

**Assessing Advanced Care Provider Awareness, Motivations, and Behaviors Related to
Climate Change and Health**

by

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Abstract

A review of a local healthcare system identified the need for determining what barriers hinder advanced care provider (ACP) participation in climate change initiatives. The Climate and Health Tool was used to survey ACPs and provided valuable insight into developing a change proposal to increase ACP participation in climate change solutions. Increasing participation in pro-climate behaviors related to mitigating the direct and compound effects of climate change on health will improve patient outcomes. ACPs have an opportunity to improve patient outcomes and decrease unsustainable healthcare expenditures through improved patient education regarding actions that individuals can take to reduce their risk of exposure to the effects of climate change. Determining what barriers deter participation in climate change initiatives helps identify solutions to overcome the lack of involvement and motivation of engaging in behaviors that combat the effects of climate change on human health.

Keywords: advanced care provider, climate change, global warming, health, healthcare providers, healthcare professionals, role, curriculum, initiative, and intervention

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Assessing Advanced Care Provider Awareness, Motivations, and Behaviors Related to Climate Change and Health

Planetary health affects population and individual health. Scientists have been warning for decades that climate change, mainly due to greenhouse gases produced by human behaviors, would have widespread effects on the Earth (Jackson, 2021). The World Health Organization estimates 250,000 additional deaths per year due to the impacts of climate change between the years 2030 and 2050 (World Health Organization, 2021). As temperatures continue to rise, precipitation patterns will change, bringing heavy rains and more droughts, heatwaves, stronger and more frequent hurricanes, an ice-free Arctic Ocean, and rising sea levels (Jackson, 2021). Mortality associated with extreme weather events, respiratory and cardiovascular conditions related to poor air quality, food-and-water borne illnesses, infectious diseases, and mental health consequences is rising due to the changing climate (Centers for Disease Control and Prevention, 2021). Healthcare providers must be aware of the changing climate and the impacts that it has on patient health.

There are many examples around the globe of how increased temperatures affect health. In Maricopa County, Arizona, increased temperatures are significantly associated with all-cause mortality, cardiovascular mortality, heat-related mortality, and the number of hospital visits for heat-related illnesses (Petitti et al., 2016). Increased temperatures also create challenges for farming practices and lead to undernourished children for the population in rural Burkina Faso, Africa, who depend on agricultural practices for nourishment (Belesova et al., 2017). In Philadelphia, Pennsylvania, the increase in minimum daily temperatures is associated with an increased risk of infant mortality, disproportionately affecting lower socioeconomic status

families (Schinasi et al., 2020). There are health implications and demands on our healthcare systems as temperatures continue to rise and heat records are broken.

Air quality is another component of climate change that has detrimental health impacts. Poor air quality is directly related to human morbidity and mortality (Mendes, 2018; Polivka, 2018). The number of patients with acute respiratory ailments is correlated with the level of air pollution on that day (Yalniz et al., 2020). The report by the Medical Society Consortium on Climate and Health Wisconsin Health Professionals for Climate Action revealed that total annual national health costs in 2020 for conditions related to breathing in air pollution as a result of burning fossil fuels triggering respiratory and cardiovascular disease were \$820 billion (about \$2,500 per person in the United States). The \$820 billion accounts for costs related to hospitalizations, premature deaths, injuries, mental health complications, missed days of work, lost wages, and downstream health costs from air pollution. Total annual health costs due to ozone smog pollution, which exacerbates asthma and may contribute to the negative cardiovascular, metabolic, nervous system, and reproductive health outcomes, is \$7.9 billion. An additional \$11.4 million annually is due to rising temperatures and carbon dioxide levels, which intensify allergenic pollens and cause asthma-related healthcare visits (Alwis & Limaye, 2021). Poor air quality is not only a global problem, but also a local problem related to wildfire smoke with air quality index levels that are dangerous for all individuals.

Developing countries, disadvantaged communities, and low-income families are unduly affected by the detriments of climate change. The individuals who generally contribute the least to the causes of the climate crisis are often the ones most affected by the changing climate (World Health Organization, 2021). As more disruptions to our biological world occur, the climate crisis threatens existing health inequalities between communities (World Health

Organization, 2021). The health effects of climate change contribute to disease burden and increase demands on healthcare systems across the globe (Jiang et al., 2022; Yalniz et al., 2020). It is a public health responsibility for healthcare providers to be informed about the health impacts of climate change, engage in climate change initiatives, and alert patients, communities, and decision-makers to safeguard patients' health across the globe (Harvard T.H. Chan School of Public Health, 2022). In addition to the preventable health effects of climate change, there is also significant financial benefit from sustainability measures. In the review of the local healthcare system, the director of sustainability identified annual cost savings for sustainability initiatives ranging from \$500,000 to \$1.2 million per year (S.E. Wohlford, personal communication, October 18, 2022). Efforts must be placed on mitigation strategies to protect population health from the effects of climate change that are occurring in communities across the globe.

Specific Aims/Purpose

The purpose of this project was to evaluate key barriers, attitudes, and beliefs that prevent advanced care providers from participating in climate change initiatives and develop a change proposal to increase provider participation in climate change initiatives.

Project Question

What critical barriers, attitudes, and beliefs deter advanced care providers' participation in climate change initiatives promoting pro-climate behaviors to protect population health from the detrimental effects of climate change?

Theoretical Framework

This project aimed to survey advanced care providers of a healthcare system consisting of multiple hospitals and community settings to assess the barriers to provider involvement in hospital climate change initiatives. A key component of the evaluation tool used in this study

provided sight into how to formulate the change proposal (Schenk et al., 2021). Kurt Lewin's Three Stages of Change model provided a theoretical framework for a planned approach to an organizational change, which occurs in three stages. The three stages of Lewin's change model are unfreezing, changing, and refreezing (Hussain et al., 2018). The first stage is the unfreezing phase, which involves preparing individuals by improving readiness and willingness to change. The second stage is the transitional stage, where the change happens, which relies on planning and strong communication to implement the recommended change (Sarayreh et al., 2013). The final stage is the refreezing stage, in which people return to a state of operation with the new adoption of the change (Sarayreh et al., 2013). This model helps transform individuals' attitudes and behaviors, organizational systems and processes, and the culture of practice.

Following a theoretical framework when developing a change proposal is crucial for success. The primary consideration is that change is often met with resistance because individuals find the adjustment period uncomfortable. Lewin's change model provides the perspective that there is a baseline way of functioning, and after an implemented change, there will be a return to a different baseline way of functioning. The refreezing stage is a return to a new usual way of operation and will be the new standard of comfort going forward with improvements to the process (Sarayreh et al., 2013). Lewin's change model provided guidance for proposing a change and establishing realistic stages for the affected individuals.

Definition of Keywords

Key terms utilized in this literature review include *advanced care provider, climate change, global warming, health, healthcare providers, healthcare professionals, role, curriculum, initiative, and intervention.*

- *Advanced care provider* is a type of healthcare provider, specifically representing nurse practitioners, physician associates, clinical nurse specialists, audiologists, clinical psychologists, midwives, and neurophysiologists.
- *Climate change* is “a change in global or regional climate patterns, in particular, a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels” (Oxford English Dictionary, n.d.).
- *Global warming* is “an increase in the earth’s atmospheric and oceanic temperatures widely predicted to occur due to an increase in the greenhouse effect resulting especially from pollution” (Merriam-Webster, n.d.).
- *Health* is used to mean freedom from physical disease or pain and being in sound body, mind, and spirit (Merriam-Webster, n.d.).
- *Healthcare provider* is used to represent any provider of healthcare involved in diagnosing disease, including medical doctors, doctors of osteopathic medicine, advanced practice registered nurses, and physician associates.
- *Healthcare professionals* include any individual working for the healthcare organization involved in direct or indirect patient care.
- *Role* is used to mean “a function or part performed especially in a particular operation or process” (Merriam-Webster, n.d.).
- *Curriculum* is used to mean a set of courses constituting an area of specialization, entailing medical training offered by educational institutions for the purposes of this project.

Summary

The effects of climate change are detrimental to human health. The reliance on fossil fuels for energy has compromised the protective ozone layer high in the atmosphere and accelerated global warming (Shaftel, 2021). More frequent and devastating disruptions to our biological world will occur as temperatures rise (Centers for Disease Control and Prevention, 2021). As the health effects of climate change are becoming more apparent across the globe, healthcare providers must be aware of this indubitable component of health and be prepared to act (Harvard T.H. Chan School of Public Health, 2022). Healthcare provider knowledge is crucial for proper patient education on relevant preventative health measures and public understanding (Harvard T.H. Chan School of Public Health, 2022). Yet, one of the most underlying and overarching disparities in human health is not a standard part of healthcare provider training and, as a result, is not incorporated into patient education (Valois et al., 2016). This gap in practice contributes to a lack of public health awareness, compounding the detrimental effects of climate change on human morbidity and mortality (Völker & Hunchangsith, 2018). There is an opportunity for increased healthcare provider knowledge and involvement in the realm of climate change and human health.

The negative health consequences of climate change create an influx of patients seeking medical care. This influx of patients increases the demands on healthcare systems and leads to increased healthcare-related expenditures (Polivka, 2018; World Health Organization, 2021). Healthcare provider awareness of the health effects of climate change is imperative to promote pro-climate behaviors that improve population health outcomes (Harvard T.H. Chan School of Public Health, 2022). This project evaluates what barriers hinder advanced care providers from participating in climate change initiatives and incorporating pro-climate knowledge into practice. The information gleaned from the survey was used to develop a change proposal following Kurt

Lewin's Three Stages of Change model to address strategies to overcome barriers to participation in climate change initiatives. Improved healthcare provider engagement in pro-climate behaviors can reduce hospital visits and hospitalizations related to negative consequences of climate change through increased patient education on risk reduction measures and has the potential to save billions of dollars in the related total annual health costs due to the effects of climate change.

Chapter 2: Integrated Review of the Literature

This literature review focused on translating strategies to mitigate the effects of climate change on health into the healthcare system and on identifying the barriers healthcare providers face when incorporating such strategies into practice. The Cumulative Index to Nursing and Allied Health Literature and PubMed database sources were used to search for pertinent keywords. Varying combinations of the keywords were used to yield more specific results. Medical subject heading terms were reviewed to determine applicability to the purpose of the literature review. Initially, an advanced search was set to after 2017; however, due to the limited interventional studies and the vast lack of research on healthcare provider participation in climate change initiatives, the date range was modified to the past 10 years to yield more results. The data for climate change related to population health is emerging as the health effects of climate change are manifesting. Only articles in the English language or with a translated version available with available full-text publications were included. Results included meta-analyses, systematic reviews, peer-reviewed journal articles, surveys, descriptive, qualitative, and mixed-method studies. Search results were analyzed for topic relevance and the inclusion criteria of articles available in English and published since 2002. Exclusion criteria consisted of articles that only focused on climate change but did not include the component of human health. Articles that

were about the health of other species were not included. The selected articles were reviewed and divided into three significant concepts based on the following themes that emerged that support this project's goals: the effects of climate change on human morbidity and mortality, healthcare provider awareness of the topic, and climate change curriculum.

Effects of Climate Change on Human Health

The first theme of the literature review is the effects of climate change on human health. Globally, there is a direct relationship between rising temperatures and morbidity (Belesova et al., 2017; Estrella et al., 2019; Jiang et al., 2022; Pelletier et al., 2017; Yalniz et al., 2020). There is also a direct relationship between rising temperatures and mortality (Petitti et al., 2016; Schinasi et al., 2020). In Maricopa County, Arizona, increased temperatures correlated with increased all-cause mortality, heat-related mortality, and heat-related illnesses (Petitti et al., 2016). In Philadelphia, Pennsylvania, increased minimum daily temperatures increase the risk of infant mortality, disproportionately affecting lower socioeconomic families without adequate air conditioning (Schinasi et al., 2020). In Burkina Faso, Africa, rising temperatures are challenging traditional farming practices and causing the younger generation of children to be undernourished. Rising temperatures create a humanitarian issue as people are forced to migrate to survive off land that is no longer inhabitable due to the harsh conditions and land that is no longer suited for farming (Belesova et al., 2017). Rising temperatures are detrimental to human health across the globe.

Air quality is another component of climate change that has detrimental health impacts. A study based in Canada found that young healthy adults within 5 km of a steel mill had alterations in urinary biomarkers of oxidative cell stress. Living near exposure sites subjects individuals to increased air pollution, which has detrimental systemic effects on a cellular level (Pelletier et al.,

2017). In Izmir, Turkey, Yalniz et al. (2020) found a significant increase in respiratory diseases on days when the particulate matter in the air was high. On days with high levels of air pollution, there was an increased incidence in children with acute upper respiratory infections and acute bronchitis and an increase in chronic respiratory disease exacerbations in the elderly group (Yalniz et al., 2020). In Sichuan, China, Jiang et al. (2022) found short-term exposure to air pollutants was associated with increased hospital admission for coronary heart disease. A 5-year air quality management project in Quito, Ecuador, has decreased traffic-related air pollution and has found a lower incidence of respiratory illnesses in school-aged children (Estrella et al., 2018). Evidence demonstrates individuals seeking medical care due to exacerbations of acute and chronic respiratory conditions are directly related to poor air quality.

The healthcare system established to protect and promote health is a major contributor to the problem. The U.S. healthcare system is responsible for a quarter of all global healthcare-related greenhouse gas emissions, making it the leading healthcare-related contributor in the world and the seventh-largest producer of carbon dioxide worldwide (Eckelman et al., 2020). Those who contribute the least to the problem are often those affected the most by the impacts of climate change (Belesova et al., 2017). The impact of our practices, or lack thereof, has a global impact.

Healthcare Provider Awareness

Research has concluded that a significant barrier to addressing climate change is a lack of knowledge. Völker and Hunchangsith (2018) utilized a mixed-methods approach to determine if physicians assess patients' environmental history and provide environmental health education or recommendations that link the ecosystem to health. The study found physician engagement in the behavior was associated with the level of knowledge on the subject (Völker & Hunchangsith,

2018). The more informed an individual is on this topic, the more likely the individual will be motivated to engage in climate advocacy.

There is inadequate education on the topic of climate change and health and gaps between current knowledge of healthcare providers and desired competency level on the subject (Kemper & Etzel, 2020; Valois et al., 2016; Wortzel et al., 2022). Kemper and Etzel (2020) selected a group of pediatricians to conduct a pilot study evaluating the feasibility of surveying physicians regarding climate change advocacy in clinical practice. The study found that most physicians felt responsible for understanding the impact of climate change on health; yet, only half of the participants had received education on the topic and were engaging in climate advocacy. The authors stated the act of completing a survey is an intervention as reading and answering questions related to the topic increases participants' awareness (Kemper & Etzel, 2020). Similarly, Valois et al. (2016) used a mixed-methods approach with a competency framework and questionnaire to conduct a needs assessment to prioritize the educational needs of physicians regarding the health impacts of climate change and participation in continuing medical education activities. The findings identified gaps between the current knowledge of healthcare providers and the desired level of competency about the health impacts of climate change (Valois et al., 2016). Wortzel et al. (2022) addressed the environmentally unsustainable behaviors, attitudes, and beliefs physicians are socialized to accept and adopt through medical training. In a sample of 400 healthcare personnel, 80% identified climate change as relevant to patient care, yet only 30% knew what their hospitals were doing to address the problem (Wortzel et al., 2022). Nearly half of the respondents reported not knowing how to address climate change with patients. Others reported feeling powerless, not having enough time, feeling morally distressed, or in denial, while some believe that providing adequate healthcare sacrifices

environmental consciousness (Wortzel et al., 2022).

In contrast to the previous studies sampling physicians, Chenven & Copeland (2013) included front-line environmental services staff in implementing a training program that supported a systems change to reduce waste and decrease the use of chemicals for cleaning. The study found it empowered the staff to support environmental sustainability measures that lowered the carbon footprint, increased cost savings for the institution, and supported the community from a planetary view with a triple bottom line outcome (Chenven & Copeland, 2013). The theme of healthcare provider awareness supports the project by emphasizing the importance of hospital staff awareness as an integral part of pro-climate change behaviors to decrease waste, decrease costs, and support population health.

Climate Change Initiatives

Incorporating the climate change topic into curricula and training increases pro-climate attitudes and behaviors (Cruz et al., 2018; Grabow et al., 2018; Richardson et al., 2017). Cruz et al. (2018) conducted a cross-sectional descriptive analysis to assess the factors influencing nursing students' attitudes toward climate change and the topic's inclusion in nursing curricula. Introducing the topic of climate change relating to health helped nursing students develop critical thinking skills as climate change threatens the supply of resources and requires adaptive healthcare delivery systems (Cruz et al., 2018). Richardson et al. (2017) used a similar approach to measure the impact of scenario-based learning activities on the attitudes of student nurse-midwives. The study demonstrated the students had greater awareness and knowledge of sustainability measures that are clinically relevant to the impacts of climate change on health (Richardson et al., 2017). In contrast, Grabow et al. (2018) did not sample healthcare students, but rather constituents of Madison, Wisconsin, representing the population of that community.

The study evaluated the feasibility of mindfulness-based climate action training to reduce the participants' carbon footprint while supporting personal health (Grabow et al., 2018).

Research demonstrates climate change is detrimental to human health, as evidenced by the first identified theme of this literature review. Healthcare provider awareness of the subject determines engagement in pro-climate behaviors, including linking a patient's ecosystem to health outcomes (Völker & Hunchangsith, 2018). The theme of climate change curriculum supports the project by demonstrating that applicable curriculum for healthcare providers and training for constituents ensure exposure to the topic of climate change and health, which increases knowledge to improve population health behaviors and outcomes.

Strengths of the Evidence

The studies provide robust evidence that climate change is detrimental to human health, yet there are ways to mitigate the effects of climate change. Increasing healthcare provider awareness increases the likelihood of patient education on the subject (Völker & Hunchangsith, 2018). The studies' breadth represents nursing students, physicians from various disciplines, and constituents of a local community, which implies a comprehensive need for education and training.

Limitations in the Evidence

Many of the studies evaluate the impact of climate change on health and do not evaluate the outcome of a healthcare provider's involvement in pro-climate initiatives. The implications of climate change on health are often vast and compound. Measuring the positive impact of one intervention on a health outcome is difficult to ascertain due to the cumulative contributors to climate change, which may be a reason for limited research on the subject.

Gap Identification and Project Applicability

There is a large amount of evidence demonstrating the negative health consequences of climate change. These negative consequences vary from malnutrition due to compromised crop resources from warming temperatures to airway inflammation from poor air quality, raising blood pressure, and exacerbating respiratory illnesses (Belesova et al., 2017; Mendes, 2018; Polivka, 2018). The data support these health consequences and propose solutions; however, there is a gap in the literature on how healthcare providers translate this information into practice to improve patient outcomes (Valois et al., 2016). A needs assessment may identify key barriers to healthcare provider participation in climate change initiatives and serve as the foundation for solutions to promote increased healthcare provider participation, and in turn, population health.

There is also limited evidence on healthcare provider attitudes and beliefs on the topic. Kearney and Bell (2019) identified the southeastern United States as more vulnerable to climate change due to its geographic location and the high poverty level. Constituents of counties in the southeastern United States below the national poverty level, including Virginia, are significantly less likely to believe that global warming was occurring (Kearney & Bell, 2019).

Summary

A thorough review of the literature supports the impacts of climate change on population health and the healthcare provider's role in mitigating such effects. For a healthcare provider to influence patient outcomes related to climate change, the healthcare provider must be aware of the problem, which increases motivation and engagement in pro-climate behaviors (Völker & Hunchangsith, 2018). Increased healthcare provider awareness improves patient outcomes by considering the patient's environment as a direct health factor (Völker & Hunchangsith, 2018). Increased healthcare provider awareness and population health awareness influence pro-climate behaviors with direct and compound positive outcomes (Chenven & Copeland, 2013). Surveying

providers to identify barriers to participation in hospital-wide climate change initiatives is the first step in increasing healthcare provider awareness. Healthcare providers and population health awareness are imperative to prevent and mitigate the effects of climate change on population health.

Chapter 3: Methods

Design

This project aimed to identify barriers, attitudes, and beliefs that prevent advanced care provider participation in climate change initiatives in a healthcare system by surveying providers for key barriers and developing a change proposal to decrease identified barriers to participation. The findings can be used to foster awareness and motivate ACPs to engage in conversations with colleagues and patients about climate change and health. The expected outcome of this project was to identify the barriers to ACP engagement and motivation and tailor interventions of change to increase participation in climate change solutions within the hospital.

This project utilized a descriptive design to assess ACPs' perception of barriers to participation in climate change initiatives, specifically in the interest of population health. The descriptive design method does not include any manipulation of the environment or intervention, but instead serves to gather information reflective of a sample.

Project Sample

The population of interest included English-speaking advanced care providers over 18 years old. The target sample population encompassed 558 individuals including nurse practitioners, physician associates, clinical nurse specialists, audiologists, clinical psychologists, midwives, and neurophysiologists. The participants were recruited from an extensive healthcare system consisting of multiple hospitals and outpatient facilities in collaboration with the organization's efficiency and sustainability program manager, who leads various educational sessions with healthcare professionals to promote environmental stewardship and community engagement. The sampling method used in this project was convenience sampling. The survey was distributed via the ACPs' institutional email for voluntary participation.

Protection of Human Subjects

The study was based on voluntary and anonymous participation through an invitation to participate in the survey sent to the participant's institutional email addresses. Collected data did not contain personally identifiable information and did not include "Protected Health Information." No access to identifiable data will be available. There was no direct contact or interaction with any of the subjects. The study's principal investigator and co-investigator were up to date on the Collaborative Institutional Training Initiative requirements.

To address the research questions, the results were described using summary statistics of the Likert scales assessed in the survey. The participants remained anonymous and could skip questions or select "prefer not to answer" if they wished to do so. These variables were summarized overall. The data was reported in frequencies, and it could not be extracted to determine the correlation of responses for each respondent. No human specimens were utilized in this study. The study solely collected anonymous survey responses to analyze our population of interest.

Instruments

An appropriate tool for this study was the Climate and Health Tool (CHANT). The lead author and principal investigator of the CHANT, Elizabeth Schenk, a research professor at Washington State University College of Nursing, granted permission to use CHANT for this project (Appendix C). The CHANT has been used in similar studies related to climate change and healthcare providers' awareness (Fasching Maphis, 2020). A 10-person panel of content experts, including nurses, a physician, and a psychometrician, developed the instrument (Schenk et al., 2019).

The CHANT uses a Likert scale instrument for ordinal levels of measurement and is a psychometrically validated instrument for measuring healthcare providers' awareness, concern, motivation, and engagement in personal and professional practice strategies (Schenk et al., 2021). Psychometrics of the tool include exploratory factor analysis, retaining five-factor model demonstrated comparative fit index (CFI) = .95, root mean square errors of approximation (RMSEA) = .04, standardized root mean square residual (RMSR) = .09, and demonstration of subscale internal consistency with Cronbach's alpha > 0.70 (Schenk et al., 2020, p. 97). Cronbach's alpha is frequently used to assess the reliability, or internal consistency, especially when using multiple Likert scale questions (Cruz et al., 2018; Richardson et al., 2017). It is necessary to ensure instrument reliability and validity for the research project to be robust and dependable.

Procedures

A link to participate in the CHANT was distributed via email to advanced care providers and clinical nurse specialists. The email contained a link to the Climate and Health Tool (CHANT) with a short alphanumeric code to maintain anonymity. This code was specific to the survey episode for this project. The lead author and principal investigator of CHANT, Elizabeth Schenk, Ph.D., MHI, RN-BC, FAAN Assistant Research Professor, Washington State University College of Nursing, has provided written approval for the use of CHANT for this project.

The link to the survey with the specific code was disseminated to the target population and remained open for participation for one month. There were two \$50 incentive drawings for participation. The \$100 total was provided from the co-investigator's, Lindsey Hill's, personal funds. Individuals who wished to be entered into the randomized drawing must have responded to the email after completing the survey indicating that they wished to be entered into the \$50

drawings. It did not commit them to participation in climate change solutions or compromise their anonymity of responses.

Data Management and Analysis

Washington State University (WSU) managed data collection for the CHANT using Qualtrics (www.qualtrics.com). The averages and frequencies of the responses were determined using Qualtrics. The survey responses were collected and stored as unidentifiable data in Qualtrics through the WSU Statistics Department. Once the survey link expired, unidentifiable results could be reviewed and downloaded through the Qualtrics platform. WSU provided the project's co-investigator with a link to Qualtrics with specific access to the responses from the project's survey code. This link allowed access to monitor responses and download the results when data collection was complete for analysis.

A change proposal was developed after the data analysis phase was complete based on the findings from the survey results. The project's principal investigator and co-investigator discussed the findings and developed recommendations based on the current literature. The findings and recommendations will be presented to ACP leaders within the hospital system.

Chapter 4: Results

Description of the Sample

The sample size of 89 advanced care providers included nurse practitioners, physician associates, clinical nurse specialists, audiologists, clinical psychologists, midwives, and neurophysiologists. An invitation to participate in the survey was distributed to 517 individuals; 89 individuals participated in the survey, which yields a 17.2% response rate. Out of the 89 individuals who participated in the survey, 82.89% identify as female, 14.47% identify as male, and 2.63% chose not to respond. Those identifying as White/Caucasian include 93.42% of the

responses; 1.32% identify as African American, 1.32% identify as Asian, 1.32% identify as American Indian or Alaska Native, and 2.63% as “other.” Only 5.26% of respondents identify as Hispanic/Latino ethnicity; 94.74% do not identify as Hispanic/Latino ethnicity.

When asked “What is your current professional role,” 82.42% indicated direct care/clinical, 7.69% in administration/leadership, 2.20% in quality/research, 6.59% are faculty, and 1.10% reported “other.” About half of the respondents, 51.32% indicated that they work in outpatient care, 43.42% in the hospital/acute care setting, 1.32% in long-term care, 1.32% in a college or university setting, and 2.63% in a community setting. The respondents’ age ranges from 25 years to 65 years old. The mode of the data is age 38, or 6.67% of the respondents.

The major themes of the results will be summarized in this section, but the full report of findings can be found in Appendix B. As shown in Figure 1, when asked to indicate the level of familiarity with the statement, “Health care delivery is responsible for approximately 8.5% of total greenhouse gas emissions in the US that contribute to warming,” the majority of respondents were “not familiar at all” that healthcare delivery is responsible for approximately 8.5% of total greenhouse gas emissions. The Likert scale level of familiarity choices ranged from not familiar at all, slightly familiar, somewhat familiar, moderately familiar, to extremely familiar.

Figure 1

Level of Familiarity With the Following Evidence-Based Statements

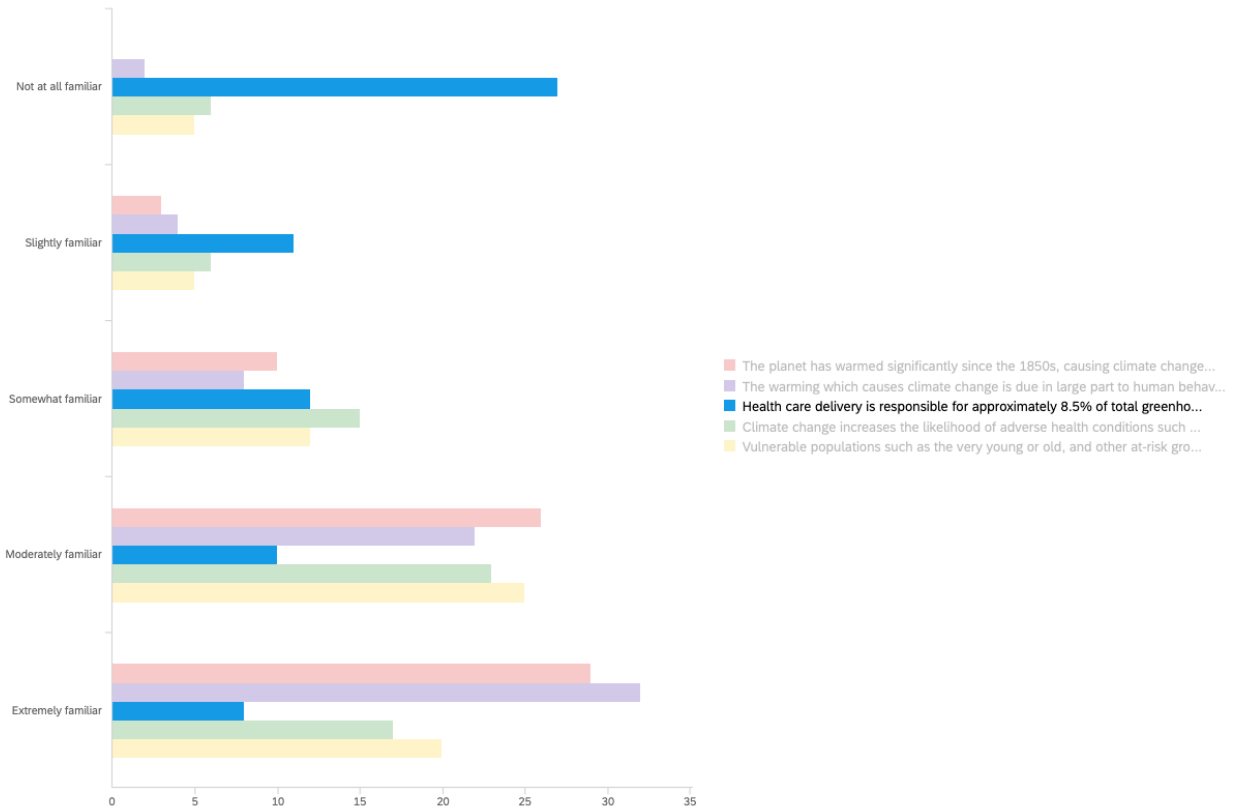


Figure 2 shows the results of the following statement, “I have heard about climate change from these sources (check all that apply).” The respondents indicated professional courses and professional organizations were the least out of all sources of information about climate change. TV news, internet, and print media were sources where respondents have heard about climate change the most. One person indicated that they have not heard about climate change.

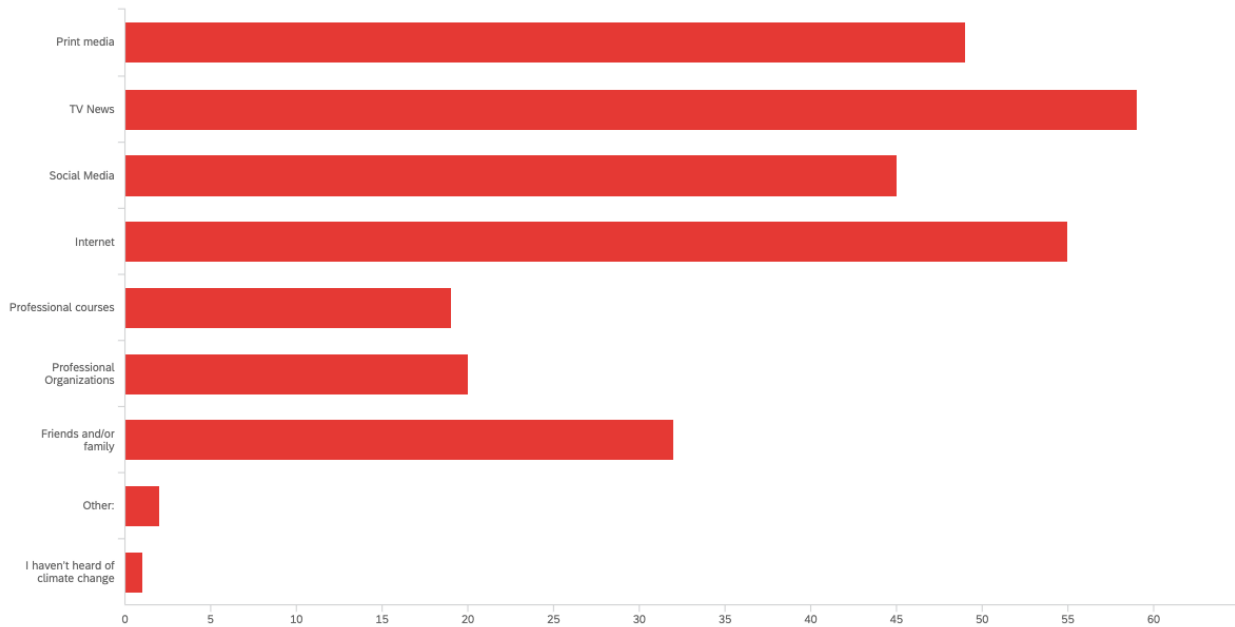
Figure 2*Sources of Hearing About Climate Change*

Figure 3 shows the results of the following question, “How concerned are you about the following, as they relate to climate change?” This question was posed as a Likert scale ranging from not at all concerned, slightly concerned, somewhat concerned, moderately concerned, to extremely concerned. The majority of respondents were extremely concerned about the overall impacts on the future generations and the changes to the planet (other species, forests, oceans, etc.) as they relate to climate change. Most respondents indicated some level of concern related to the health impacts, financial impacts, overall impacts on loved ones and future generations, as well as changes to the planet as related to climate change.

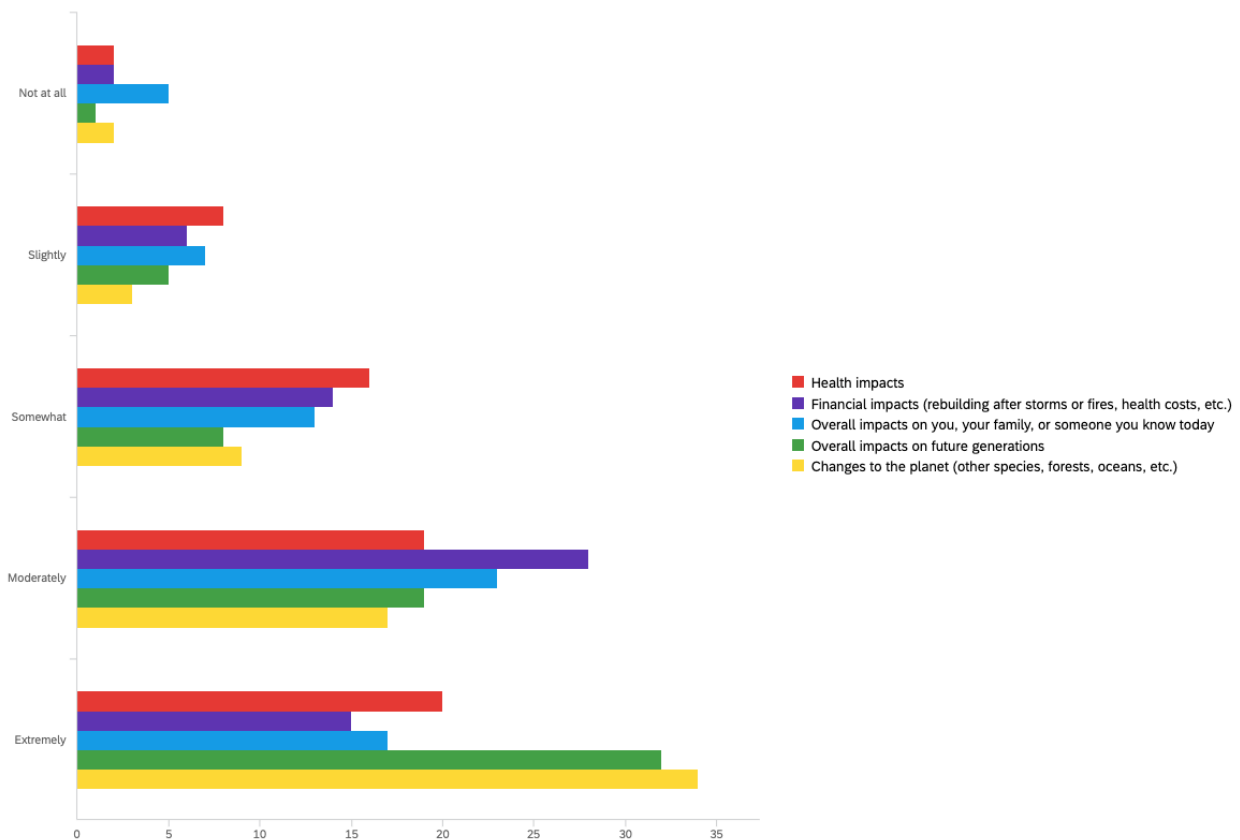
Figure 3*Level of Concern as They Relate to Climate Change*

Figure 4 shows the results of the statement, “Health care contributes approximately 8.5% of Greenhouse Gases (GHGs) in the US. Please indicate how true the following statements are for you.” The answer choices are on a Likert scale ranging from very untrue for me, somewhat untrue for me, neutral, true for me, to very true for me. The majority of respondents indicated that it was “true for them” that they wanted to prepare for health impacts of climate change at their workplace and to teach patients/clients/community members about how climate change impacts health. The majority also indicated that it was “very true for them” that they wanted to change their practice to reduce GHG contributions.

Figure 4

How True the Following Statements are for You Related to Greenhouse Gases

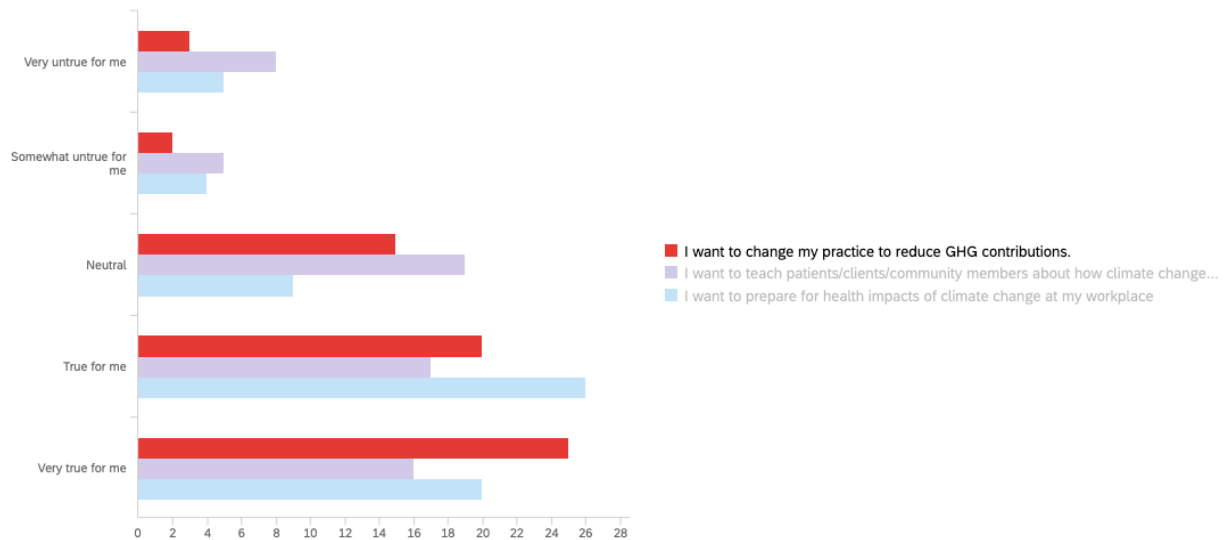


Figure 5 shows the responses to the question, “How often do you communicate (in-person, phone, email, letter, etc) about climate change and health with these groups or individuals?” The answer choices are presented in a Likert scale ranging from never, yearly, 2-3 times per year, monthly, to weekly. The majority of respondents indicate that they never communicate about climate change and health in the professional setting or with elected officials or community leaders, but do so at least monthly personally, with friends, family, or neighbors.

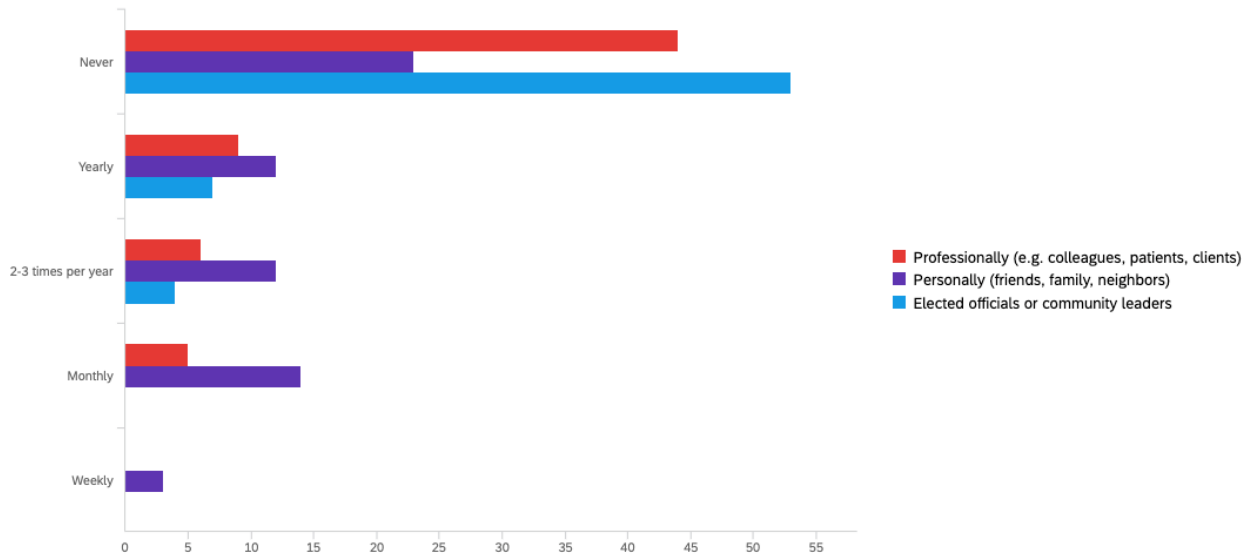
Figure 5*Frequency of Communication About Climate Change and Health*

Figure 6 shows the results of the statement, “The following are reasons I am motivated to address climate change: (Check all that apply).” The majority of respondents indicated that they do not address climate change to the extent that they would like because “they do not know what to do.” A majority also indicated that they “do not know enough about climate change” or “are overwhelmed.” Only one person indicated that the question was not applicable to them because they did not want to address climate change.

Figure 6

Reasons I do Not Address Climate Change to the Extent I Would Like



Summary

Surveying ACPs systematically collects information about a specific topic to identify gaps in practice and serves as the foundation for formulating a change proposal. The CHANT identifies barriers to ACP participation in pro-climate behaviors by determining current practices, knowledge, skills, and perception of the problem. Based on the survey results, a

change proposal will be developed on current research, literature, and modern technologies related to mitigating the effects of climate change on health.

Chapter 5: Discussion

The survey of ACPs demonstrated most of the participants desire to make changes in their practice to reduce greenhouse gas contributions but have not received formal education on the topic of the relationship between climate change and health. The survey also demonstrated that ACPs do not know how to make the desired changes in their practice. The American College of Physicians supports healthcare community engagement in environmentally sustainable practices to mitigate the effects of climate change. The American College of Physicians also believes that the healthcare community should educate others about the associated health risks of climate change to avert catastrophic environmental events and to improve public health through environmental stewardship to promote cleaner air, which supports respiratory and cardiovascular health (Crowley et al., 2016).

It is our recommendation that ACP leadership within the institution consider partnering with the Department of Sustainability to create and add educational opportunities to provide more information on the topic of climate change and health for those interested in learning more. This could take the form of education sessions at departmental meetings, journal clubs, developing a platform for information sharing, or a combination of sources. The survey results will be presented to the ACP leadership committee initially in an “SBAR” format via institutional email with a request to meet virtually or in person for further information and discussion. The SBAR formatting clearly states the situation, background, assessment, and recommendations and is a familiar format for many ACPs (see Appendix E). If ACP leadership

agrees to meet with the department of sustainability, the survey results will be presented to the leadership committee in an organized manner supporting the recommendations for change.

Relationship of Findings to Prior Research

Völker and Hunchangsith (2018) found physician engagement in climate change solutions was associated with their level of knowledge on the subject. Valois et al. (2016) conducted a needs assessment to prioritize the educational needs of physicians regarding the health impacts of climate change. The findings of Valois et al. (2016) identified gaps between the current knowledge of healthcare providers and the desired level of competency about the health impacts of climate change. Although this DNP project does not directly analyze the correlation between physician engagement in pro-climate change behaviors and their level of knowledge or desired competency level, the data from this project demonstrates the desire for ACPs to change their practice to be more environmentally conscious and also demonstrates that the majority of respondents have never received professional or formal education on the topic of climate change and health. Many of the respondents reported that they “don’t know how” or “don’t know enough about climate change and health” to help the issue. The two findings likely correlate in our survey since the majority indicated both wanting to change their practice and never receiving formal education on the topic.

Wortzel et al. (2022) found that 80% of the study participants identified climate change as relevant to patient care, yet only 30% knew what their hospitals were doing to address the problem. Nearly half of the respondents reported not knowing how to address climate change with patients. Others reported feeling powerless, not having enough time, feeling morally distressed, or in denial, while some believe that providing adequate healthcare sacrifices environmental consciousness (Wortzel et al., 2022). Our survey results indicate that 15.52% of

respondents do not know what to do to address climate change, 11.49% do not know enough about climate change, and 7.47% do not feel confident to act. Another 6.32% of the respondents report being “too busy” to address climate change to the extent that they would like, whereas 11.49% of the respondents report feeling “overwhelmed.” Other reasons the respondents report not addressing climate change to the extent that they would like include 8.05% having more pressing concerns and 5.75% choosing to spend time on other important issues. Although this DNP project did not assess feelings of moral distress or denial, the project demonstrates similar themes to the study by Wortzel et al. (2022), such as not having enough time or focusing on different issues pertaining to patient care.

Research demonstrates climate change is detrimental to human health. Healthcare provider awareness of the subject determines engagement in pro-climate behaviors, including linking a patient’s ecosystem to health outcomes (Völker & Hunchangsith, 2018). Applicable curriculum for healthcare providers and training for constituents ensure exposure to the topic of climate change and health, which increases knowledge to improve population health behaviors and outcomes (Cruz et al., 2018; Grabow et al., 2018; Richardson et al., 2017).

Limitations

Limitations of this project include that only 517 ACPs received the invitation to participate in the survey out of a total of 558 ACPs employed at the institution. The mental health impacts of climate change and what ACPs observe in their practice related to mental health impacts of climate change were of particular interest; however, the mental health ACP subgroup did not receive the invitation to participate. The mental health provider ACP subgroup did not receive the link to participate due to no response from the mental health leadership team to our email requests. The input of mental health ACPs was of particular interest due to one

theme of this topic as one of the survey questions specifically asked how often the ACP is seeing mental health issues that are worsened by climate change in their practice, such as depression, stress, anxiety, and/or trauma.

Another limitation of this project is not being able to identify which subgroup of ACPs identified with what responses. Separating the data according to the ACP subgroup would help identify trends or frequencies that are specific to educational background or area of practice. For example, are nurse practitioners more informed about the health impacts of climate change compared to physician assistants or vice versa? Having this information could help identify possible gaps in the curriculum.

The collaborating principal investigator of the study requested the term “climate change” be avoided when corresponding with ACP leadership. This request was due to the geographic location and culture of the institutional leadership and employees, which impacts the acceptance of the adoption of climate change as a real issue. Alternative terms used included planetary health, warming climate, environmental sustainability, and environmental stewardship. There is a balance between being culturally sensitive and presenting factual information based on scientific evidence.

Anecdotal Observations

Prior relationships between the department of sustainability and departmental hospital leadership determined buy-in to this project. The institutional statistics team required permission from the head of each department to disseminate the survey to each perspective group of ACPs. Rather than using the institutional statistics team to disseminate the survey, when reaching out to each departmental leader, we asked the leader or the leader’s assistant to send out the survey to their team directly. When receiving an email from a departmental leader, rather than an unknown

member of a statistics team, the suspected chance of participation is higher. It was noted that when the department of sustainability members had a previous working relationship with departmental leaders or the individual had expressed interest in getting involved within this realm, the willingness to disseminate the survey was much higher. Leaders who had not previously worked with members of the department of sustainability team did not respond to our emails and did not disseminate the survey to their prospective team members. The target sample size was 558 ACPs, but due to this phenomenon, the survey was only disseminated to 517 ACPs.

Evaluation of Theoretical Framework

Utilizing Kurt Lewin's Three Stages of Change model provided a theoretical framework for a planned approach to an organizational change. Lewin's theoretical framework highlights that change occurs in three stages. The first stage, what Lewin calls the unfreezing stage, entails preparing individuals for a proposed change. Keeping this in mind, we involved ACP leaders in the planning stages before implementing a change to ensure that our ideas are feasible and realistic for our population of interest. This crucial step of involving the leaders who represent our population of interest helps establish the foundation for change. The next steps in Lewin's model involve the change and the period of time after the change where there is a return to a new baseline way of functioning. These final two steps are important to consider when developing a change proposal but were not evaluated in the scope of this project.

Implications for Future Research

This project provides a foundation for future research within the ACP community at this local healthcare system. Themes have emerged from the data and the proposed changes can be implemented and evaluated. A continuation of this project could evaluate the effectiveness of implementing educational resources or curriculum by surveying ACPs' knowledge on the subject

and motivation to change. Future research to gather baseline knowledge of the participants before the educational intervention, and then after the educational intervention using a paired t-test would determine if the educational intervention was effective in increasing healthcare provider awareness of the topic of climate change and health.

Conclusion

The effects of climate change are a global health issue and are increasing across communities. It is the healthcare provider's responsibility to be informed about the health effects of climate change and to be a strong advocate of patient health. Increasing involvement in hospital climate change initiatives provides a resource for healthcare providers to gain knowledge on the subject and to engage in pro-climate behaviors, both personally and professionally. This project identifies a lack of healthcare provider knowledge on the subject, especially from professional resources, and a desire to make changes in practice to support environmental health but not knowing how. These findings demonstrate the need for more integration of educational opportunities for ACPs to learn more about climate change, the relation to health, and what can be done in their realm of practice. Increasing ACPs' level of knowledge on the subject protects population health through mitigation strategies of planetary and individual health.

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Appendix A

CHANT 2022: Climate and Health Tool

Welcome

Thank you for participating in this voluntary survey to better understand nurses' and other health professionals' perceptions of climate change and health. Your responses are anonymous and no identifying information will be collected. It is expected to take 10-12 minutes to complete. You may withdraw from the study at any time. Responding to the survey items will indicate your consent to participate.

The first section asks several questions about you and your workplace.

About You

This question asks about your profession, role, and education, if there is more than one educational pathway. Please click on your profession and follow the options.

Profession

Role

Highest Education

Role 2

If you are in a health profession or have an education not listed above, please enter it here.

How many years have you been a health professional?

What is your current professional role?

What is your primary professional setting?

Please complete this sentence: I identify as _____:

Female, Male, Transgender, Other, Choose not to respond

What is your race?

African, Asian, American, Pacific, White/Caucasian, Other
 American Indian or Islander, Alaska Native

Do you consider yourself to be Hispanic/Latino ethnicity?

Yes / No

What is your current age?

If you live in the United States, Brazil, Canada, or Italy, please select the state or province in which you live.

Nation

State or Province

If you do not live in the United States, Brazil, Canada, or Italy, please enter the nation where you live.

Please select the statement that is the most true for you about the Nurses' Climate Challenge:

I have never heard of the Nurses' Climate Challenge

I have looked at the Nurses' Climate Challenge materials

I have been a recipient of a Nurses' Climate Challenge presentation I am a Nurses Climate Champion

If you have been asked to provide an **anonymous identifier code** (a 4-6 character alphanumeric code you will remember and reuse when repeating the survey), please enter it here.

Anonymous Identifier

Not Applicable

Awareness

	Not at		
--	--------	--	--

	all familiar	Slightly familiar	Some what familiar
The planet has warmed significantly since the 1850s, causing climate change.			
The warming which causes climate change is due in large part to human behaviors which add greenhouse gases (GHGs) to the atmosphere (such as use of gas and coal to heat buildings, fuel for transportation, and modern agriculture)			
Health care delivery is responsible for approximately 8.5% of total greenhouse gas emissions in the US that contribute to warming			
Climate change increases the likelihood of adverse health conditions such as heat stroke, asthma exacerbation, Lyme disease, and others			

Please indicate your level of familiarity with the following evidence-based statements.

Vulnerable populations such as the very young or old, and other at-risk groups (people living with homelessness or poverty, people of color, etc.) experience more adverse health impacts from climate change

I have heard about climate change from these **sources** (check all that apply)

Experience

How often have you noticed the following climate-related **weather events** in your area?

Very

Never, Rarely, Occasionally, Frequently, Frequently

Extreme heat

Heavy precipitation

Droughts

Flooding

Hurricanes and storm surges

Wildfires

The Centers for Disease Control identify several health conditions that are worsened by climate change. For each group, **how often** are you seeing these conditions?

Patients/Clients:

	Never	Rarely	Occasionally	Frequently	Very Frequently
Respiratory problems, such as asthma, allergies, or worsening COPD					
Vector-borne diseases, such as Lyme disease, West Nile virus, Rocky Mountain Spotted Fever					

Extreme heat illness

Physical trauma related to severe storms or fires					
Mental health issues, such as depression, stress, anxiety, and/or trauma					

For this group, **how often** are you seeing these conditions?

Self/Family/People I know

	Never	Rarely	Occasionally	Frequently	Very Frequently
Respiratory					

problems, such as asthma, allergies, or worsening COPD Vector-borne diseases, such as						
Lyme disease, West Nile virus, Rocky Mountain Spotted Fever						

Extreme heat illness

Physical trauma related to severe storms or fires						
Mental health issues, such as depression, stress, anxiety, and/or trauma						

For this group, **how often** are you seeing these conditions?

People I read or hear about, but don't know personally

	Never	Rarely	Occasionally	Frequently	Very Frequently
Respiratory problems, such as asthma, allergies, or worsening COPD Vector-borne diseases, such as					
Lyme disease, West Nile virus, Rocky Mountain Spotted					

Fever						
Extreme heat illness						
Physical trauma related to severe storms or fires						
Mental health issues, such as depression, stress, anxiety, and/or trauma						

Concern and Motivation

How **concerned** are you about the following, as they relate to climate change?

Not at all Slightly Somewhat Moderately Extremely

Health impacts

Financial impacts

(rebuilding after

storms or fires, health costs,

etc.)

Overall impacts on

you, your family, or

someone you know today

Overall impacts on

future generations

Changes to the

planet (other

species, forests, oceans, etc.)

How **optimistic** are you that humans will:

Not at all Slightly Somewhat Very Extremely

Applicable

Adequately

prepare for the impacts of climate change?

Prevent further climate change?

Health care contributes approximately 8.5% of Greenhouse Gases (GHGs) in the US. Please indicate how true the following statements are **for you**.

		Very untrue for me	Somewhat untrue for me	Neutral	True for me	Very true for me	Not Applicable
I want to change my practice to reduce GHG contributions.							
I want to teach patients/clients /Community members about how climate change impacts health.							

I want to prepare for health impacts of climate change at my workplace

The following are reasons I am **motivated** to address climate change: (Check all that apply)

- Personal experience with nature
- Religious/faith/spiritual
- Health impacts
- Financial costs
- Social justice, inequity
- The future
- Clean air and water

Loss of property

Increasing severity of weather

Worse wildfires

Infectious disease

Sea level rise

My family

To help create healthy communities

To live within my ecological footprint

To protect the planet

Professional obligation

To reduce climate impacts of my work and workplace Not applicable - I'm not motivated to take action Other:

The following are reasons I do **NOT** address climate change to the extent I would like:

(Check all that apply)

Loss of jobs

National security

It costs too much

I am overwhelmed

It is too complex

Humans can't reduce climate change

I don't know enough about climate change

I don't know what to do

Political views

I have more pressing concerns

It is not convenient

I choose to spend time on other important issues

I am too busy

I'm not confident to act

Not Applicable-I do address climate change to the extent I would like

Not Applicable-I do not want or intend to address climate change Other:

Behaviors

How often do you perform the following behaviors at **home**:

	Never	Rarely	Sometimes	Often	Always
Use non-fossil fuel based energy sources (such as					
purchase wind or solar energy, geothermal, buy energy offsets, etc.)					
Conserve energy (such as use energy efficient appliances,					
keep moderate temperature settings, turn off lights and electronics, etc.)					
Use less gasoline (drive fuel-efficient					
vehicles, reduce unnecessary trips, bike-walk, etc.)					
Reduce waste (buy					
less, reuse more, recycle and compost more)					
Choose foods that require fewer resources to					

grow/produce (local, seasonal, fewer animal products, less packaging)						
---	--	--	--	--	--	--

How often do you do the following behaviors at **work**: (If you do not work or volunteer in a professional setting, please skip this question)

Never Rarely Sometimes Often Always

Conserve energy (such as turn off lights and electronics, etc.)

Commute to work using active (bike, walk), shared, or public transportation

Reduce waste

(plastic, paper, linen, clinical supplies, etc.)

Ask leaders at your workplace to support policies, products and/or processes that create fewer greenhouse gases

(GHGs)

How often do you communicate (in-person, phone, email, letter, etc.) about climate change and health with these groups or individuals?

Never 2-3 times per year Monthly Weekly Yearly

Professionally (e.g. colleagues, patients, clients)

Personally (friends, family, neighbors)

Elected officials or community leaders

Closing

Is there anything else you would like to add?

Your participation is much appreciated. Your responses will contribute to a better understanding of the nursing profession and other health professions regarding climate change and health.

If you are interested in learning more please see these excellent resources:

[Alliance of Nurses for Healthy Environments](#)

Get involved in a nationwide [Nurses Climate Challenge](#), an online climate & health toolkit for nurses

See [Healthcare Without Harm](#), a global leader in reducing pollution from healthcare.

Join [Nurses Drawdown](#), a global effort aligned with Project Drawdown.

Thank you!

[Powered by Qualtrics](#)

Appendix B

Initial Report

CHANT 2023: Radford University

May 11th 2023, 9:13 am MDT

D6 - Please complete this sentence: I identify as_____:

#	Answer	%	Count
1	Female	82.89%	63
2	Male	14.47%	11
3	Other	0.00%	0
4	Choose not to respond	2.63%	2
5	Transgender	0.00%	0
	Total	100%	76

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count	Bottom 3 Box	Top 3 Box
1	Please complete this sentence: I identify as_____:	1.00	4.00	1.22	0.58	0.33	76	97.37%	2.63%

D7 - What is your race?

#	Answer	%	Count
1	White/Caucasian	93.42%	71
2	African American	1.32%	1
3	Asian	1.32%	1
4	American Indian or Alaska Native	1.32%	1
5	Pacific Islander	0.00%	0
6	Other	2.63%	2
	Total	100%	76

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count	Bottom 3 Box	Top 3 Box
1	What is your race? - Selected Choice	1.00	6.00	1.21	0.89	0.80	76	96.05%	3.95%

D8 - Do you consider yourself to be Hispanic/Latino ethnicity?

#	Answer	%	Count
1	Yes	5.26%	4

2	No	94.74%	72
	Total	100%	76

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count	Bottom 3 Box	Top 3 Box
1	Do you consider yourself to be Hispanic/Latino or ethnicity?	1.00	2.00	1.95	0.22	0.05	76	100.00 %	100.00 %

D4 - What is your current professional role?

#	Answer	%	Count
2	Direct Care/Clinical	82.42%	75
3	Community/Public Health	0.00%	0
4	Administration/Leadership	7.69%	7
5	Quality/Research	2.20%	2
6	Faculty	6.59%	6
7	Retired	0.00%	0
8	Student (please enter profession)	0.00%	0
9	Other	1.10%	1
	Total	100%	91

Other

Student (please enter profession) - Text

D5 - What is your primary professional setting?

#	Answer	%	Count
1	Hospital/Acute Care	43.42%	33
2	Outpatient Care	51.32%	39
3	Long-term Care	1.32%	1
4	Community Setting	2.63%	2
5	K-12 School	0.00%	0
6	College or University	1.32%	1
7	Government/Agency	0.00%	0
8	Non-Profit Organization	0.00%	0
9	Business/Entrepreneur	0.00%	0
10	Other	0.00%	0
11	Retired	0.00%	0
	Total	100%	76

Other

D9 - What is your current age?

#	Answer	%	Count
1	20	0.00%	0
2	21	0.00%	0
3	22	0.00%	0
4	23	0.00%	0
5	24	0.00%	0
6	25	2.67%	2
7	26	1.33%	1
8	27	1.33%	1
9	28	4.00%	3
10	29	5.33%	4
11	30	0.00%	0
12	31	2.67%	2
13	32	2.67%	2
14	33	4.00%	3
15	34	1.33%	1
16	35	5.33%	4
17	36	5.33%	4
18	37	0.00%	0
19	38	6.67%	5
20	39	2.67%	2
21	40	2.67%	2
22	41	4.00%	3
23	42	2.67%	2
24	43	4.00%	3

25	44	4.00%	3
26	45	1.33%	1
27	46	1.33%	1
28	47	2.67%	2
29	48	4.00%	3
30	49	2.67%	2
31	50	4.00%	3
32	51	1.33%	1
33	52	2.67%	2
34	53	1.33%	1
35	54	4.00%	3
36	55	0.00%	0
37	56	1.33%	1
38	57	2.67%	2
39	58	0.00%	0
40	59	0.00%	0
41	60	1.33%	1
42	61	0.00%	0
43	62	4.00%	3
44	63	1.33%	1
45	64	0.00%	0
46	65	1.33%	1
47	66	0.00%	0
48	Less than 20	0.00%	0
50	67	0.00%	0
51	68	0.00%	0
52	69	0.00%	0
53	70	0.00%	0

54		71	0.00%	0
55		72	0.00%	0
56		73	0.00%	0
57		74	0.00%	0
58		75	0.00%	0
59		>75	0.00%	0
		Total	100%	75

Aw1 - Please indicate your level of familiarity with the following evidence-based statements.

#	Question	Not at all familiar	Slightly familiar	Somewhat familiar	Moderately familiar	Extremely familiar	Total
1	The planet has warmed significantly since the 1850s, causing climate change.	0.00% 0	4.41% 3	14.71% 10	38.24% 26	42.65% 29	68
2	The warming which causes climate change is due in large part to human behaviors which add greenhouse gases (GHGs) to the atmosphere (such as use of gas and	2.94% 2	5.88% 4	11.76% 8	32.35% 22	47.06% 32	68

	coal to create electricity and heat buildings, fuel for transportation, and modern agriculture)											
3	Health care delivery is responsible for approximately 8.5% of total greenhouse gas emissions in the US that contribute to warming	39.71 %	27	16.18%	11	17.65%	12	14.71%	10	11.76%	8	68
4	Climate change increases the likelihood of adverse health conditions such as heat stroke, asthma exacerbation, Lyme disease, and others	8.96 %	6	8.96%	6	22.39%	15	34.33%	23	25.37%	17	67
5	Vulnerable populations such as the very young or old, and other at-risk groups (people living with homelessness)	7.46 %	5	7.46%	5	17.91%	12	37.31%	25	29.85%	20	67

s or poverty, people of color, etc.) experience more adverse health impacts from climate change											
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Aw2 - I have heard about climate change from these sources (check all that apply)

#	Answer	%	Count
1	Print media	17.38%	49
4	TV News	20.92%	59
5	Social Media	15.96%	45
6	Internet	19.50%	55
7	Professional courses	6.74%	19
8	Professional Organizations	7.09%	20
9	Friends and/or family	11.35%	32
10	Other:	0.71%	2
11	I haven't heard of climate change	0.35%	1
	Total	100%	282

Ex1 - How often have you noticed the following climate-related weather events in your area?

#	Question	Never		Rarely		Occasionally		Frequently		Very Frequently		Total
1	Extreme heat	0.00%	0	23.08%	15	49.23%	32	23.08%	15	4.62%	3	65
2	Heavy precipitation	0.00%	0	7.69%	5	63.08%	41	27.69%	18	1.54%	1	65
3	Droughts	11.11%	7	50.79%	32	28.57%	18	9.52%	6	0.00%	0	63
4	Flooding	0.00%	0	27.69%	18	63.08%	41	9.23%	6	0.00%	0	65
5	Hurricanes and storm surges	25.00%	16	39.06%	25	32.81%	21	3.13%	2	0.00%	0	64
6	Wildfires	43.75%	28	32.81%	21	20.31%	13	3.13%	2	0.00%	0	64

Ex2a - The Centers for Disease Control identify several health conditions that are worsened by climate change. For each group, how often are you seeing these conditions? Patients/Clients:

#	Question	Never		Rarely		Occasionally		Frequently		Very Frequently		Total
1	Respiratory problems, such as asthma, allergies, or worsening COPD	6.15%	4	4.62%	3	23.08%	15	35.38%	23	30.77%	20	65
2	Vector-borne diseases, such as Lyme disease, West Nile	3.08%	2	23.08%	15	43.08%	28	21.54%	14	9.23%	6	65

	virus, Rocky Mountain Spotted Fever											
3	Extreme heat illness	21.54%	14	52.31%	34	23.08%	15	3.08%	2	0.00%	0	65
4	Physical trauma related to severe storms or fires	41.54%	27	44.62%	29	12.31%	8	1.54%	1	0.00%	0	65
5	Mental health issues, such as depression, stress, anxiety, and/or trauma	4.62%	3	12.31%	8	15.38%	10	33.85%	22	33.85%	22	65

Ex2b - For this group, how often are you seeing these conditions?

Self/Family/People I know

#	Question	Never		Rarely		Occasionally		Frequently		Very Frequently		Total
1	Respiratory problems, such as asthma, allergies, or worsening COPD	10.77%	7	20.00%	13	35.38%	23	24.62%	16	9.23%	6	65
2	Vector-borne diseases,	29.23%	19	32.31%	21	26.15%	17	6.15%	4	6.15%	4	65

	such as Lyme disease, West Nile virus, Rocky Mountain Spotted Fever											
3	Extreme heat illness	61.54 %	40	26.15%	17	10.77%	7	1.54%	1	0.00%	0	65
4	Physical trauma related to severe storms or fires	69.23 %	45	26.15%	17	3.08%	2	1.54%	1	0.00%	0	65
5	Mental health issues, such as depression, stress, anxiety, and/or trauma	15.38 %	10	16.92%	11	30.77%	20	23.08%	15	13.85%	9	65

Ex2c - For this group, how often are you seeing these conditions? People I read or hear about, but don't know personally

#	Question	Never		Rarely		Occasionally		Frequently		Very Frequently		Total
1	Respiratory problems, such as asthma, allergies, or	0.00%	0	11.11 %	7	38.10%	24	31.75%	20	19.05 %	12	63

	worsening COPD											
2	Vector-borne diseases, such as Lyme disease, West Nile virus, Rocky Mountain Spotted Fever	1.59%	1	17.46%	11	42.86%	27	28.57%	18	9.52%	6	63
3	Extreme heat illness	11.11%	7	30.16%	19	39.68%	25	15.87%	10	3.17%	2	63
4	Physical trauma related to severe storms or fires	9.68%	6	35.48%	22	27.42%	17	19.35%	12	8.06%	5	62
5	Mental health issues, such as depression, stress, anxiety, and/or trauma	0.00%	0	16.13%	10	19.35%	12	29.03%	18	35.48%	22	62

C1 - How concerned are you about the following, as they relate to climate change?

#	Question	Not at all		Slightly		Somewhat		Moderately		Extremely		Total
1	Health impacts	3.08%	2	12.31%	8	24.62%	16	29.23%	19	30.77%	20	65
2	Financial impacts	3.08%	2	9.23%	6	21.54%	14	43.08%	28	23.08%	15	65

	(rebuilding after storms or fires, health costs, etc.)											
3	Overall impacts on you, your family, or someone you know today	7.69%	5	10.77%	7	20.00%	13	35.38%	23	26.15%	17	65
4	Overall impacts on future generations	1.54%	1	7.69%	5	12.31%	8	29.23%	19	49.23%	32	65
5	Changes to the planet (other species, forests, oceans, etc.)	3.08%	2	4.62%	3	13.85%	9	26.15%	17	52.31%	34	65

M2 - Health care contributes approximately 8.5% of Greenhouse Gases (GHGs) in the US. Please indicate how true the following statements are for you.

#	Question	Very untrue for me		Somewhat untrue for me		Neutral		True for me		Very true for me		Total
1	I want to change my	4.62%	3	3.08%	2	23.08%	15	30.77%	20	38.46%	25	65

	practice to reduce GHG contributions.											
2	I want to teach patients/clients/community members about how climate change impacts health.	12.31%	8	7.69%	5	29.23%	19	26.15%	17	24.62%	16	65
3	I want to prepare for health impacts of climate change at my workplace	7.81%	5	6.25%	4	14.06%	9	40.63%	26	31.25%	20	64

M1 - How optimistic are you that humans will:

#	Question	Not at all		Slightly		Somewhat		Very		Extremely		Total
1	Adequately prepare for the impacts of climate change?	23.44%	15	34.38%	22	35.94%	23	4.69%	3	1.56%	1	64
2	Prevent further	31.25%	20	34.38%	22	29.69%	19	3.13%	2	1.56%	1	64

climate change?										
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**M3 - The following are reasons I am motivated to address climate change:
(Check all that apply)**

#	Answer	%	Count
1	Personal experience with nature	6.13%	39
4	Religious/faith/spiritual	2.04%	13
5	Health impacts	7.70%	49
6	Financial costs	6.29%	40
7	Social justice, inequity	3.93%	25
8	The future	8.49%	54
9	Clean air and water	8.81%	56
10	Loss of property	2.67%	17
11	Increasing severity of weather	6.60%	42
12	Worse wildfires	3.62%	23
13	Infectious disease	5.03%	32
14	My family	6.60%	42
15	To help create healthy communities	6.29%	40
16	To live within my ecological footprint	5.50%	35
17	To protect the planet	7.08%	45
18	Not applicable - I'm not motivated to take action	0.16%	1
19	Other:	0.00%	0
20	Sea level rise	4.40%	28
21	Professional obligation	3.14%	20
22	To reduce climate impacts of my work and workplace	5.50%	35

	Total	100%	636
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M4 - The following are reasons I do NOT address climate change to the extent I would like: (Check all that apply)

#	Answer	%	Count
1	Loss of jobs	1.72%	3
4	National security	1.72%	3
5	It costs too much	4.60%	8
6	I am overwhelmed	11.49%	20
7	It is too complex	9.20%	16
8	Humans can't reduce climate change	1.72%	3
9	I don't know enough about climate change	11.49%	20
10	I don't know what to do	15.52%	27
11	Political views	2.30%	4
12	I have more pressing concerns	8.05%	14
13	I'm not confident to act	7.47%	13
14	Not Applicable-I do address climate change to the extent I would like	4.60%	8
15	Other:	2.30%	4
16	I am too busy	6.32%	11
17	It is not convenient	5.17%	9
18	I choose to spend time on other important issues	5.75%	10
19	Not Applicable-I do not want or intend to address climate change	0.57%	1
	Total	100%	174

B2 - How often do you do the following behaviors at work: (If you do not work or volunteer in a professional setting, please skip this question)

#	Question	Never		Rarely		Someti mes		Often		Always		Total
1	Conserve energy (such as turn off lights and electronics, etc.)	12.50%	8	15.63%	10	31.25%	20	32.81%	21	7.81%	5	64
2	Commute to work using active (bike, walk), shared, or public transportation	68.75%	44	17.19%	11	7.81%	5	3.13%	2	3.13%	2	64
3	Reduce waste (plastic, paper, linen, clinical supplies, etc.)	10.94%	7	23.44%	15	35.94%	23	26.56%	17	3.13%	2	64
4	Ask leaders at your workplace to support policies, products and/or processes that create fewer greenhou	62.50%	40	23.44%	15	12.50%	8	1.56%	1	0.00%	0	64

se gases (GHGs)											
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B3 - How often do you communicate (in-person, phone, email, letter, etc.) about climate change and health with these groups or individuals?

#	Question	Never		Yearly		2-3 times per year		Monthly		Weekly		Total
1	Professionally (e.g. colleagues, patients, clients)	68.75%	44	14.06%	9	9.38%	6	7.81%	5	0.00%	0	64
2	Personally (friends, family, neighbors)	35.94%	23	18.75%	12	18.75%	12	21.88%	14	4.69%	3	64
3	Elected officials or community leaders	82.81%	53	10.94%	7	6.25%	4	0.00%	0	0.00%	0	64

Final1 - Is there anything else you would like to add?

Is there anything else you would like to add?

My clinical practice is women's health, so the healthcare needs of my patients are not listed on this survey. I live in a rural setting, and driving is a necessity. My family has been discussing EV and other environmentally friendly energy sources, but they are not yet affordable or practical for us. I would embrace all, if they were readily available and proven to be more environmentally friendly (batteries, mining of the minerals, etc.) than what we currently have. TY for reaching out.

The Left uses worse case scenario “climate science” to make their case to impose costly and inconvenient impractical measure to make a negligible impact on climate. If the world was truly in a climate crisis that we could control, then mankind would make innovations to control it. We have been through multiple ice ages, the climate changes whether man is here or not. And just like COVID, mainstream media/big tech censor voices that go against the narrative.

NA

There are significantly more important issues to be addressed within healthcare than virtue signaling regarding topics like this. Please take the time to reflect on focusing your resources and opportunity to contribute to the knowledge base on advancing healthcare. Do not let the easy path of joining the crowd waste your talent and intellectual capital.

More information on ways my specific organization can help would be very useful.

Recycling is not available in my city unless you pay for it extra or take yourself, this is a major barrier

I'm not convinced climate change is due to humans

no

n/a

Our hospital is terrible at green efforts/recycling of materials and reduction of waste

D10 - If you live in Brazil, Canada, Finland, Italy, or the United States, please select the state or province in which you live.

Unable to export widget. Please contact Qualtrics Support.

D13 - If you have been asked to provide an anonymous identifier code (a 4-6 character alphanumeric code you will remember and reuse when repeating the survey), please enter it here.

Unable to export widget. Please contact Qualtrics Support.

D1 - This question asks about your profession, role, and education, if there is more than one educational pathway. Please click on your profession and follow the options.

#	Answer	%	Count
1	Nursing	51.32%	39
32	Medicine	0.00%	0
45	Dentistry	0.00%	0
55	Mental Health	5.26%	4
73	Pharmacy	0.00%	0
85	Physical Therapy	0.00%	0
94	Physician Assistant	39.47%	30
103	Occupational Therapy	0.00%	0
114	Social Work	0.00%	0
125	Other Health Professional	3.95%	3
	Total	100%	76

#	Answer	%	Count
2	APRN	53.42%	39
13	RN	0.00%	0
26	LPN	0.00%	0
29	Student	0.00%	0
36	Resident	0.00%	0
39	DO	0.00%	0
42	MD	0.00%	0
46	Dentist	0.00%	0
49	Hygienist	0.00%	0
52	Tech	0.00%	0
56	LPC Student	0.00%	0

59	LPC	2.74%	2
64	Psychology Student	0.00%	0
67	Psychology	2.74%	2
70	Other	0.00%	0
77	Registered Pharmacist	0.00%	0
82	Pharmacy Tech	0.00%	0
89	Physical Therapy	0.00%	0
98	Practicing PA	41.10%	30
107	Practicing Occupational Therapist	0.00%	0
120	Practicing Social Worker	0.00%	0
126	126	0.00%	0
	Total	100%	73

#	Answer	%	Count
3	MSN/MN	36.99%	27
8	DNP	16.44%	12
14	Diploma	0.00%	0
16	ADN	0.00%	0
18	BSN/BAN	0.00%	0
24	PhD	2.74%	2
27	27	0.00%	0
62	MA/MS	39.73%	29
78	PharmD	0.00%	0
80	Master's	0.00%	0
92	Doctorate PT	0.00%	0
99	BA/BS	4.11%	3

112	Doctorate OT	0.00%	0
116	BSW	0.00%	0
118	MSW	0.00%	0
	Total	100%	73

#	Answer	%	Count
4	CNM	6.06%	2
5	CNS	12.12%	4
6	CRNA	15.15%	5
7	NP	60.61%	20
15	15	6.06%	2
	Total	100%	33

D2 - If you are in a health profession or have an education not listed above, please enter it here.

If you are in a health profession or have an education not listed above, please enter it here.

Registered Dietitian

I have a PhD not DNP

Geriatrics

Nurse Practitioner

BS Community Health Education

PMHNP

Physician Assistant

Post graduate certificate

 nurse practitioner

 Nurse practitioner, MSN

D11 - If you do not live in Brazil, Canada, Finland, Italy, or the United States, please enter the nation where you live.

If you do not live in Brazil, Canada, Finland, Italy, or the United States, please enter the nation where you live.

 n/a

 United States

D12 - Please select the statement that is the most true for you about the Nurses' Climate Challenge:

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Please select the statement that is the most true for you about the Nurses' Climate Challenge:	1.00	5.00	1.49	1.29	1.67	76

#	Answer	%	Count
1	I have never heard of the Nurses' Climate Challenge	86.84%	66
2	I have looked at the Nurses' Climate Challenge materials	1.32%	1
3	I have been a recipient of a Nurses' Climate Challenge presentation	0.00%	0

4	I am a Nurses Climate Champion	0.00%	0
5	I have heard of the Nurses Climate Challenge	11.84%	9
	Total	100%	76

D3 - How many years have you been a health professional?

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	How many years have you been a health professional?	1.00	42.00	15.96	10.55	111.21	75

#	Answer	%	Count
1	1	2.67%	2
2	2	2.67%	2
3	3	1.33%	1
4	4	4.00%	3
5	5	5.33%	4
6	6	2.67%	2
7	7	6.67%	5
8	8	5.33%	4
9	9	4.00%	3
10	10	5.33%	4
11	11	2.67%	2
12	12	4.00%	3
13	13	2.67%	2

14	14	1.33%	1
15	15	5.33%	4
16	16	2.67%	2
17	17	2.67%	2
18	18	2.67%	2
19	19	0.00%	0
20	20	2.67%	2
21	21	1.33%	1
22	22	5.33%	4
23	23	5.33%	4
24	24	2.67%	2
25	25	2.67%	2
26	26	1.33%	1
27	27	2.67%	2
28	28	0.00%	0
29	29	0.00%	0
30	30	2.67%	2
31	31	1.33%	1
32	32	0.00%	0
33	33	0.00%	0
34	34	0.00%	0
35	35	0.00%	0
36	36	1.33%	1
37	37	0.00%	0
38	38	0.00%	0
39	39	1.33%	1
40	40	1.33%	1
41	41	1.33%	1

42		42	2.67%	2
43		43	0.00%	0
44		44	0.00%	0
45		45	0.00%	0
46		>45	0.00%	0
47	NA: I am a student		0.00%	0
		Total	100%	75


B1 - How often do you perform the following behaviors at home:

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Use non-fossil fuel based energy sources (such as purchase wind or solar energy, geothermal, buy energy offsets, etc.)	1.00	4.00	1.69	0.93	0.87	64
2	Conserve energy (such as use energy efficient appliances, keep moderate temperature settings, turn off lights and electronics, etc.)	2.00	5.00	4.03	0.66	0.44	64
3	Use less gasoline (drive fuel-efficient vehicles, reduce unnecessary trips, bike-walk, etc.)	1.00	5.00	3.11	1.06	1.13	64
4	Reduce waste (buy less, reuse more, recycle and compost more)	2.00	5.00	3.67	0.87	0.75	64
5	Choose foods that require fewer resources to grow/produce (local, seasonal, fewer animal products, less packaging)	1.00	5.00	3.13	0.91	0.83	64


#	Question	Never		Rarely		Someti mes		Often		Always		Tot al
1	Use non-fossil fuel based energy sources (such as purchase wind or solar energy, geothermal, buy energy offsets, etc.)	57.81%	37	21.88%	14	14.06%	9	6.25%	4	0.00%	0	64
2	Conserve energy (such as use energy efficient appliances, keep moderate temperature settings, turn off lights and electronics, etc.)	0.00%	0	1.56%	1	15.63%	10	60.94%	39	21.88%	14	64
3	Use less gasoline (drive fuel-efficient vehicles, reduce unnecessary trips, bike-walk, etc.)	6.25%	4	23.44%	15	32.81%	21	28.13%	18	9.38%	6	64
4	Reduce waste (buy less, reuse more, recycle and compost more)	0.00%	0	10.94%	7	26.56%	17	46.88%	30	15.63%	10	64
5	Choose foods that require fewer	3.13%	2	21.88%	14	39.06%	25	31.25%	20	4.69%	3	64

Appendix C

Email correspondence giving permission to use the CHANT from the lead author and Principal Investigator of the CHANT at Washington State University College of Nursing.



Schenk, Elizabeth Caroline <elizabeth.schenk@wsu.edu>

To:  Hill, Lindsey

Tuesday, April 5, 2022 at 9:11 AM

← You replied to this message on 4/5/22, 10:46 AM. Show Reply

NOTICE: This email originated externally. It is not from a Radford University account. Use caution responding, opening attachments, or clicking links.

Hi Lindsey -


Thank you for nudging again and I apologize for the delay. Sounds like a great project you are working on.

It is not possible to adapt CHANT , but I have another suggestion that may work. We aren't allowing adaptations at this point for several reasons. We are collecting data from over 30 nations and in 4 languages. All use the same order and numbering of items, so the data can be analyzed together. It is not possible to change only one version, or we wouldn't be able to use it in our aggregated data, which is the primary purpose of developing the tool. We created a mechanism for investigators such as yourself to use the platform and gain access to your own results for downloading and analysis. Also, the survey has been psychometrically analyzed and any changes would mean we would need to re-analyze. Also, if we add items we need to back through IRB.


What may work is for you to create a second brief survey to link to. We could add one question at the end of CHANT with verbiage you would create to request participants to go to another survey. This would not be part of CHANT's IRB exemption, so you may need to go through IRB for this. Also, the results won't be linked to CHANT results - you would end up with 2 separate data sets you could analyze as aggregated data. On the other hand, if you wanted it not to be anonymous, you could potentially do that (based on IRB) to learn about who is interested, or where they work or other more specific information.

Would this help?

Thanks, Beth



Schenk, Elizabeth Caroline <elizabeth.schenk@wsu.edu>

To:  Hill, Lindsey

Sunday, November 6, 2022 at 11:16 PM

← You replied to this message on 11/7/22, 7:49 AM. Show Reply

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Hi Lindsey.

Gotcha. I see your request from October 24th. I will send you a link to your specific survey episode. Since you will be offering your survey in 2023, I would like to send you this after January 1. This is because we update it each year, and start a different file location for data collection. I will be able to use the 2023 version as of January 2, and can send you yours shortly after that. Will that work?

Thanks, Beth

Appendix D

On behalf of Sarah Wohlford,

The Carilion Clinic Department of Sustainability, in partnership with Radford University DNP FNP student, Lindsey Hill, is conducting a research study about healthcare provider awareness of climate change, titled: *Assessing Advanced Care Provider Awareness, Motivations, and Behaviors Related to Climate Change and Health*

Our goal is to identify barriers, attitudes, and beliefs of Advanced Care Providers at Carilion Clinic around climate change and to develop a change proposal based on the findings of the survey.

The study will involve completing a brief survey titled *Climate and Health Tool*. The survey is voluntary and will take approximately 5-10 minutes to complete.

Link to participate: https://wsu.co1.qualtrics.com/jfe/form/SV_b9hDNRHPtZNL8ma

As an incentive for participation, if you would like to be in a drawing for one of two \$50 visa gift cards, please email lhill2@radford.edu after completing the survey. If you chose to reach out to Lindsey via email, it does not compromise the anonymity of your survey responses.

We are asking that you complete this survey by April 1, 2023.

After completing the survey, if you are interested in learning more about how to get involved with the work of Carilion's sustainability department, please contact Sara Wohlford (sewohlford@carilionclinic.org). If you choose to reach out to Sara, it does not compromise the anonymity of your survey responses.

We want to assure you Carilion is committed to protecting your privacy. We follow the Federal Privacy Law (HIPAA). You do not have to participate in this study if you do not want to. Your decision to be in any study is totally voluntary. Your work at Carilion will not be altered by your decision to participate or not participate.

Kind regards,
Sara and Lindsey

Sara Wohlford, MPH, RN Principal Investigator
Director of Sustainability
Carilion Clinic
(C) 540.529.4934

Lindsey Hill, RN
Co-Investigator
DNP FNP Student
Radford University

Appendix E

SBAR

S: A recent survey of Carilion ACPs demonstrates a desire by the majority of respondents to make changes in their practice to reduce negative environmental impacts and address climate change but, at the same time, an overarching perception that there has been minimal formal education on the relationships between climate change, environmental sustainability, and health, thus leaving them unprepared to act.

B: The American College of Physicians believes that physicians and the broader health care community should engage in environmentally sustainable practices that reduce carbon emissions of health care, support efforts to mitigate and adapt to the effects of climate change and educate others about the health risks posed. By addressing these topics, we can not only do our part to help avert environmental catastrophe but also gain public health improvements such as cleaner air and better respiratory health from reduced dirty fuel use and improved cardiovascular health through more active transportation like walking and cycling (Crowley et al., 2016).

Further evidence demonstrates that increased knowledge on the topics of climate and health and environmental sustainability increases environmental stewardship amongst clinicians. Hospital staff awareness of these topics is an integral part of a multitude of environmentally sustainable behaviors in the workplace to decrease emissions and waste, decrease costs, and support population health (Cruz et al., 2018; Richardson et al., 2017; Völker and Hunchangsith, 2018).

A: In March 2023, DNP student Lindsey Hill, in partnership with Carilion's Department of Sustainability, surveyed 517 ACPs within Carilion with 89 responses, a 17.2% response rate, and found:

- Only 26.5% of respondents were moderately or extremely familiar with the evidence-based statement that healthcare delivery is responsible for approximately 8.5% of total greenhouse gas emissions. The remaining 73.5% ranged between somewhat, slightly, or not at all familiar.
- The majority of respondents, 98.46%, were concerned about the overall impacts on future generations and 96% were also concerned about the changes to the planet (other species, forests, oceans, etc.) as they relate to climate change.
- The majority of respondents, 71.88%, indicated that it was "true or very true for them" that they wanted to prepare for health impacts of climate change at their workplace and to teach patients/clients/community members about how climate change impacts health. The majority, 69.23%, also indicated that it was "true or very true for them" that they wanted to change their practice to reduce GHG contributions.
- There are a multitude of reasons that ACPS do not address climate change to the extent that they would like, the main reasons indicated in the survey include that they "do not

know what to do,” “do not know enough about climate change,” and they “are overwhelmed.”

R: It is our recommendation that ACP leadership within Carilion consider partnering with the Department of Sustainability to create and add educational opportunities to provide more information on these topics for those interested in learning more. This could take the form of education sessions at departmental meetings, journal clubs, or developing a platform for information sharing.

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