Journal of Advanced Nursing

WILEY

JAN Leading Global Nursing Research

EMPIRICAL RESEARCH QUANTITATIVE OPEN ACCESS

Nurses' Perceptions and Behaviours Regarding Climate Change and Health: A Quantile Regression Analysis

Min Kyung Park[1] | Seoyoung Baek[1] | Da Woon Jeong[1,2] | Gwang Suk Kim[3]

[1]Department of Nursing, Graduate School of Yonsei University, Seoul, Republic of Korea | [2]Division of Nursing, Severance Cardiovascular Hospital, Seoul, Republic of Korea | [3]College of Nursing, Mo-Im Kim Nursing Research Institute, Yonsei University, Seoul, Republic of Korea

Correspondence: Gwang Suk Kim (gskim@yuhs.ac)

Received: 24 February 2024 | **Revised:** 21 August 2024 | **Accepted:** 29 September 2024

Funding: This work received support from the 2022 Faculty-Student Research Fund granted by the Mo-Im Kim Nursing Research Institute, College of Nursing at Yonsei University (6-2022-0028). This research was supported by the Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education [Grant 2020R1A6A1A03041989].

Keywords: behaviour | climate change | environment | health | nurses | perception | quantile regression

ABSTRACT

Aims: The aim of this study is to identify the factors associated with nurses' perceptions and behaviours related to climate change and health (PBCH) according to their PBCH levels.

Design: A cross-sectional study was used.

Methods: This study included a sample of 499 Korean nurses and adhered to the STROBE checklist. Data were collected from March 23 to May 10, 2023. Quantile regression analysis was performed, and PBCH levels were measured using the Korean version of the Climate Health and Nursing Tool.

Results: Across all quantile groups, the experience of extreme weather events and awareness of climate change-coping facilitators were associated with PBCH. Differences were observed in factors associated with PBCH levels. Significant associations with PBCH were observed within the 75th percentile group, for having a religion, household income, and workplace climate friendliness. In the 25th percentile group, having a child, the number of sources for climate change–health-related information, and experience in setting climate change–health goals and strategies significantly influenced PBCH.

Conclusion: We propose a differentiated strategy by elucidating the factors associated with high and low quantiles of PBCH levels.

Implications: By verifying specific factors associated with PBCH levels, nurses can enhance their preparedness to respond to the health risks posed by climate change in their clients.

Impact: Identifying common factors associated with all quantiles of nurses is important for establishing universal PBCH characteristics. Recognising the distinctions between high and low PBCH levels can aid in developing tailored nursing strategies to enhance PBCH among nurses.

Reporting Method: This study adhered to the STROBE guidelines.

Patient or Public Contribution: No Patient or Public Contribution.

1 | Introduction

According to the World Health Organisation (WHO), climate change is considered the greatest global health threat of the 21st century (World Health Organisation 2019). Vulnerable populations such as older adults, children, and individuals with chronic illnesses suffer greater harm from climate change, exacerbating existing health inequalities (Cook, Demorest, and Schenk 2019). The Lancet Countdown has issued a warning that without immediate action, the unequal and inequitable health impacts of climate change on the global population's health and well-being will worsen (Romanello et al. 2022; Watts et al. 2021).

Owing to the various health issues caused by climate change, it is crucial for nurses to lead the way in implementing changes (Dickman et al. 2022). Nurses can play a role in providing direct care and health education while considering the health risks associated with climate change; they can influence the reduction of greenhouse gas emissions in the healthcare sector and help develop strategies to respond to the health impacts of climate change (Sayre et al. 2010). As the understanding of nurses' broader role in climate change and health unfolds, nurses have called for expanded leadership roles to address global health inequities and bear witness to the health needs related to climate change (Kurth 2017). As healthcare professionals, nurses bear moral and professional responsibilities to act promptly to mitigate the impact of climate change on human health and implement strategies to protect both humanity and the planet (Chaiard and Turale 2022).

To effectively respond to the health threats posed by climate change, it is essential for nurses to be aware of the issues, have the motivation to act, and take action both at home and in the workplace (Park et al. 2023). Nurses must clearly understand how healthcare activities interact with the environment (Anåker and Elf 2014) and what is happening to patients due to climate change (Iira et al. 2021). This understanding enables them to play a crucial role in addressing the health impacts of climate change (Iira et al. 2021). Additionally, nurses can play a vital role in mitigating the negative health impacts of climate change by reducing significant greenhouse gas emissions in healthcare systems. Healthcare systems account for 4.4% of global greenhouse gas emissions (Karliner et al. 2019), and South Korea's healthcare system is the eighth-largest emitter of greenhouse gases in the world (Health Care Without Harm 2019).

Although responses at the organisational and policy levels are important, the voluntary behaviours of individuals vary based on their awareness, concern, and willingness to act regarding climate change; thus, individual PBCH should be emphasised (Stern 2000). However, there is a lack of knowledge about the factors influencing nurses' perception and behaviour related to climate change and health (PBCH), and to our knowledge, no studies have examined the differences in influencing factors at different PBCH levels. Identifying the influencing factors for different PBCH levels through quantile regression analysis will help design effective interventions to improve nurses' PBCH in each quantile. Additionally, by identifying independent variables that significantly impact all quantiles, comprehensive strategic approaches that can be effective in improving PBCH at various levels can be developed.

Therefore, this study aimed to (a) explore the distribution of PBCH among nurses in Korea, including the subdomain level of PBCH and differences in PBCH according to subject characteristics and (b) identify the specific factors associated with PBCH at different quantile levels (25th, 50th, and 75th percentiles) to understand how these factors differ across various PBCH levels. The findings of this study will contribute to improving the level of PBCH among nurses and strengthening their response to climate change.

2 | Background

To enhance the response to climate change and improve environmental sustainability, it is crucial to evaluate nurses' PBCH (Chung, Lee, and Jang 2024; Park et al. 2023). PBCH signifies not only nurses' awareness and behaviours related to the health impacts of climate change but also their motivations and concerns related to the health impacts of climate change (Jeong, Kim, and Park 2022; Schenk et al. 2021). Previous studies have emphasised the importance of nurses being adequately aware, concerned, and motivated, and demonstrating appropriate behaviour in addressing the health impacts of climate change and its threats (Buriro et al. 2018; Chung, Lee, and Jang 2024; Iira et al. 2021; Nsengiyumva et al. 2020; Park et al. 2023; Schenk et al. 2021). Understanding nurses' PBCH is particularly important not only for environmental management but also for their roles as health-related experts (Demorest et al. 2019).

Healthcare professionals, particularly nurses, may exhibit variations in their PBCH owing to their personal and professional facilitators and barriers (Kotcher et al. 2021; Park et al. 2023). According to previous studies, concerns about natural disasters and the spread of infectious diseases were recognised as the greatest facilitators of PBCH (Park et al. 2023), while complexity, inconvenience, and busyness were seen as the biggest barriers (Kotcher et al. 2021; Park et al. 2023). Previous studies have found that characteristics such as older age (Chung, Lee, and Jang 2024; Park et al. 2023), higher educational level (Nsengiyumva et al. 2020; Park et al. 2023), and longer working experience (Chung, Lee, and Jang 2024; Nsengiyumva et al. 2020) are associated with a high level of perception of climate change and its health risks. Differences in perceptions and behaviours towards climate change were also observed based on religion (Morrison, Duncan, and Parton 2015). In addition, climate change-related characteristics such as information experience (Buriro et al. 2018), workplace climate friendliness (Chung, Lee, and Jang 2024), experience of setting climate change–health goals and strategies (Sussman, Gifford, and Abrahamse 2016), and experience of monitoring and coping with climate change–health impact (Korea Health Promotion Institute 2021) were also emphasised as important factors to PBCH. Additionally, the higher the experience of extreme weather, climate change-related health problems, and the optimistic attitude towards climate change response, the higher the PBCH (Park et al. 2023). Owing to the diverse demographic and work-related characteristics of nurses, there

is a possibility of a biased distribution of groups with lower or higher levels of PBCH based on independent variables. Therefore, it cannot be ruled out that associated factors may differ between the lower and higher quantiles.

However, the identification of factors associated with PBCH is limited. Although studies investigating healthcare professionals' perceptions of the health impacts of climate change are gradually increasing, most of them have focused on physicians (Herrmann and Sauerborn 2018; Sarfaty et al. 2014, 2015). Recent research has increasingly targeted nurses (Buriro et al. 2018; Iira et al. 2021; Schenk et al. 2021; Nsengiyumva et al. 2020), but the level of PBCH was mainly compared between groups according to participants' characteristics, or the correlation among variables was explored. In few studies analysing the factors influencing PBCH (Chung, Lee, and Jang 2024; Park et al. 2023), only multiple regression was performed, making it impossible to identify information essential for improvement according to the PBCH level. Conducting quantile regression allows for the division of the dependent variable into quantiles, similar to the structure of the original data, and the relationship with independent variables can be independently assessed for each quantile (Shapira et al. 2019). Quantile regression analysis allows us to examine the relationship between independent and dependent variables at each quantile, providing the advantage of investigating the relationship across different points in the quantiles of the dependent variable (Petscher and Logan 2014).

Therefore, this study hypothesises that the factors influencing nurses' PBCH will differ according to PBCH quantiles. The results of this study will provide foundational data for the development of intervention strategies based on various levels of PBCH in future studies.

3 | Methods

3.1 | Design

This cross-sectional descriptive survey aimed to identify factors associated with PBCH levels among nurses in Korea.

3.2 | Participants

A total of 499 Korean nurses from various workplaces, including hospitals, public health, government/public, and educational sectors, participated to minimise potential workplace biases. This study included nurses with at least 6 months of work experience, excluding foreign residents and foreigners. Nurses working in medical clinics, nursing homes, private institutes, and corporate settings were excluded because of their limited numbers and low likelihood of autonomous education and practice. According to Krejcie and Morgan's (1970) method, which was utilised as the basis for participant recruitment in previous studies exploring the influencing factors of climate change mitigation behaviour (Baek and Kim 2019), when the population size is between 75,000 and 1,000,000, an appropriate sample size is 382. Considering that the population of active nurses, that is, the target population of this study, was 285,097 based on the 2021 Health and Medical Workforce Survey, it was determined that a minimum of 382 participants were required. In an international study that measured nurses' PBCH using the Climate, Health, and Nursing Tool (CHANT), which is the original version of K-CHANT, a total of 487 participants were surveyed (Schenk et al. 2021). Although the sample size was deemed appropriate, the researchers recommended diversifying the participant pool (Schenk et al. 2021). Accordingly, we aimed to recruit 500 participants, with a minimum of 50 and a maximum of 200 from each workplace type to meet the sample size suggested in previous research. Disproportionate probability sampling was used to include nurses from various institutions. One response with missing values was excluded, leaving 499 data points for analysis. Using G*Power 3.1.9.7, with a significance level of 0.05, a medium effect size of 0.15, and a power of 0.95, and referring to a previous study that examined the PBCH among nursing graduate students (Park et al. 2023), which had nine independent variables, a minimum sample size of 166 was calculated for multiple linear regression analysis. The sample size in this study was sufficient to apply the analysis method and achieve the aim of the study.

3.3 | Instrument With Validity and Reliability

3.3.1 | Participants' Characteristics

Participants' characteristics were constructed by reviewing survey items from prior studies that explored nurses' PBCH (Park et al. 2023; Schenk et al. 2021). General characteristics were assessed using 10 items: sex, age, marital status, having a child, underlying diseases, educational level, having a religion, household income, workplace, and current workplace experience. Climate change–health-related characteristics were assessed using nine items: experience of extreme weather events, experience of climate change-related health problems, number of sources for climate change–health-related information, optimistic attitude towards climate change response, workplace climate friendliness, awareness of climate change-coping facilitators, awareness of climate change-coping barriers, experience in setting climate change–health goals and strategies, and experience in monitoring and coping with climate change–health impact.

3.3.2 | PBCH

The PBCH was measured using the K-CHANT, originally developed in English by Schenk et al. (2020) and translated and modified in Korea by Jeong, Kim, and Park (2022). The K-CHANT consists of 20 items across five domains: awareness (four items), concern (five items), motivation (three items), behaviour at home (four items), and behaviour at work (four items). As CHANT is a survey tool used to comprehensively assess nurses' awareness, experience, motivation, and behaviours related to climate change and health (Schenk et al. 2020; Winquist et al. 2023), we computed a composite PBCH score by averaging the individual scores from the five domains, to use as a dependent variable. A computed PBCH score was used in the previous study as well (Park et al. 2023). In the K-CHANT's development study (Jeong, Kim, and Park 2022), the validity (content validity index and confirmatory factor analysis [CFI]) and reliability (internal consistency reliability and test–retest reliability) of the tool

were verified. Additionally, both Jeong, Kim, and Park's (2022) study and the current study confirm its reliability and validity. The results of the confirmatory factor analysis (CFA) showed acceptable fit indices in both studies, with SRMR < 0.08, RMSEA < 0.08, AGFI > 0.70, and CFI > 0.70 (Table S1). The internal consistency reliability was demonstrated by a Cronbach's alpha of 0.81, with the intraclass correlation coefficient ranging from 0.66 to 0.90 in Jeong, Kim, and Park (2022), and a Cronbach's alpha of 0.86 in the current study. In this study, the convergent validity of K-CHANT was verified by affirming significant positive correlations between K-CHANT and the "Climate Change Awareness and Response Measurement Tool" developed by Kim and Kim (2016) (Table S2). The square roots of the AVE (average variance extracted) ranged from 0.552 to 0.681, which were greater than the correlations for three domains (awareness, concern, motivation), suggesting that the discriminant validities were acceptable (Fornell and Larcker 1981; Farrell and Rudd 2009). However, the "behaviours at home" and "behaviours at work" domains did not fully satisfy discriminant validity (Table S3).

3.4 | Data Collection

The recruitment process is depicted in Figure 1. Participants were recruited using convenience and snowball sampling through online nursing communities and institutional networks. This recruitment strategy aimed to enhance the inclusivity and diversity of the sample, ensuring representation from a wide range of nursing professionals. This approach aimed to activate nurse participation through nursing community platforms, and encouraged the involvement of nursing groups through connections with initial participants. Two participants per workplace type, who had no conflicts of interest with the researchers and met the selection criteria, were recommended by the institution's network as primary contacts and were provided with a survey URL to facilitate voluntary participation. If the selected primary contacts participated in the survey, they were asked to introduce suitable individuals. An online survey was conducted using Google Forms to recruit participants from various regions and workplaces. The first page of the survey included an informed consent form that described the study's aim, methods, and the protection of participants' data. In this study, we controlled for missing values using the "required response" feature in Google Forms, ensuring that all questions required an answer before submission. Despite this, a mid-survey system error resulted in one participant having missing values. Therefore, data from 499 participants were analysed after excluding this one response. Regarding response bias, we confirmed that no participants provided identical answers across all items.

3.5 | Data Analysis

The collected data were analysed using STATA 16.1 software. The distribution of participants' characteristics and PBCH was analysed using descriptive statistics. Independent *t*-tests and one-way analysis of variance (ANOVA) were used to examine differences in PBCH according to participant characteristics. Pearson's correlation analysis was used to assess relationships for continuous variables. Finally, ordinary least squares (OLS) and quantile regression were conducted to identify factors associated with PBCH. The OLS model provided a baseline understanding of the relationships between independent variables and the mean level of PBCH. OLS is typically conducted to examine the relationship between the outcome and covariates based on the fixed mean value. Model fit for the OLS regression was assessed using unadjusted and adjusted R-squared values However, this approach does not enable the identification of predictors that vary with changes in the outcome variable (Petscher and Logan 2014). Conversely, quantile regression could investigate factors associated with low or high values of the phenomenon under study. In this study, a quantile regression analysis was conducted by dividing the distribution of PBCH into quantiles (25%, 50%, and 75%). High percentiles indicated a higher level of PBCH, with the 25th percentile the 50th percentile, and the 75th percentiles representing the scores of 72, 77 and 83, respectively.

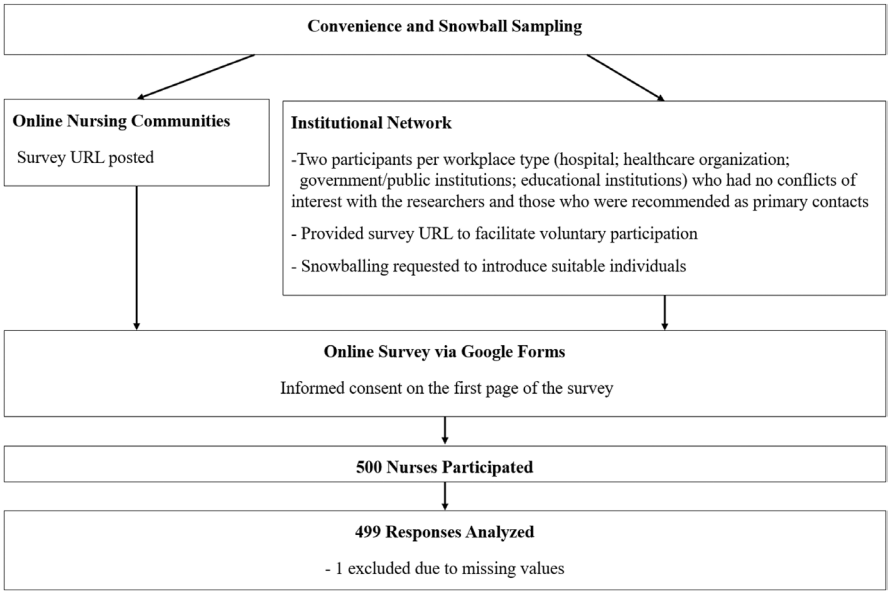

FIGURE 1 | Recruitment flowchart.

3.6 | Ethical Considerations

Data were collected in Korea from March 23 to May 10, 2023, after obtaining approval from the Institutional Review Board of Yonsei University Health System, South Korea (IRB No. 4-2022-1470 and dated January 10, 2023). Prior to data collection, research information was provided to the participants in the form of an explanation letter including the purpose and methods of the study along with a consent form. Data collection was conducted only with participants who voluntarily agreed after reading the provided information. Following the completion of the survey, participants were provided with a gift token (mobile coffee coupons) as compensation for their time. To distribute the gift tokens, participants who consented provided their phone numbers, which were used solely for the purpose of sending the mobile coffee coupons.

4 | Results

4.1 | Participants' Characteristics

This study included nurses currently used, with data from 499 participants analysed after excluding one participant with missing values for key variables. The general characteristics of the participants are as follows: 94.2% were women, with an average age of 38.00 years. Among the participants, 40.1% were single, and 50.3% did not have children. Additionally, 51.1% reported having no religion, and 44.0% had a monthly household income of over 5 million KRW. In terms of workplace, 38.9% worked in hospitals and 31.5% in healthcare organisations. The average work experience was 7.28 years.

The climate change–health–related characteristics are as follows: participants reported an average score of 23.51 of 35 for the experience of extreme weather events. They accessed information about climate change and health through an average of 2.17 of 7 possible sources. Regarding climate friendliness in the workplace, participants reported that their workplace was doing an average of 2.64 of 10 possible actions. Participants were aware of an average of 2.08 of 5 climate change-coping facilitators, with nurses being most commonly aware of natural disasters (81.8%) and the least common climate change-coping facilitator being professional responsibility (21.2%). For awareness of climate change-coping barriers, participants were aware of an average of 1.69 of 5 barriers, with the most frequent being complexity and inconvenience and not knowing what to do (48.1%). Regarding setting climate change–health goals and strategies, 42.7% of participants reported having such experiences. Additionally, 43.5% had experience in monitoring and coping with the health impacts of climate change (Table 1).

4.2 | Participants' PBCH

The average PBCH score was 77.05 ± 9.15 of 100 using the K-CHANT. When scores were converted to a 5-point scale for comparison across subdomains, the concern domain had the highest score of 4.22 ± 0.60, whereas the behaviour at work domain had the lowest score of 3.25 ± 0.72 (Table 2).

4.3 | PBCH According to Participants' Characteristics

Differences in PBCH were observed by age ($r = 0.25$, $p < 0.001$), marital status ($t = -2.95$, $p = 0.003$), having a child ($t = 4.10$, $p < 0.001$), having a religion ($t = 2.95$, $p = 0.003$), and household income ($r = 0.13$, $p = 0.004$). A significant difference in PBCH based on workplace type ($F = 3.07$, $p = 0.027$) was found, but post hoc tests did not reveal a significant difference between the groups. Among the climate change–health–related characteristics, experience of extreme weather events ($r = 0.33$, $p < 0.001$), experience of climate change-related health problems ($r = 0.20$, $p < 0.001$), number of sources for climate change–health–related information ($r = 0.24$, $p < 0.001$), optimistic attitude towards climate change response ($r = 0.14$, $p = 0.002$), workplace climate friendliness ($r = 0.26$, $p < 0.001$), and awareness of climate change-coping facilitators ($r = 0.32$, $p < 0.001$) showed statistically significant positive correlations with PBCH (Table 1).

4.4 | Factors Associated With PBCH

The hypothesis of this study that the factors influencing nurses' PBCH will differ according to PBCH quantiles was supported. Table 3 presents the results of the OLS and quantile regression analyses. More frequent experience of extreme weather events and a higher awareness of climate change-coping facilitators were associated with higher PBCH in both the OLS and across all quantiles. Awareness of climate change-coping facilitators had a greater impact on PBCH in the 25th and 50th quantiles. While the variable of having a child did not exhibit significance in the OLS model or other quantiles, people with a child had higher PBCH compared to those without a child at the 25th percentile ($p = 0.006$). Conversely, people with a religion ($p < 0.001$) and those with a higher workplace climate friendliness ($p = 0.027$) had higher PBCH solely at the 75th percentile. The unadjusted and adjusted R-squares in the OLS model were 0.32 and 0.31, respectively.

5 | Discussion

In this study, the identified level of PBCH among nurses was 77.05 ± 9.15 of 100, higher than previous studies on Korean nursing graduate students (73.52) (Park et al. 2023) and American nurses (74.49) (Schenk et al. 2021). This increase is anticipated to be associated with the escalating exposure to media information and growing academic interest related to climate change and health in Korea. Compared with a previous study conducted in Korea (Park et al. 2023), an analysis of the subdomains reveals a notable elevation in the domains of "awareness" and "concern." However, the level of "behaviours at work" exhibited virtually no change. This underscores the need for concerted efforts to transform these awareness and concerns into behavioural changes within the workplace. Conversely, nurses may face challenges in practicing responsible behaviour due to various constraints in the workplace, which requires institution-wide engagement (Rempel et al. 2025). When compared by the nurse's work area, nurses working in hospitals had the lowest levels of PBCH. Considering that working in hospitals not only contributes

TABLE 1 | PBCH according to participants' characteristics ($n = 499$).

Characteristics	Categories	*n* (%) or mean ± SD	PBCH	
			mean ± SD	*t*/*r*/F (*p*)
General characteristics				
Sex	Women	470 (94.2)	77.22 ± 8.97	1.72 (0.085)
	Men	29 (5.8)	74.21 ± 11.60	
Age (years)		38.00 ± 9.57		0.25 (< 0.001)
Marital status	Single	201 (40.1)	75.59 ± 9.93	−2.95 (0.003)
	Married/separated	298 (59.9)	78.03 ± 8.47	
Having a child	Yes	248 (49.7)	78.71 ± 7.84	4.10 (< 0.001)
	No	251 (50.3)	75.40 ± 10.04	
Underlying diseases	Yes	166 (33.3)	76.41 ± 9.35	−1.09 (0.299)
	No	333 (66.7)	77.36 ± 9.05	
Educational level	Associate degree	65 (13.0)	78.12 ± 6.67	1.41 (0.238)
	Bachelor	339 (68.0)	76.61 ± 9.82	
	Master	83 (16.6)	78.35 ± 7.79	
	PhD/postdoctoral	12 (2.4)	74.58 ± 9.48	
Having a religion	Yes	244 (48.9)	78.27 ± 9.45	2.95 (0.003)
	No	255 (51.1)	75.87 ± 8.72	
Household income (monthly)	< 200	8 (1.6)	71.50 ± 12.42	0.13 (0.004)[a]
	200–300	125 (25.1)	75.34 ± 9.74	
	300–500	146 (29.3)	76.97 ± 9.58	
	500–800	123 (24.6)	78.54 ± 7.91	
	> 800	97 (19.4)	77.92 ± 8.53	
Workplace	Hospital	194 (38.9)	75.57 ± 10.18	3.07 (0.027)[a]
	Healthcare organisation	157 (31.5)	77.95 ± 7.65	
	Government and public institutions	54 (10.8)	77.13 ± 9.16	
	Education institutions	94 (18.8)	78.52 ± 8.90	
Current workplace experience (years)		7.28 ± 6.32		0.08 (0.062)
Climate change-health-related characteristics				
Experience of extreme weather events (range 11–35)		23.51 ± 3.93		0.33 (< 0.001)
Experience of climate change-related health problems (range 0–13)		5.21 ± 3.96		0.20 (< 0.001)
Number of sources for climate change–health-related information (range 0–7)		2.17 ± 1.30		0.24 (< 0.001)
Optimistic attitude towards climate change response (range 2–10)		6.51 ± 1.91		0.14 (0.002)
Workplace climate friendliness (range 1–10)		2.64 ± 1.77		0.26 (< 0.001)
Awareness of climate change–coping facilitators (range 0–5)		2.08 ± 1.84		0.32 (< 0.001)
Awareness of climate change–coping barriers (range 0–5)		1.69 ± 1.02		−0.044 (0.331)

(Continues)

TABLE 1 | (Continued)

Characteristics	Categories	*n* (%) or mean ± SD	PBCH	
			mean ± SD	*t*/*r*/F (*p*)
Experience in setting climate change–health goals and strategies	Yes	213 (42.7)	79.96 ± 8.23	6.37 (< 0.001)
	No	286 (57.3)	74.88 ± 9.22	
Experience in monitoring and coping with climate change–health impact	Yes	217 (43.5)	80.20 ± 8.09	7.05 (< 0.001)
	No	282 (56.5)	74.63 ± 9.21	

Abbreviations: PBCH = perceptions and behaviours related to climate change and health, SD = standard deviation.
[a]Non-significant results in post hoc tests.

to climate change but is also affected by it (Dhillon and Kaur 2015), there is a need for efforts to increase the level of PBCH among nurses in hospitals, especially in efforts to lead to substantial behavioural change.

Commonly significant factors for PBCH in all groups in this study were the experience of extreme weather events (extreme heat, heavy precipitation, droughts, floods, typhoons/hurricanes, forest fires, and air pollution/particulate matter) and awareness of climate change-coping facilitators (concerns about natural disasters, concerns about the spread of infectious diseases, social justice/reducing inequality, prevention of property loss, and professional responsibility). These two variables also showed significance in the OLS regression, underscoring the importance of prioritising intervention strategies and policy approaches targeting the entire nursing workforce. Participants who experienced extreme weather events related to climate change exhibited higher levels of PBCH. This finding aligns with previous research (Howe 2021), suggesting that enhancing nurses' understanding of the relationship between extreme weather events and climate change could potentially contribute to improvements in PBCH. Strengthening the capacity of frontline nurses to address information regarding weather events in the workplace could serve as an efficient strategy for increasing their awareness of weather events. It is necessary to provide frontline nurses with knowledge that is generally accessible to the public as well as specific knowledge about their approach as healthcare professionals in the workplace.

High awareness of climate change-coping facilitators positively influenced PBCH, similar to findings from previous studies on nursing graduate students (Park et al. 2023). Many nurses were motivated by concerns about natural disasters (81.8%) and the spread of infectious diseases (61.9%). This suggests that nurses are concerned about the impact of climate change on human health and safety and are expected to act as healthcare professionals in response to these challenges. On the contrary, nurses were relatively less motivated by reducing inequality (25.5%), professional responsibility (21.2%), and preventing property loss (17.6%). Nurses need to recognise the negative impacts of climate change on the underlying socioeconomic reasons for their disproportionate and inequitable distribution (Nicholas and Breakey 2017). Education and training programs that link climate change-induced inequality, professional ethics inherent to nursing specialisation, and cost-effectiveness of climate change response are essential. By doing so, nurses can recognise various motivating factors across different domains, which can serve as a strategy for enhancing PBCH. Nevertheless, the relationship between awareness of climate change-coping facilitators and PBCH scores presents a bidirectional ambiguity that merits further investigation. It is unclear whether individuals with higher PBCH scores are more likely to be aware of these coping facilitators, or if increased awareness of these issues leads to higher PBCH scores. Understanding the directionality of this relationship is crucial for developing effective interventions. If the former is true, it would be essential to educate individuals about the broad impacts of climate change to enhance their PBCH. Conversely, if the latter is true, focusing on raising awareness of specific climate change-related issues could be more effective. We encourage further research investigating the directionality of these relationships.

In the 75th percentile group, having a religion, household income, and workplace climate friendliness significantly influenced PBCH. In this study, having a religion showed a higher level of PBCH, which differs from previous studies that identified non-religious people as more pro-environmental to a greater extent than those with religious affiliations (Morrison, Duncan, and Parton 2015). Given that religion was a significant factor only in the third quantile of this study, these results need to be interpreted in a cultural context as well as in various demographic characteristics. In groups with high levels of PBCH, religion could trigger pro-environmental actions. This result emphasises the importance of engaging religious organisations in encouraging changes in PBCH among their members in Korea.

Household income was also associated with PBCH. Pro-environmental behaviours cost money, and this financial burden acts as a major behavioural barrier (Huang, Wen, and Gao 2020). In addition to introducing low-cost behaviours related to reducing climate change, it is necessary to provide rewards such as carbon neutrality to encourage voluntary participation while reducing the financial burden.

The higher the workplace climate friendliness, the higher the level of PBCH among nurses in the third quantile, which is consistent with previous study (Anåker et al. 2015). Individuals tend to engage in problems related to their schools or institutions, not at the global or international level, when it comes to climate change (Anåker et al. 2015). The initiatives of the WHO and Health Care Without Harm encompass educating healthcare professionals about climate change issues; identifying potential

TABLE 2 | Mean scores of subcategories of K-CHANT ($N = 499$).

Subscales	Items	Mean ± SD	Min~Max	Out of 5 score
Awareness	4	16.83 ± 2.58	4~20	4.21 ± 0.66
Concern	5	21.09 ± 2.98	5~25	4.22 ± 0.60
Motivation	3	11.43 ± 2.24	3~15	3.81 ± 0.75
Behaviors at home	4	14.72 ± 2.67	4~20	3.68 ± 0.67
Behaviors at work	4	12.98 ± 2.87	5~20	3.25 ± 0.72
Total	20	77.05 ± 9.15	21~100	3.85 ± 0.46

Abbreviations: K-CHANT, Korean version of the Climate Health, and Nursing Tool; Max, maximum; Min, minimum; SD, standard deviation.

co-benefits of mitigation efforts; integrating sustainability practices into accreditation standards; and conducting comprehensive audits, measurements, and monitoring to reduce the carbon footprint of hospitals and healthcare systems. Nurses should be encouraged to achieve sustainability goals in climate-friendly workplaces. Motivation, concern, and behaviours at work are emphasised as key to achieving environmental sustainability in nursing (Chung, Lee, and Jang 2024). Understanding the influence and role of organisations in enabling individuals to undertake climate change behaviours at work is important (Magill et al. 2020). Future research should investigate nurses' perceptions of workplace climate friendliness and explore differences among various healthcare fields.

Experiences in monitoring and coping with climate change–health impact increased PBCH among nurses at the 50th and 75th percentiles. Climate change–health impact monitoring and coping include monitoring the symptoms of climate change-related diseases, such as heat- and cold-related illnesses, and preparing responses to extreme weather events. This is a role currently assigned to certain areas of nursing in South Korea, such as visiting nurses who provide health management and supplies to vulnerable groups during extreme weather conditions and emergency room nurses who report cases of heat-related and cold-related illnesses to the Korea Disease Control and Prevention Agency system (Korea Health Promotion Institute 2021). The results of this study suggest that having a sense of responsibility for these roles and actually performing them can be useful strategies for responding to climate change in the short and long term. Furthermore, it is expected that PBCH levels could be increased by providing opportunities to monitor and cope with climate change–health impacts, or by including content in institutional education and drills.

In the 25th percentile group, having a child, the number of sources for climate change–health-related information, and experience in setting climate change–health goals and strategies significantly influenced PBCH. Climate change poses an urgent threat to future generations (Sanson, Van Hoorn, and Burke 2019), and parents raising children in this era of climate change experience emotions such as sadness and anxiety concerning their children's future (Gaziulusoy 2020). These emotions can lead to higher PBCH levels. Providing education on the impact of climate change on children's health and actively implementing mitigation policies would be useful strategies to protect children's health and enhance PBCH levels among nurses with lower PBCH. Additionally, previous research indicates that people in households with members who have medical conditions and social vulnerabilities also perceive themselves as being at higher risk (Akerlof et al. 2015). In other words, the vulnerability of family members to climate change is linked to an increased perception of one's own vulnerability, which can impact PBCH. Until now, research on nurses' responses to climate change has primarily considered vulnerable groups as subjects within nursing practice (Leffers et al. 2017). However, since this study identified the presence of children among family members as a significant factor influencing PBCH, future research should explore vulnerable populations known for their susceptibility to the health impacts of climate change, such as the older adults, children, pregnant women, and those with underlying conditions, not only as recipients of nursing care but also as family members of nurses.

In this study, increased experience with climate change and health information from various sources was associated with higher levels of PBCH. However, exposure through nursing curricula and organisations was relatively low compared to that through government/public institutions and environmental/international organisations, similar to a previous study (Xiao et al. 2016). Therefore, there is a need for more proactive education in nursing programs to expand the diversity of informational experiences and improve PBCH. Although climate change–health education programs are gradually being offered through nursing organisations (Alliance of Nurses for Healthy Environments 2022; Nurses Climate Challenge 2022), most of these programs are conducted in English-speaking countries, creating a barrier for nurses in non-English-speaking countries to acquire information on the somewhat unfamiliar topic of climate change. Since climate change is a common health issue worldwide, information to improve nurses' PBCH should be actively provided across all nursing fields. Additionally, nursing schools and graduate programs should incorporate topics related to climate change and health into their educational curricula (Cruz, Alshammari, and Felicilda-Reynaldo 2018; Mitchell 2021).

Experience in setting climate change–health goals and strategies increased PBCH among nurses in the first and second quartiles. Setting goals and strategies can positively influence individual motivation and behaviour (Lunenburg 2011). Scholars in the fields of nursing and climate change also asserted that nurses should learn about the impacts of climate change and use this

TABLE 3 | Factors associated with PBCH ($n = 499$).

	OLS			QR 0.25			QR 0.50			QR 0.75		
Variables	***β***	**SE**	***p***	***β***	**SE**	***p***	***β***	**SE**	***p***	***β***	**SE**	***p***
Age	0.01	0.05	0.789	0.01	0.06	0.904	−0.04	0.06	0.316	−0.03	0.05	0.706
Having a child (Ref: no.)	0.69	0.93	0.461	2.48	1.01	0.006	1.57	1.16	0.197	−1.28	0.95	0.289
Having a religion (Ref: no.)	1.34	0.71	0.061	0.57	0.77	0.544	1.70	0.89	0.182	2.53	0.73	< 0.001
Household income	0.84	0.34	0.014	0.48	0.37	0.328	0.28	0.42	0.564	0.97	0.35	0.004
Experience of extreme weather events	0.56	0.09	< 0.001	0.57	0.09	< 0.001	0.47	0.11	0.002	0.56	0.09	< 0.001
Experience of climate change-related health problems	0.02	0.10	0.834	0.07	0.10	0.573	0.07	0.12	0.660	0.05	0.10	0.624
Number of sources for climate change–health-related information	0.83	0.28	0.003	0.60	0.31	0.019	0.35	0.35	0.355	0.59	0.29	0.250
Optimistic attitude towards climate change response	0.09	0.19	0.632	0.32	0.20	0.365	0.35	0.23	0.281	−0.19	0.19	0.427
Workplace climate friendliness	0.33	0.22	0.124	0.27	0.24	0.396	0.31	0.27	0.387	0.64	0.22	0.027
Awareness of climate change–coping facilitators	1.28	0.36	< 0.001	1.68	0.38	0.001	1.72	0.44	0.001	1.03	0.36	0.005
Experience in setting climate change–health goals and strategies (Ref: no.)	0.93	0.41	0.024	1.00	0.45	0.035	0.93	0.51	0.020	0.86	0.42	0.066
Experience in monitoring and coping with climate change–health impact (Ref: no.)	1.84	0.42	< 0.001	1.10	0.46	0.142	1.82	0.53	0.012	2.35	0.43	< 0.001
R^2 (adjusted R^2)	0.32 (0.31)			0.20			0.17			0.18		

Abbreviations: OLS = ordinary least squares, PBCH = perceptions and behaviours related to climate change and health, QR = quantile regression, R^2 = *R* square, Ref = reference, SE = standard error.

information as a skill to educate others to help protect health, and that thinking strategically about how to use nursing knowledge, interests, and diverse skill sets to optimise the benefits of action related to climate change is meaningful (Lokmic-Tomkins, Nayna Schwerdtle, and Armstrong 2023). Offering opportunities to nurses who do not have high PBCH levels to exercise leadership by devising appropriate goals and strategies related to climate change in the workplace can be beneficial for enhancing PBCH levels.

The finding that the experience of climate change-related health problems, either personally or through those close by, did not impact PBCH scores across all quantiles is significant. This may be because of the nature of how climate change affects health. The health impacts of climate change manifest not only through the development of new health issues directly but also by exacerbating existing health conditions (Centers for Disease Control and Prevention (US) 2024; Intergovernmental Panel on Climate Change 2021). Therefore, individuals are less likely to attribute their health outcomes solely to climate change. For instance, while extreme weather events are immediate and observable, making their impact on health more apparent, climate change-related health problems are often indirect and compounded by pre-existing conditions, leading to a lower perceived impact (Centers for Disease Control and Prevention (US) 2024). This highlights the need for more targeted education and awareness programs that clearly link climate change to specific health outcomes,

helping individuals recognise the broader and more indirect health impacts of climate change.

5.1 | Limitations and Recommendations for Further Research

Although the present study reveals important findings, it has some limitations. The study participants were limited to nurses in Korea, restricting the generalisability of the findings to other cultural contexts or populations. Further research in diverse settings is necessary to explore cultural differences in the perception and response to climate change among healthcare professionals. In addition, the assessment of workplace climate friendliness relied on self-report questionnaires. As a result, there may be differences between participants' perceived responses and the actual climate friendliness of their institutions. Future research is recommended to objectively examine the climate friendliness of healthcare institutions and investigate their association with nurses' PBCH levels.

Additionally, the discriminant validity of the tool used to measure PBCH, K-CHANT, was not fully achieved between the "behaviours at home" and "behaviours at work" factors. It would be beneficial for future research to incorporate items that can better capture the unique characteristics of nurses' behaviours at home and at work.

5.2 | Implications for Policy and Practice

By identifying the specific factors associated with PBCH at different quantile levels, future research can develop more comprehensive and practical strategies for responding to climate change. Specifically, this study confirms that workplace climate friendliness, awareness of climate change-coping facilitators, and experiences of monitoring and coping with climate change–health impacts at the workplace help improve PBCH levels in groups with higher PBCH. This suggests that providing nurses with roles related to climate change and health at the workplace, along with an environment and opportunities that promote these roles, can create a positive feedback loop through leadership. Establishing climate change response teams within the workplace and providing nurses with roles and support for climate change mitigation and adaptation can be useful methods (Sayre et al. 2010). To enhance and sustain these institutional-level climate change initiatives, policy support will be essential.

In addition, this study underscores that the experience of extreme weather events and awareness of climate change-coping facilitators significantly impact the PBCH levels of nurses across all quantiles, regardless of high or low PBCH levels. Therefore, policy support should prioritise providing opportunities for all nurses to gain experience and increase awareness of extreme weather and climate change coping strategies. Enabling healthcare systems to prepare for extreme weather events is crucial to addressing the health impacts of climate change (Kishore et al. 2018), and it will also contribute to improving nurses' PBCH by emphasising the link between extreme temperatures and climate change.

6 | Conclusion

This study highlights the significant role of nurses in responding to the health impacts of climate change. The experience of extreme weather events and awareness of climate change-coping facilitators were found to be crucial across all PBCH levels, emphasising the need for targeted interventions that prioritise these aspects. Different influencing factors were identified between high and low quantile PBCH groups, indicating that different approaches are necessary depending on the PBCH level, among nurses. By addressing both high and low PBCH levels, we can ensure that all nurses are equipped to mitigate the health risks posed by climate change, thereby protecting both human health and the environment.

Author Contributions

All authors have made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data. M.K.P., S.B., D.W.J., and G.S.K. contributed to conception, design, data analyse, and data interpretation; M.K.P., S.B., and D.W.J. collected the data, drafted the initial manuscript; G.S.K. reviewed and revised the manuscript and approved the final version of the article.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The datasets generated and/or analysed during the current study are not publicly available due to still being used for further analysis. However, upon approval of the final manuscript related to these data, they may be provided by the corresponding author upon reasonable request.

Statistics

The authors have checked to make sure that our submission conforms as applicable to the Journal's statistical guidelines described STROBE. The authors affirm that the methods used in the data analyses are suitably applied to their data within their study design and context, and the statistical findings have been implemented and interpreted correctly. The authors agree to take responsibility for ensuring that the choice of statistical approach is appropriate and is conducted and interpreted correctly as a condition to submit to the Journal.

References

Akerlof, K. L., P. L. Delamater, C. R. Boules, C. R. Upperman, and C. S. Mitchell. 2015. "Vulnerable Populations Perceive Their Health as at Risk From Climate Change." *International Journal of Environmental Research and Public Health* 12, no. 12: 15419–15433. https://doi.org/10.3390/ijerph121214994.

Alliance of Nurses for Healthy Environments. 2022. *Environmental Health in Nursing*. 2nd ed. Maryland Mount Rainier, MD: Alliance of Nurses for Healthy Environments. https://envirn.org/e-textbook.

Anåker, A., and M. Elf. 2014. "Sustainability in Nursing: A Concept Analysis." *Scandinavian Journal of Caring Sciences* 28, no. 2: 381–389. https://doi.org/10.1111/scs.12121.

Anåker, A., M. Nilsson, Å. Holmner, and M. Elf. 2015. "Nurses' Perceptions of Climate and Environmental Issues: A Qualitative Study." *Journal of Advanced Nursing* 71, no. 8: 1883–1891. https://doi.org/10.1111/jan.12655.

Baek, S., and C. Kim. 2019. "Variables Associated With Behavioral Intention of Elementary Students on Climate Change." *Journal Title* 32, no. 3: 348–360.

Buriro, N. A., S. Mureed, R. Kumar, F. Ahmed, K. Hussain, and A. Fatima. 2018. "Nurses' Perception, Knowledge and Information Sources on Climate Change and Health at Dow University Hospital Karachi." *Journal of Liaquat University of Medical & Health Sciences* 17, no. 4: 265–271. https://doi.org/10.22442/jlumhs.181740590.

Centers for Disease Control and Prevention (US). 2024. "Climate Effects on Health." https://www.cdc.gov/climateandhealth/effects/default.htm.

Chaiard, J., and S. Turale. 2022. "Nursing: The Critical Need to Address Climate Change and to Protect Health." *Journal of Nursing Scholarship* 54, no. 1: 5–6. https://doi.org/10.1111/jnu.12739.

Chung, S. J., H. Lee, and S. J. Jang. 2024. "Factors Affecting Environmental Sustainability Attitudes Among Nurses–Focusing on Climate Change Cognition and Behaviours: A Cross-Sectional Study." *Journal of Advanced Nursing* Online ahead of print: 1–12. https://doi.org/10.1111/jan.16205.

Cook, C., S. L. Demorest, and E. Schenk. 2019. "Nurses and Climate Action." *American Journal of Nursing* 119, no. 4: 54–60. https://doi.org/10.1097/01.NAJ.0000554551.46769.49.

Cruz, J. P., F. Alshammari, and R. F. D. Felicilda-Reynaldo. 2018. "Predictors of Saudi Nursing Students' Attitudes Towards Environment and Sustainability in Health Care." *International Nursing Review* 65, no. 3: 408–416. https://doi.org/10.1111/inr.12432.

Demorest, S., S. Spengeman, E. Schenk, C. Cook, and H. L. Weston. 2019. "The Nurses Climate Challenge: A National Campaign to Engage 5,000 Health Professionals Around Climate Change." *Creative Nursing* 25, no. 3: 208–215. https://doi.org/10.1891/1078-4535.25.3.208.

Dhillon, V. S., and D. Kaur. 2015. "Green Hospital and Climate Change: Their Interrelationship and the Way Forward." *Journal of Clinical and Diagnostic Research 89 Research: JCDR* 9, no. 12: LE01–LE05. https://doi.org/10.7860/JCDR/2015/13693.6942.

Dickman, E., C. Backler, C. D. Berg, M. Komandt, and J. Schiller. 2022. "Climate Change and Oncology Nursing: A Call to Action." *Clinical Journal of Oncology Nursing* 26, no. 1: 109–113. https://doi.org/10.1188/22.CJON.109-113.

Farrell, A. M., and J. M. Rudd. 2009. "Factor Analysis and Discriminant Validity: A Brief Review of Some Practical Issues." In *Proceedings of the Australia and New Zealand Marketing Academy Conference 2009*, edited by D. Tojib, 1–9. Melbourne, Australia: Promaco Conventions.

Fornell, C., and D. F. Larcker. 1981. "Evaluating Structural Equation Models With Unobservable Variables and Measurement Error." *Journal of Marketing Research* 18, no. 1: 39–50. https://doi.org/10.2307/3151312.

Gaziulusoy, A. İ. 2020. "The Experiences of Parents Raising Children in Times of Climate Change: Towards a Caring Research Agenda." *Current Research in Environmental Sustainability* 2: 100017. https://doi.org/10.1016/j.crsust.2020.100017.

Health Care Without Harm. 2019. "Health Care's Climate Footprint." https://noharm-global.org/documents/health-care-climate-footprint-report.

Herrmann, A., and R. Sauerborn. 2018. "General Practitioners' Perceptions of Heat Health Impacts on the Elderly in the Face of Climate Change—A Qualitative Study in Baden–Württemberg, Germany." *International Journal of Environmental Research and Public Health* 15, no. 5: 843. https://doi.org/10.3390/ijerph15050843.

Howe, P. D. 2021. "Extreme Weather Experience and Climate Change Opinion." *Current Opinion in Behavioral Sciences* 42: 127–131. https://doi.org/10.1016/j.cobeha.2021.05.005.

Huang, L., Y. Wen, and J. Gao. 2020. "What Ultimately Prevents the Pro-Environmental Behavior? An In-Depth and Extensive Study of the Behavioral Costs." *Resources, Conservation and Recycling* 158: 104747. https://doi.org/10.1016/j.resconrec.2020.104747.

Iira, T., M. L. Ruth, T. Hannele, J. Jouni, and K. Lauri. 2021. "Finnish Nurses' Perceptions of the Health Impacts of Climate Change and Their Preparation to Address Those Impacts." *Nursing Forum* 56, no. 2: 365–371. https://doi.org/10.1111/nuf.12540.

Intergovernmental Panel on Climate Change. 2021. "*The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Summary for Policymakers." In *Climate Change*. Geneva, Switzerland: Cambridge University Press.

Jeong, D. W., G. S. Kim, and M. K. Park. 2022. "Validity and Reliability of the Korean Version of the Climate, Health, and Nursing Tool." *Journal of Korean Academy of Nursing* 52, no. 2: 173–186. https://doi.org/10.4040/jkan.21211.

Karliner, J., S. Slotterback, R. Boyd, B. Ashby, and K. Steele. 2019. "Health Care's Climate Footprint: How the Health Sector Contributes to the Global Climate Crisis and Opportunities for Action." *Health Care Without Harm*. https://noharm-global.org/documents/health-care-climate-footprint-report.

Kim, S. Y., and S. H. Kim. 2016. "An Analysis of Determinants of Climate Change Awareness and Response Behavior." *Korean Journal of Public Administration* 54: 179–206.

Kishore, N., D. Marqués, A. Mahmud, et al. 2018. "Mortality in Puerto Rico After Hurricane Maria." *New England Journal of Medicine* 379, no. 2: 162–170. https://doi.org/10.1056/NEJMsa1803972.

Korea Health Promotion Institute. 2021. "The 5th National Health Promotion Comprehensive Plan [Health Plan 2030, 2021~2030]." *Korea Health Promotion Institute*. https://www.khealth.or.kr/healthplan2020.

Kotcher, J., E. Maibach, J. Miller, et al. 2021. "Views of Health Professionals on Climate Change and Health: A Multinational Survey Study." *Lancet Planetary Health* 5, no. 5: e316–e323. https://doi.org/10.1016/S2542-5196(21)00053-X.

Krejcie, R. V., and D. W. Morgan. 1970. "Determining Sample Size for Research Activities." *Educational and Psychological Measurement* 30, no. 3: 607–610. https://doi.org/10.1177/001316447003000308.

Kurth, A. E. 2017. "Planetary Health and the Role of Nursing: A Call to Action." *Journal of Nursing Scholarship* 49, no. 6: 598–605. https://doi.org/10.1111/jnu.12343.

Leffers, J., R. M. Levy, P. K. Nicholas, and C. F. Sweeney. 2017. "Mandate for the Nursing Profession to Address Climate Change Through Nursing Education." *Journal of Nursing Scholarship* 49, no. 6: 679–687. https://doi.org/10.1111/jnu.12331.

Lokmic-Tomkins, Z., P. Nayna Schwerdtle, and F. Armstrong. 2023. "Engaging With Our Responsibility to Protect Health From Climate Change." *Journal of Advanced Nursing* 79, no. 6: e41–e44. https://doi.org/10.1111/jan.15508.

Lunenburg, F. C. 2011. "Goal-Setting Theory of Motivation." *International Journal of Management, Business, and Administration* 15, no. 1: 1–6.

Magill, M. S., P. R. Yost, B. Chighizola, and A. Stark. 2020. "Organizational Climate for Climate Sustainability." *Consulting Psychology Journal: Practice and Research* 72, no. 3: 198–222. https://doi.org/10.1037/cpb0000163.

Mitchell, P. H. 2021. "Nursing's Mandate in Climate Change." *International Nursing Review* 68, no. 3: 279–280. https://doi.org/10.1111/inr.12704.

Morrison, M., R. Duncan, and K. Parton. 2015. "Religion Does Matter for Climate Change Attitudes and Behavior." *PLoS One* 10, no. 8: e0134868. https://doi.org/10.1371/journal.pone.0134868.

Nicholas, P. K., and S. Breakey. 2017. "Climate Change, Climate Justice, and Environmental Health: Implications for the Nursing Profession." *Journal of Nursing Scholarship* 49, no. 6: 606–616. https://doi.org/10.1111/jnu.12326.

Nsengiyumva, R., M. R. Mukarubayiza, C. Murekatete, and P. Meharry. 2020. "Climate Change Associated With Neonatal Health Risks: Rwandan Nurses and Midwives' Awareness and Perceptions." *Rwanda Journal of Medicine and Health Sciences* 3, no. 2: 261–272. https://doi.org/10.4314/rjmhs.v3i2.15.

Nurses Climate Challenge. 2022. "Taking Action on Climate Change: A Guide for Health Professionals at Work." https://us.nursesclimatechallenge.org/resources.

Park, M. K., S. Baek, D. W. Jeong, and G. S. Kim. 2023. "Factors Influencing Nursing Graduate Students' Perception and Behavior Related to Climate Change and Health: A Secondary Data Analysis." *Korean Journal of Adult Nursing* 35, no. 1: 71–83. https://doi.org/10.7475/kjan.2023.35.1.71.

Petscher, Y., and J. A. R. Logan. 2014. "Quantile Regression in the Study of Developmental Sciences." *Child Development* 85, no. 3: 861–881. https://doi.org/10.1111/cdev.12190.

Rempel, H., M. R. Kalogirou, S. Dahlke, and K. F. Hunter. 2025. "Understanding Nurses' Experience of Climate Change and Then Climate Action in Western Canada." *Journal of Advanced Nursing* 81, no. 12: 8182–8190. https://doi.org/10.1111/jan.16094.

Romanello, M., C. Di Napoli, P. Drummond, et al. 2022. "The 2022 Report of the Lancet Countdown on Health and Climate Change: Health at the Mercy of Fossil Fuels." *Lancet* 400, no. 10363: 1619–1654. https://doi.org/10.1016/S0140-6736(22)01540-9.

Sanson, A. V., J. Van Hoorn, and S. E. L. Burke. 2019. "Responding to the Impacts of the Climate Crisis on Children and Youth." *Child Development Perspectives* 13, no. 4: 201–207. https://doi.org/10.1111/cdep.12342.

Sarfaty, M., B. Bloodhart, G. Ewart, et al. 2015. "American Thoracic Society Member Survey on Climate Change and Health." *Annals of the American Thoracic Society* 12, no. 2: 274–278. https://doi.org/10.1513/AnnalsATS.201410-460BC.

Sarfaty, M., M. Mitchell, B. Bloodhart, and E. W. Maibach. 2014. "A Survey of African American Physicians on the Health Effects of Climate Change." *International Journal of Environmental Research and Public Health* 11, no. 12: 12473–12485. https://doi.org/10.3390/ijerph111212473.

Sayre, L., N. Rhazi, H. Carpenter, and N. L. Hughes. 2010. "Climate Change and Human Health: The Role of Nurses in Confronting the Issue." *Nursing Administration Quarterly* 34, no. 4: 334–342. https://doi.org/10.1097/NAQ.0b013e3181f60df9.

Schenk, E. C., C. Cook, S. Demorest, and E. Burduli. 2020. "CHANT: Climate, Health, and Nursing Tool: Item Development and Exploratory Factor Analysis." *Annual Review of Nursing Research* 38, no. 1: 97–112. https://doi.org/10.1891/0739-6686.38.97.

Schenk, E. C., C. Cook, S. Demorest, and E. Burduli. 2021. "Climate, Health, and Nursing Tool (CHANT): Initial Survey Results." *Public Health Nursing* 38, no. 2: 152–159. https://doi.org/10.1111/phn.12864.

Shapira, S., M. Friger, Y. Bar-Dayan, and L. Aharonson-Daniel. 2019. "Healthcare Workers' Willingness to Respond Following a Disaster: A Novel Statistical Approach Toward Data Analysis." *BMC Medical Education* 19, no. 1: 130. https://doi.org/10.1186/s12909-019-1561-7.

Stern, P. C. 2000. "New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior." *Journal of Social Issues* 56, no. 3: 407–424. https://doi.org/10.1111/0022-4537.00175.

Sussman, R., R. Gifford, and W. Abrahamse. 2016. *Social Mobilization: How to Encourage Action on Climate Change*, 134. Victoria, British Columbia: Pacific Press Institute for Climate Solutions.

Watts, N., M. Amann, N. Arnell, et al. 2021. "The 2020 Report of the Lancet Countdown on Health and Climate Change: Responding to Converging Crises." *Lancet* 397, no. 10269: 129–170. https://doi.org/10.1016/S0140-6736(20)32290-X.

Winquist, A., E. C. Schenk, C. Cook, S. Demorest, and E. Burduli. 2023. "Climate, Health, and Nursing Tool (CHANT): A Confirmatory Factor Analysis." *Public Health Nursing* 40, no. 2: 306–312. https://doi.org/10.1111/phn.13161.

World Health Organization. 2019. "Ten Threats to Global Health in 2019." WHO. https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019.

Xiao, J., W. Fan, Y. Deng, S. Li, and P. Yan. 2016. "Nurses' Knowledge and Attitudes Regarding Potential Impacts of Climate Change on Public Health in Central of China." *International Journal of Nursing Sciences* 3, no. 2: 158–161. https://doi.org/10.1016/j.ijnss.2016.04.002.

Supporting Information

Additional supporting information can be found online in the Supporting Information section.