American Thoracic Society Member Survey on Climate Change and Health

Mona Sarfaty[1], Brittany Bloodhart[1], Gary Ewart[2], George D. Thurston[3], John R. Balmes[4], Tee L. Guidotti[5], and Edward W. Maibach[1]

[1]Center for Climate Change Communication, George Mason University, Fairfax, Virginia; [2]American Thoracic Society, Washington, DC; [3]New York University Medical Center, New York, New York; [4]University of California at San Francisco, San Francisco, California; and [5]Institute for Science, Society, Policy, University of Ottowa, Ottowa, Ontario, Canada

Abstract

The American Thoracic Society (ATS), in collaboration with George Mason University, surveyed a random sample of ATS members to assess their perceptions of, clinical experiences with, and preferred policy responses to climate change. An e-mail containing an invitation from the ATS President and a link to an online survey was sent to 5,500 randomly selected U.S. members; up to four reminder e-mails were sent to nonrespondents. Responses were received from members in 49 states and the District of Columbia (n = 915); the response rate was 17%. Geographic distribution of respondents mirrored that of the sample. Survey estimates' confidence intervals were ±3.5% or smaller. Results indicate that a large majority of ATS members have concluded that climate change is happening (89%), that it is driven by human activity (68%), and that it is relevant to patient care ("a great deal"/"a moderate amount") (65%). A majority of respondents indicated they were already observing health impacts of climate change among their patients, most commonly as increases in chronic disease severity from air pollution (77%), allergic symptoms from exposure to plants or mold (58%), and severe weather injuries (57%). A larger majority anticipated seeing these climate-related health impacts in the next 2 decades. Respondents indicated that physicians and physician organizations should play an active role in educating patients, the public, and policy makers on the human health effects of climate change. Overall, ATS members are observing that human health is already adversely affected by climate change and support responses to address this situation.

Keywords: climate change; medical education; environmental health; climate and health

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Correspondence and requests for reprints should be addressed to Mona Sarfaty, M.D. M.P.H., 4400 University Avenue, George Mason University, Farfax, VA 22030. E-mail: msarfaty@gmu.edu

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In 2012, the American Thoracic Society (ATS) published a workshop report that highlighted the evidence that climate change is affecting the respiratory health of Americans. The report cited several respiratory conditions affected by climate change and provided recommendations for clinicians and researchers on how best to respond to climate change (1). Additional articles in ATS journals have summarized the scientific evidence on global warming and the threat that climate change represents to global cardiopulmonary health (2, 3). This year, the *U.S. National Climate Assessment* (NCA3), the consensus of experts from across the agencies of the U.S. government, academia, and the nonprofit sector, and the *Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (IPCC AR5), which is the consensus of thousands of scientists from around the world, concluded that climate change is already affecting health of people in the United States and around the globe, respectively (4, 5).

Each of these publications is based on peer-reviewed studies and raises an obvious question: Are the predicted health harms associated with climate change being witnessed in the field by practitioners of pulmonary and critical care medicine in the United States? To date, there have been no data on which to answer this question.

The ATS, in collaboration with the George Mason University Center for Climate Change Communication, surveyed ATS members to find out member attitudes on the existence of and drivers of climate

change, if members are witnessing health effects of climate change in their practices, and suggestions on what actions, if any, should be taken. The current survey was designed by researchers from the George Mason University Center for Climate Change Communication Program on Climate and Health and the ATS Committee on Environmental Policy.

Methods

Survey Instrument

The survey instrument was an expansion of a validated survey tool that was adapted for a clinical audience to assess physicians' experiences with climate change. The nonclinical questions on climate beliefs and policy preferences were drawn from earlier surveys developed for use with members of the general public (6, 7). Questions on clinical observations were developed by the research team and the ATS Environmental Health Policy Committee and piloted with clinicians from partnering organizations (8). The survey also invited respondents to provide clinical anecdotes about their own patients. There were 46 questions and several open-ended questions. Responders took on average 5 to 10 minutes to complete the survey. The survey was approved by the George Mason University Institutional Review Board (Project 624642). The distribution of the survey was conducted online using Qualtrics software. The full results are found in the online supplement.

Contact Procedures

In July and August of 2014, surveys were distributed by e-mail to 5,500 randomly selected U.S. members of the ATS (half of its U.S. membership). A letter of invitation came from the President of the ATS. The link to the survey was in the letter and in subsequent reminders. The invitation letter outlined the importance of gaining ATS member perspectives on climate change to help shape ATS actions on the issue. Two incentives were offered. For every responder, a $1 donation would go to the ATS Foundation fund for promising new researchers, and responders were entered into a raffle to win a free registration for the ATS International Conference in Denver, Colorado in the Spring of 2015. Only individuals who had not yet responded received reminders. Three reminders and one final appeal were sent at intervals of 1 week or more.

Analysis

Descriptive statistics were run on all variables, using unweighted data and SPSS statistical software. No weighting was used to account for differences between the sample population and the general U.S. ATS population. All mean differences reported are deemed significant if $P < 0.05$ in a two-way test. Confidence intervals (CIs) were calculated for each percent response entering the sample (5,500) and responder population size and the specific percent response using an online CI calculator (9). Open-ended comments have been edited for grammar, spelling, and to abbreviate the length of statements without altering the meaning. Both are found in the online supplement.

Results

Sample

All recipients of the survey were U.S. ATS members. The reported race of participants was 81% white, 13% Asian, 1.5% black, 2% multiple racial identities, and 2.5% racial group not listed. Only 4% of respondents identified as Latino/a. The age of the majority of participants was between 31 and 65 years, with those younger than 30 years of age making up 4%, and those older than 65 years making up 13%. More men than women completed the survey (68 vs. 32%). Most respondents were physicians holding an M.D. (84%, 73% of whom held a single degree and 27% of whom held an M.D. plus another degree); those holding a Ph.D. (11%) and other clinical professional degrees (5%, registered nurses, respiratory therapists, and midlevel practitioners) made up the remainder of the sample.

The participants practiced pulmonary medicine (45%), critical care (15%), scientific research (15%), pediatrics (6.5%), internal medicine and specialties of internal medicine (5%), sleep medicine (2.5%), environmental/occupational medicine (1%), surgical specialties (1%), and other types of practice (6%). The primary work settings were academic (53%), hospital-based (27%), and outpatient (15%). Two percent were retired.

Response Rate

Of the 5,500 e-mailed surveys, 80 had invalid addresses, leaving a total of 5,420 individuals contacted. The response rate was 17%, or 915. The responders represented 49 states and the District of Columbia. Based on the sample size and the number of responders, the 95% CIs for all reported responses are ±3.5% or less.

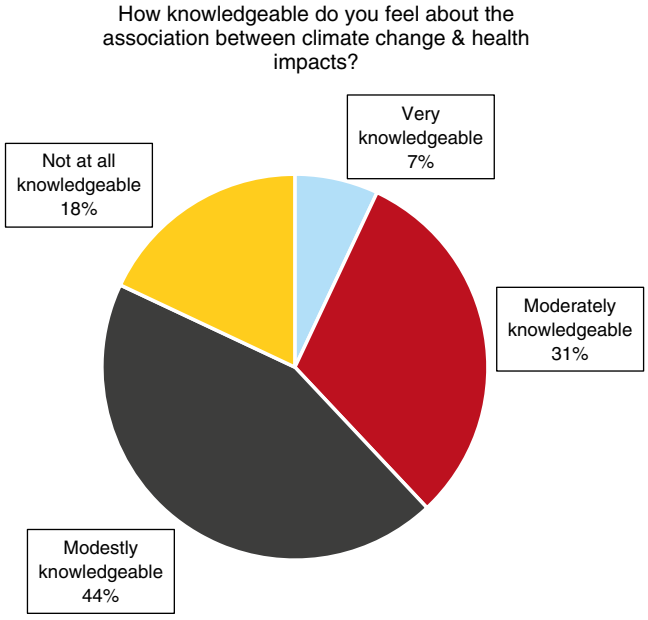

Figure 1. Proportion of respondents who feel very, moderately, or modestly knowledgeable.

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Knowledge, Beliefs, and Attitudes

A majority of ATS respondents (89%) indicated that they think that human-caused climate change is presently happening, based on the following provided definition: Climate change refers to the idea that the world's average temperature has been increasing over the past 150 years and may be increasing more in the future, and that the world's climate is changing as a result. Sixty-eight percent identify that it is mostly or entirely caused by human activity. Only 38% of respondents felt "moderately" or "very" knowledgeable about the association between climate change and health; 44% felt "modestly" knowledgeable (Figure 1). Self-efficacy of the respondents was strong: 67% felt that "actions I take in my personal and/or professional life can contribute to effective action on climate change."

Clinical Experience

A clear majority of survey responders indicated that climate change is relevant to direct patient care and is already affecting the health of their own patients, as shown in Figure 2 and Table 1. The most common health effects that participants noted among their own patients were air pollution–related increases in severity of chronic disease (77%), increased allergic symptoms (58%), injuries due to severe weather (57%), and heat-related effects (48%). Across all the categories of health effects, more physicians thought their patients would experience harms in the next 10 to 20 years than are harmed currently. A request for anecdotes about patient experiences produced more than 100 comments. See Table 2 for examples of the brief anecdotes.

Affected Groups

The majority of respondents (81%) said that they had personally experienced climate change to some extent outside their role as a health professional. A majority reported that certain specific groups of people will be disproportionately affected by climate change, including people with chronic diseases (75%), the poor and working poor (65%), young children aged 0 to 4 years (66%), and adults over age 60 years (63%).

Trusted Sources of Information

The survey sought views on trusted sources of climate change information. The report of the global Intergovernmental Panel on Climate Change (IPCC, fifth report) scored only 40% as "trusted/strongly trusted"; 23% rated the IPCC as "don't know." The more trusted sources were the Centers for Disease Control and Prevention (86%), the American Thoracic Society (83%), the World Health Organization (79%), and the Institute of Medicine (National Academy of Sciences) (76%).

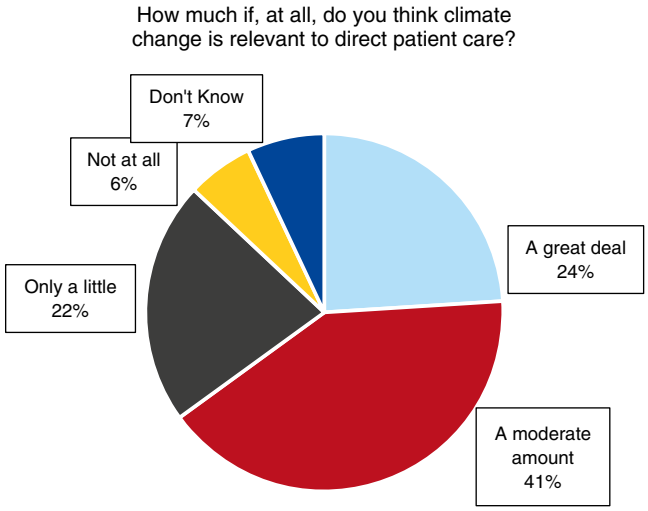

Figure 2. Proportion of respondents who think climate change is relevant to direct patient care.

Responding to Climate Change

The survey indicated a significant majority believed physicians should play a role in responding to climate change including informing the public about the health effects of climate change (72%); informing patients on the health effects of climate change (62%); and encouraging offices, clinics, and hospitals to be environmentally sustainable (80%). The survey also showed support for education on climate change and health as continuing medical education (74%) and undergraduate medical education (73%), for patient education materials (71%), and association policy statements (77%). A majority

Table 1. Responses to the question: "In which of the following ways, if any, do you think your patients are currently being affected by climate change, or might be affected in the next 10–20 years?"

	Yes (%)	No (%)	Don't Know (%)	Total No. of Responses
Air pollution–related increases in severity of illness				
Now	77	12	12	752
10–20 yr from now	80	6	14	704
Increased care for allergic sensitization & symptoms of plant/mold exposure				
Now	58	17	25	749
10–20 yr from now	66	8	26	704
Injuries due to severe storms, floods, droughts, fires				
Now	57	26	17	749
10–20 yr from now	69	9	22	701
Heat-related effects				
Now	48	30	22	749
10–20 yr from now	67	10	22	709
Vector-borne infection				
Now	40	32	28	744
10–20 yr from now	62	9	28	706
Diarrhea from food/waterborne illnesses				
Now	26	43	31	742
10–20 yr from now	48	14	38	703

Table 2. Selected brief anecdotes

Injury from severe storms, floods, fires droughts	Many of my patients with chronic lung diseases report increased symptoms on high-pollution days, particularly when there are wildfires in close proximity to urban areas.
	COPD and asthma exacerbations from the more frequent wildfires here in San Diego; exacerbations of atopic & pulmonary illness after natural disasters: flooding & forest fires, which…are…in part consequential to climate change
	A 51-year-old woman with asthma had a severe exacerbation in June 2008 secondary to increased particulate air pollution from multiple wildfires in northern California…with high ozone…extreme heat.
	Wildfires are increasing and have caused patients with lung disease increased hospital admissions and/or aggravation of their disease
	Wildfires throughout 2013 have resulted in increased exacerbations in patients with asthma…patients with cardiac failure, and severe wheezing episodes among former patients with COPD.
Air pollution	With dramatic weather swings this winter and summer, our patients with asthma have really experienced flares during these shifts in weather (i.e., the "polar vortex" and "pollen vortex")
	I see many patients experiencing increases in respiratory symptoms as a result of local air pollution and/or increased seasonal allergens.
	Ozone exposure in my city worsens the symptoms of my patients with COPD and asthma
Heat	Not a patient, but a neighbor with severe COPD definitely had worsening of his disease on hot, humid summer days, forcing him to stay inside and use more of his oxygen than usual.
	Frequency of COPD and asthma exacerbations increased with high temperatures
	Many of my patients with COPD have complained of increased frequency of exacerbations due to increased temperature, humidity, and allergies, particularly to molds.
	I had a patient with a severe COPD exacerbation related to increased temperatures and several patients with asthma who have had significant worsening of their disease in the heat, requiring increase in medications.
	Several of my patients have remarked on earlier and longer allergy seasons leading to worse asthma control.
	The change in rain and temperature in the west has been associated with a spike in cases of seasonal and year-round allergies in not only children but also adults, and I think there is a relation to climate change here....
Allergy	Patient with asthma with mold allergy with much worse control/hospital stays after very rainy spring/summer
	I had tick bite in Vermont developing erythema migrans. There were not ticks until a few years ago in southern Vermont.
	In Florida, has been raining and has caused the incidence of dengue; summer has been very warm with high humidity, which I think affects patients with COPD in a negative way
	Certainly we see more vector-borne illnesses such as deer tick cause problems not just within our patients but also within our staff members.
Infections	Outbreaks of legionella pneumonia in Southeastern states associated with excess rainfall

Definition of abbreviation: COPD = chronic obstructive pulmonary disease.

agreed that physicians and their associations should be involved in advocacy pertaining to the health effects of climate change (75%).

Discussion

A clear consensus was present among respondents to this survey that climate change is occurring (89%), with a large majority indicating that it is driven by human activity (68%) and that it is having a direct impact on patient health today and will have a greater impact in the foreseeable future. Compared with past general public polling results, the survey shows physicians and allied health care professionals are more certain about the reality of climate change and its anthropogenic causes (7). An earlier survey (2014) of African-American physicians in the National Medical Association demonstrated similar responses that climate change is occurring and that it is driven by human activity and nearly identical results that it is relevant to patient care ("a great deal," or "a moderate amount") (National Medical Association 66%, ATS 65%) (8). The results and associated respondent anecdotes from both surveys also clearly indicate that physicians in many areas of the country conclude that their patients are affected by medical conditions subject to the effects of climate change.

The findings of this survey reinforce several elements of the Official ATS Workshop Report on Climate Change and Human Health. The report pointed to the expanding evidence that climate change was driving respiratory disease onset and exacerbation as a result of increased ambient and indoor air pollution, heat stress, wildfires, and spread of pollens, molds, and infectious agents (1). The same developments are identified by these poll participants in both the anecdotes and survey responses as factors that are adversely affecting their own patients. Survey participants support some of the same actions identified as opportunities for mitigation in the ATS report, particularly education for physicians, the public, and policy makers about measures that will reduce risk, and regarding the need for advocacy emphasizing sustainable energy efficient buildings. The report highlighted the importance of more research to better understand and prepare for the health impacts of climate change.

The primary limitation to this study is in the response rate (17%). The age range of the 915 responders was younger than the larger sample of the full ATS membership of 5,420 (age 18–30 yr, 4 vs. 0.9%; age 31–50 yr, 48.8 vs. 41.4%; age 51–65 yr, 33.7 vs. 42.1%; age $\geq$ 66 yr, 13.5 vs. 15.7%). As is typical of most surveys, the responders were more likely to be women, as compared with the member sample (31.6 vs. 21.6%). Response rates for other randomized surveys of ATS members conducted in 2014 were less robust (5.1, 3.8, and 2% for three surveys on reimbursement for procedures). But one should show caution in generalizing the results. The participants in this survey worked in 49

Table 3. Distribution of poll responders versus random sample, by climate region

Climate Region	% of Responders (*N* = *768*)	% of Sample (*N* = *5,420*)
Southeast	14	15
Northeast	30	32
Great Plains	10	12
Midwest	22	21
Northwest	5	4
Southwest	19	17
Alaska + Hawaii	1	1

U.S. states and the District of Columbia, and the regional distribution of the responders closely mirrors the regional distribution of the sample population by climate region, as defined in the U.S. National Assessment (Northeast, Southeast, Great Plains, Midwest, Northwest, Southwest) (5). The variance was only 2% within each of three regions and 1% within the other three regions (Table 3). Readers should note that the Pew Center for the People and the Press documented a declining trend in survey responses of all types, but their analyses of differences between smaller and larger turnouts showed that these are often of little significance except in the area of citizen engagement (10).

This survey does not prove that the specific health impacts reported by the survey respondents are climate related (e.g., by direct health measurements) but does demonstrate that it is the judgment of these physicians and other clinical professionals that the health of their patients has been affected by climate change and will be more affected in the future. Further research is needed to better understand and quantify climate change's impact on respiratory disease, both in the United States and globally. ■

Author disclosures are available with the text of this article at www.atsjournals.org.

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