, p < 0.001$) intending to engage in health actions. On the other hand, PBEF showed a positive correlation with respondents who had resided in the studied countries for less than 5 years ($\beta = 0.234, t = 3.341, p < 0.001$) intending to take health actions.

The C2A construct demonstrated a positive correlation with respondents under 44 ($\beta = 0.121, t = 2.522, p < 0.01$), those with basic or no education ($\beta = 0.087, t = 2.005, p < 0.01$), and those residing in the surveyed countries for less than 5 years ($\beta = 0.133, t = 2.128, p < 0.01$), all with the intent to take health actions. Positive relationships were also observed between SEL and non-religious participants ($\beta = 0.357, t = 6.003, p < 0.001$), and SEL and respondents residing in the studied countries for less than 5 years ($\beta = 0.238, t = 2.987, p < 0.01$) intending to take health actions. There was a positive correlation among HI, respondents living with a partner ($\beta = 0.173, t = 2.559, p < 0.01$), those in good health ($\beta = 0.274, t = 3.232, p < 0.001$), and those residing in the studied countries for more than 5 years ($\beta = 0.170, t = 2.557, p < 0.01$) with the intent to take health actions.

Upon further investigation, there were notable similarities and differences between path relationships between constructs in the model and respondents from each studied country, namely Finland, Sweden, and Norway. A positive correlation was observed between HI and respondents from Finland ($\beta = 0.446, t = 4.293, p < 0.001$), and Norway ($\beta = 0.177, t = 2.190, p < 0.01$), regarding the intention to take health actions. However, no relationship was found between HI and Swedish respondents ($\beta = -0.057, t = 0.593, p = n.s.$).

Negative relationships were found between PBAR and respondents

Table 4
Comparison between path coefficients and coefficients of determination among the original HBM model, the edited HBM, the extended HBM, and the proposed model.

Model	PSU	PSE	PBE	PBA	C2A	SLE	HI	R-squared
Proposed HBM & HIS	0.600	0.119	0.224	-0.122	0.089	0.314	0.177	76.70%
The extended HBM model	0.082	0.143	0.267	-0.144	0.130	0.361		75.90%
The modified HBM model	0.137	0.170	0.373	-0.255	0.214			71.80%
The original HBM model	0.155	0.198	0.496	-0.305				70.20%

from Finland ($\beta = -0.185, t = 2.709, p < 0.01$), and Norway ($\beta = -0.123, t = 2.091, p < 0.01$) intending to take health actions. No correlation was found between PBAR and Swedish respondents ($\beta = -0.074, t = 1.069, p = n.s.$). Positive correlations were found between PSEV and respondents from Norway ($\beta = 0.154, t = 2.852, p < 0.01$), Sweden ($\beta = 0.180, t = 2.389, p < 0.01$), PBEF and respondents from Norway ($\beta = 0.233, t = 2.981, p < 0.01$), Sweden ($\beta = 0.197, t = 1.978, p < 0.05$), SEL and respondents from Norway ($\beta = 0.121, t = 2.522, p < 0.01$), and Sweden ($\beta = 0.121, t = 2.522, p < 0.01$) with the intention to take health actions. However, no relationship was found between PSEV, PBEF, or SEL and Finnish respondents.

Lastly, there was a positive relationship between C2A and Swedish respondents ($\beta = 0.234, t = 2.098, p < 0.01$) intending to take health actions, but no relationship was found between C2A and respondents from Finland and Norway.

5. Discussion

5.1. Improved model and demographic factors

Factors influencing health behaviors among immigrants in three Nordic countries, with an emphasis on the role of health information in shaping these behaviors was explored. Structural equation modelling (SEM) was utilized to test research hypotheses and examine path relationships between model constructs. The proposed model, which incorporates health information, significantly explains immigrant health behavior. The enhanced coefficients of determination suggest that the proposed model has greater explanatory power than the original health belief model (HBM), modified HBM, and extended HBM. The study further examined the relationship between proposed model constructs and demographic information, reporting that specific demographic factors, such as age, gender, education level, and living situation, influenced the intention to engage in health-related behavior.

5.2. Perceived susceptibility, severity, and health intentions

Factors affecting immigrants' perceptions of their susceptibility to health problems and their intention to address these concerns were identified. These factors include unhealthy habits, living or working conditions, psychological status, and medical history. The findings reveal that older immigrants are more likely to act on their perceived susceptibility, while younger immigrants are more likely to act on their perceived severity. This aligns with previous studies on immigrants and native populations regarding health concerns stemming from unhealthy habits, living or working conditions, mental health issues, and medical

history (Byrow et al., 2019; Hjelm et al., 2018; Mikkola et al., 2019; Mölsä et al., 2019; Ye et al., 2021).

5.3. Influence of perceived consequences

The severity of a health concern, such as negative impacts on daily life, work, or education, and daily activities, significantly influences immigrants' health intentions was confirmed. Results indicate that female and younger respondents who perceived their health concerns as severe were more likely to take health action. These findings are consistent with previous research on immigrants and native populations, which found that the perceived consequences of health concerns can affect health intentions (Kamimura et al., 2017; Kennedy & Rogers, 2009; Orji et al., 2012; Papadopoulos et al., 2003; Saadi et al., 2015).

5.4. Perceived benefits, barriers, and health actions

The study revealed that perceived benefits (physical and mental health, as well as cost savings) positively influenced the population's intent to engage in health-related action. Results demonstrated that women who perceived greater benefits were more likely to take action, while those who perceived greater barriers were less likely. Prior studies on vulnerable individuals' health concerns revealed that they believed taking care of their health would reduce risks and save money (Deshpande et al., 2009; Greene, 2018; Kamimura et al., 2017; Saadi et al., 2015; Saghaei-Asl et al., 2020).

Respondents' intention to take health action is influenced by various perceived barriers, including cultural, religious, and privacy concerns. These barriers encompass handling health problems independently, discomfort discussing health problems with healthcare professionals of the opposite sex, and concerns about the dissemination of personal health information. The study's findings further support this, as respondents living alone with a high level of perceived barriers were less likely to take health actions. In contrast, respondents who had lived in the studied countries for less than five years were more likely to do so. These findings are in line with previous research on perceived barriers among immigrant groups, including cultural salience, taboos, religious beliefs, health professionals' cultural insensitivity and ignorance, preference for doctors with immigrant backgrounds, fear of immigration authorities discovering health problems, and feeling ignored by healthcare professionals (Akhavan, 2012; Mbanya et al., 2019; McIntyre & Chow, 2020; Nkulu Kalengayi et al., 2012; Shaheen et al., 2020).

5.5. Cues to action and health intentions

Additionally, the results indicated that cues to action positively impacted participants' intentions to engage in health actions. Different effective cues were identified, including the "presence of deceased family and friends," "advice from family or friends," "counsel from local healthcare professionals," and "recommendations from healthcare professionals from their home country". The study revealed that individuals who perceived greater benefits and responded to these cues were more likely to take health actions. Conversely, respondents living alone with high perceived barriers were found to be less likely to engage in health actions. These findings align with prior research on the stimuli for health action, such as disease symptoms, appearance, self-image, death among family and friends, advice from family and friends, recommendations from healthcare providers in their home country, and local healthcare providers (Clarke et al., 2021; Jones et al., 2015; Korda & Itani, 2013; Orji et al., 2012; Savic et al., 2016).

5.6. Health information sources and health intentions

The present study offers evidence that acquiring health information positively influences immigrants' intentions to engage in health actions. It identified oral health, mental health, nutrition, and diet as the

foremost categories of healthcare services and/or health information utilized or anticipated by participants. Internet searches for health information significantly impacted immigrants' intentions to address health concerns. Primary considerations for selecting health information sources were cost and confidentiality, with the Internet emerging as the most popular source among immigrants, consistent with prior research (Beretta et al., 2018; Chae et al., 2021; Esmailzadeh et al., 2018; Jauhiainen & Tedeschi, 2021).

5.7. Ineffective health information sources and validation

Conversely, the study did not find TV or radio programs, published or digital materials, educational workshops, or meetings to be effective means for immigrants to access health information. This discrepancy may be attributed to accessibility and language barriers for those with limited local language fluency, a factor unsupported as a reason for selecting health information sources in the surveyed population (Kington et al., 2021). Intriguingly, while healthcare professionals, family members, relatives, and friends were not deemed effective sources of health information (Jang et al., 2018; Roble et al., 2022), they played a significant role in motivating immigrants to undertake health actions.

In line with previous studies, respondents typically verified the accuracy of health information by assessing the publication date, audience consideration, publisher or author reputation, and simplicity (Esmailzadeh et al., 2018; Hacker et al., 2015; Helitzer et al., 2009). However, unlike earlier research, the role of family or friend recommendations in checking the validity and accuracy of health information among respondents was not confirmed, diverging from previous findings (Esmailzadeh et al., 2018).

Additionally, the study found that respondents in good health, living with a partner, and having resided in the surveyed countries for over five years tended to show a higher inclination to engage in health actions upon obtaining health information. These factors, which reflect the participants' demographic and contextual characteristics, were associated with a greater likelihood of taking proactive health actions. It is important to note that while these factors were identified as influencing health actions, they do not negate the significant role of perceived benefits, cues to action, and perceived barriers in shaping individuals' intentions to engage in health-related behaviors. Non-religious respondents with high self-efficacy and cues to action were similarly more likely to address health concerns, supporting prior research on reasons for selecting health information sources among immigrant populations in various countries, such as affordability and confidentiality.

5.8. Self-efficacy and health intentions

Self-efficacy was the primary predictor of individuals' intentions to participate in health behaviors, as it enhanced their confidence in performing the behavior. This finding aligns with previous research, which identified several indicators of confidence related to future health concerns, including discussing health problems with healthcare professionals, making necessary behavioral changes to maintain physical or mental health, participating in health programs, and seeking consultations with healthcare professionals (Kennedy & Rogers, 2009; Papadopoulos et al., 2003; Saadi et al., 2015; Savic et al., 2016; Simmelink et al., 2013).

5.9. Tailoring interventions for migrant populations

The study underscores the necessity of bespoke health interventions for migrants, taking into account demographic variables like age, gender, educational attainment, and duration of residence in the host country. Custom health messaging has been found to boost health-related behaviors among distinct groups (Noar et al., 2007; Nudelman & Yakubovich, 2022). Therefore, focusing on recent migrants and independent female migrants might yield promising results. The specific

health needs of migrants, which can differ from those of the general population, should be taken into account (Norredam et al., 2010). Future studies must explore the potential of culturally sensitive, technology-based solutions and the role of healthcare practitioners in promoting healthy behaviors among migrants. The research also revealed potential variations in health behaviors among immigrants in Finland, Sweden, and Norway. Health information correlated with health intentions for Finnish and Norwegian respondents, but not for Swedish ones. Meanwhile, perceived severity, benefits, and self-efficacy positively affected Norwegian and Swedish respondents, not Finnish ones. Interestingly, only Swedish respondents demonstrated a link between action cues and health intention. Nonetheless, the limited sample size restricts the generalizability of these findings, necessitating further investigation into cultural, social, and systemic discrepancies and the need for broader, country-specific studies. The study underlines the significance of geographical variations in health interventions among migrants but also cautions against the assumption of universal applicability due to cultural, societal, and individual differences. Future research should explore these geographic variations in more detail and with larger sample sizes.

6. Limitations

Several limitations were identified with regard to its design and execution. Primarily, the cross-sectional research design utilized offers a singular temporal perspective, precluding the possibility of a longitudinal investigation. Furthermore, the survey's exclusive availability in English restricted participation to immigrants proficient in the language, consequently diminishing the generalizability of the findings to the broader immigrant populations within the countries examined. Additionally, the study's limited representation of non-binary individuals hindered the attainment of a comprehensive understanding of health action intentions beyond the conventional male and female classifications. To address these constraints, future research endeavors should assess the efficacy of the proposed model and investigate the relationships between health beliefs, health information, and intentions to undertake actions in relation to diverse physical and mental health challenges. Moreover, interventional studies are warranted to evaluate the influence of model-based educational programs on the health behaviors of both immigrant groups and native populations. Such inquiries would contribute significantly to the field of library and information science research by promoting understanding of information-seeking behaviors and health information needs among diverse populations.

7. Conclusion

This research underscores factors influencing health behaviors among immigrants in Norway, Finland, and Sweden, enhancing our understanding through an expanded Health Belief Model. By integrating this model with structural equation modelling, we shed light on the health disparities and inequalities among diverse groups, emphasizing immigrants. The study contributes to our knowledge of how demographic factors influence health-related intentions. Significantly, the research suggests that the Internet serves as the main health information source for immigrants, while traditional media and healthcare professionals have limited effectiveness. It also identifies cultural, religious, and privacy-related barriers to health actions, pointing to the need for tailored interventions. This study uniquely examines the impact of non-religious individuals with high self-efficacy on health matters, an aspect often overlooked in prior research. The findings imply that addressing the health concerns of immigrants and marginalized groups could lead to improved health outcomes for these populations. This work further highlights the importance of health information validation among immigrants, adding depth to our understanding of health information utilization. In moving forward, it is crucial to continue exploring the intricate relationship between health beliefs, health information, and

diverse populations across various contexts. This knowledge will enable the design of more effective health interventions specific to distinct groups. Ultimately, confronting the health disparities faced by immigrants and other marginalized communities is essential to achieving health equity and improving population health.

Ethics approval

The study was performed in accordance with the examination and approval statements by the Board of research ethics at Åbo Akademi University.

Declaration of Competing Interest

Not applicable.

Acknowledgement

This research was supported by the grants from Finnish cultural foundation, Karl-Erik Henriksson Foundation, and Åbo Akademi Jubileumsfond. Writing this paper would not have been possible without the exceptional guidance, consultation, and support of Dr. Kristina Eriksson-Backa (Åbo Akademi University), Dr. Shahrokh Nikou (Åbo Akademi University), Professor Jannica Heinström (University of OsloMet), and Professor Ola Pilerot (University of Borås).

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.lisr.2023.101253>.

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