

The Effect of Climate Change on Natural Disasters: A College Student Perspective

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ABSTRACT

Climate change is currently a topic of debate that is discussed not only within the physical science community but also by those in policy. Outside of these communities lies the American public, often not seeking out climate change research, but rather ingesting information interpreted by a third party, most likely through a political lens. Given the increased attention to natural disasters, one area of concern is the possible relationship between climate change and natural disasters. An assessment of the public's opinion on this relationship has seen minimal research and none regarding college students. College students are a unique subset of the populace for their age, media sensitivity, and possible future in policy or research. This study surveyed college students in geography courses at Kent State University regarding their opinion of the effect of climate change on various natural disasters, while given examples of recently occurring natural disasters. The natural disasters included both atmospheric-related and nonatmospheric-related phenomena. The results show similar responses for those natural disasters that are atmospheric related. However, disparities exist between atmospheric-related and nonatmospheric-related natural disasters, illustrating a lack of knowledge between climate change and non-atmospheric natural disasters, especially tsunamis. Finally, females were found more likely to agree with the effect of climate change on natural disasters, while males were more likely to disagree.

1. Introduction

Societal perceptions of climate change are often shaped by photographs, videos, eyewitness accounts, and the media (Wilson 2000). The resulting perceptions that are formed include views on whether climate change is occurring, whether climate change is due to natural forces or anthropogenic forcing, and whether these changes affect the frequency, intensity, and/or duration of various natural disasters. The stances of the general public on these viewpoints can vary drastically. These differences range from those who have never heard of climate change, to those who think climate change is simply political, and, finally, to individuals who have changed their behavior in an attempt to mitigate climate change (Semenza et al. 2008). Across this spectrum are individuals with varying levels of climate change knowledge, which affects their opinion of the relationship between climate change and natural disasters.

Opinions on climate change and its potential effects on natural disasters are shaped by knowledge of both climate change and natural disasters. Therefore, the level of knowledge on either subject may be discerned from a population's perspective on the relationship between climate change and natural disasters. College students may represent a unique portion of this population because of their probable exposure to both of these topics in school. In addition, this subset of society has been exposed to extensive media coverage of natural disasters in recent memory, such as the Japanese earthquake and tsunami (11 March 2011) and/or the Joplin tornado (22 May 2011), which may create an impression on their opinion of the relationship between climate change and natural disasters. College students also serve as the bridge population between childhood and adulthood (Rieh and Hilligoss 2008). Finally, college students represent a population that will soon emerge as our future researchers and lawmakers who may have an impact on future climate change policy and informing the next generation of American citizens.

This study surveyed 455 college students at Kent State University in Kent, Ohio, to investigate their opinions about the relationship between natural disasters and

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climate change. The survey asked college students to identify whether or not they believe climate change has an effect on the frequency, intensity, and/or duration of various natural disasters such as tornadoes, hurricanes, and earthquakes. The results were stratified by type of disaster and gender. From these surveys, this study assesses the following research questions:

- Do college students perceive that climate change has affected the frequency, intensity, and/or duration of various recent natural disasters?
- Do college students perceive climate change as having an effect on atmospheric-related or nonatmospheric-related recent natural disasters?
- Is participant perception gender specific?

2. Literature review

The measures of natural hazards are composed of several components: magnitude, frequency, duration, areal extent, speed of onset, spatial dispersion, and temporal spacing (Burton et al. 1993). Magnitude refers to the measure of severity for a natural hazard. Frequency refers to how often the event can be expected at a significant magnitude. Duration refers to the measure of time the event persists. Speed of onset is the measure of time in which conditions move from average for an event to one of significant magnitude. Finally, areal extent, spatial dispersion, and temporal spacing refer to the spatial references of an event (Burton et al. 1993).

A natural hazard is an extreme event occurring naturally within one or more of Earth's systems (Burton et al. 1993). Occurring since Earth's inception, these events act independently of the social structures human existence has created (Burton et al. 1993). However, this independence does not prevent natural hazards from affecting humans and vice versa. Natural hazards can be viewed as a function of risk, exposure, vulnerability, and response (Tobin and Montz 1997). The natural disaster and hazard relationship becomes particularly specific when discussing vulnerability. Naturally occurring, hazards become disasters through the involvement of human social structures, specifically vulnerable populations and infrastructure (Cannon 1994; Chapman 1994; Mileti 1999). This interaction of nature and human existence can occur in many ways. Vulnerable populations can be affected differently within societies as well as differently among several societies (Cannon 1994). In contrast, the possible effects of human social structures on natural hazards may occur in one way, adjusting the natural environment causing their occurrence (climate change). These disasters, at the intersection of naturally occurring hazards and vulnerable populations, are frequently

discussed by various media outlets that often highlight anniversaries of past disasters, warn of the next potential threat in the near future, or report on climate change of global warming as it may relate to industry, public policy, and other facets that impact our everyday lives.

On the surface, it may seem as though news and media coverage of climate change is random and presents information as it becomes available to the general public from scientific research and/or policy developments as they relate to climate change. However, research has shown that the mass media coverage climate change receives is not random, but is actually a mediation by the media between people, policymakers, and climate scientists (Boykoff and Boykoff 2007). Moreover, the continued coverage climate change receives in mass media is also influenced by complex economic and sociopolitical influences that can undermine professional journalism (Boykoff 2007).

This undermining, whether the result of an entertainment-focused perspective or from a media outlet with a political agenda all of its own, can create confusion among the general public. Antilla (2005) concluded that of 32 media reports surrounding climate change, 3 discussed ambiguous causes and effects, 3 included a scientific frame that was unknown altogether, and 5 articles were constructed using climate skeptic rhetoric that had publicly known ties to the fossil fuel industry. Antilla (2005) found that only 21 media reports were constructed from valid scientific frames or research that included scientific authors as primary definers. This supports the hypothesis that media reports can often cause confusion among the general public.

With the increased coverage by the media in recent years, the potential connection of climate change and the frequency, intensity, and/or duration of natural disasters has become a topic of interest. In 2007, the Intergovernmental Panel on Climate Change (IPCC), as part of the Fourth Assessment Report (AR4), discussed the impacts, or lack thereof, of climate change on various disasters such as the increase in strong (category 4 or 5) tropical cyclones globally since 1970 and the increased frequency and intensity of extratropical cyclones in recent decades (Rosenzweig et al. 2007). More recently, as part of the Fifth Assessment Report (AR5) released in 2013, the IPCC Working Group 1 further investigated the future impacts of climate change on climate phenomena, specifically focusing on the frequency and intensity of tropical cyclones. The numerical experiment consensus for 2081–2100, when compared to 2000–19, demonstrated an overall decrease in the frequency of tropical cyclones in the North Atlantic. However, more interestingly and noteworthy were the predictions for storm intensity. The frequency of category 4 and category 5 storms, while

having the largest confidence interval, did show an overall increase, as did the precipitation rates associated with these storms (Christensen et al. 2013).

However, maybe of greater importance than the impacts observed is the natural disaster causation ambiguity that is presented. It is difficult to discern whether an increase in a particular natural disaster frequency, intensity, and/or duration is directly related to climate change, anthropogenic or otherwise, or whether the extreme event is embedded within the normal range of climate variability. Because of this uncertainty, some studies, such as this, aim to uncover the college-age public perception of whether climate change is impacting natural disasters.

With contrasting views of whether climate change is real and/or whether it is impacting various natural disasters, it is surprising that the perception of the public regarding climate change and natural disasters has been minimally researched. A study using the IPCC 2007 report found that individuals routinely evaluated probabilities described verbally in the report at a greater value than intended by the researchers (Budescu et al. 2009). This results in a perception of greater uncertainty about climate change. This occurred even when participants were given guidelines for the verbal language used in the report (Budescu et al. 2009). These results indicate that public perceptions can be shaped by how one interprets certain words and/or phrases, and therefore the terminology chosen by researchers can have a significant impact on the results of a study. The terminology challenge may provide one explanation for the minimal research regarding the perception of the relationship between climate change and natural disasters.

Recognizing communication as a key component to the perception of climate change, Yale University in partnership with other universities and researchers created the Yale Project on Climate Change Communication (Leiserowitz et al. 2011). This project has been administering surveys regarding public opinion of global warming for over 3 yr. Of these nationally represented surveys, the most recent results in November of 2011 state that 63% of Americans agree that global warming is occurring. Of the participants, 65% agreed that global warming is affecting the weather of the United States (Leiserowitz et al. 2011). When asking participants to look toward the next 20 yr and the impact that global warming will have on certain weather events, 56% thought it would cause more intense hurricanes, 60% thought it would cause more droughts and water shortages as well as severe heat waves, and 55% thought it would cause more floods (Leiserowitz et al. 2011).

When asking participants to look back toward recent weather events and the effect of global warming, 57% thought it made Hurricane Irene worse, 65% thought it

made the drought in Texas and Oklahoma of 2011 worse, 60% thought it made the spring 2011 flooding of the Mississippi River worse, 67% thought it made the record high summer temperatures in the United States of 2011 worse, 60% thought it made the record snowfall in the United States of 2010 and 2011 worse, and 46% thought it made the East Coast earthquake in the summer of 2011 worse (Leiserowitz et al. 2011). However, the Yale Project's usage of the highly politicized term "global warming" can be misleading. A study analyzed conservative and liberal think tank websites for their usage of global warming and "climate change" (Schuldt et al. 2011). It was found that the partisan divide typically seen between these two views was reduced when using the term climate change (26.2%) versus global warming (42.9%) (Schuldt et al. 2011). Therefore, it can be argued that the findings from the most recent survey in November 2011 by the Yale Project on Climate Change Communication could be affected by the terminology.

In addition, when asking individuals to give their opinion on the causation of climate change, a bias may inadvertently be present that shifts their opinions toward agreeing that climate change does in fact generate disastrous events. This hypothesis extends from previous psychological research investigating human desire for creating, investigating, and attributing causation to events (Kruglanski 1990). Essentially, when humans receive knowledge on a topic, they have a tendency to generate hypotheses. These hypotheses and the new knowledge generate a need for closure, either specific or nonspecific (Kruglanski 1990). In the case of the Yale study, they are instigating hypothesis formation by participants and supplying them with specific closure, an unavoidable possible bias in their research as well as this study.

When examining differences in perception due to age, it was found that college-age adults (18–22) were somewhat more concerned about climate change than 23–34 yr olds, although there was not a clear difference in beliefs between younger adults and older generations (Feldman et al. 2010). When examining gender for differences in perceptions, women feel and express more concern about risks than men (Gustafson 1998). White males in the United States have been found to have an extremely low risk perception in comparison to women and those of other races (Finucane et al. 2000). Regarding hurricanes, women tend to feel more vulnerable than men (West and Orr 2007). These gender differences, however, may be due to socioeconomic issues rather than gender or a combination of both (Finucane et al. 2000; Gustafson 1998; West and Orr 2007).

Regional influences may also play a large role in shaping the overall perception an individual may have about atmospheric hazards, nonatmospheric hazards, or

both. Some natural disaster research, such as on floods, suggests that individuals may perform self-protective behaviors because of several factors such as previous exposure, future risk, efficacy and cost of protective behaviors, perceived ability to act, and wishful thinking (Grothmann and Reusswig 2006). Regional influence, particularly prior natural hazard events, as well as stories of such events passed down among generations and/or exposure to media headlines about local and regional events may shape perception and lead individuals to certain conclusions, whether they are based on scientific facts or simply derived from circumstantial experiences.

College students represent a unique subset of the population because of their exposure to climate topics in school, recent exposure to catastrophic disaster events, and their position as future leaders and policymakers. In addition, college students and those of a younger generation utilize various media outlets for information differently than the rest of the population. College students turn to the Internet as their information source and are more likely to find this information to be credible compared to other adult populations. They are also less likely to verify their findings (Metzger et al. 2003). When establishing credibility, the adult population is likely to “select information when they think it is accurate, current, novel, objective, reliable, authoritative, trustworthy, understandable, well-written, comprehensive, easy to obtain, and on topic” (Rieh and Hilligoss 2008, p. 49). The adult population also possesses the skills to evaluate and extract information from print media sources such as newspapers. Young people may not possess this attribute as they have grown up using the Internet as their primary sourcing body for information (Rieh and Hilligoss 2008). Young people also may not have the tools to find credible information since their considerations when searching data are primarily “whether information is related to the topic and whether it is new, interesting, and convenient, while showing less interest in authority, the readability of the language, and recency” (Rieh and Hilligoss 2008, p. 49). Therefore, college students may be more susceptible to accepting inaccurate climate change information and may be more impressionable regarding politically charged climate change discussions.

Perceptions of climate change and natural disasters are shaped by prior knowledge and exposure to natural disaster events and climate change information. It has been shown that age and gender may be factors as well as regional influences, but whether or not this translates to the climate change and natural disaster relationship has not been well explored. Knowledge of these factors on this relationship is necessary to form mitigation outreach education programs to more accurately inform

the public on the relationship between climate change and natural disasters.

3. Methodology

This study is based on a survey conducted at Kent State University during October 2011 to measure the opinion of college students regarding climate change and its effects on various recent natural disasters. The questions within the surveys requested information regarding demographics (age, gender, and residence) and the opinions of surveyed participants. The questions regarding natural disasters were grouped into atmospheric (hurricanes, tornadoes, droughts, and floods) and nonatmospheric categories (volcanic eruptions, earthquakes, and tsunamis). The opinion-based questions were designed to ask participants whether or not they thought climate change had impacted the frequency, intensity, and/or duration of a particular natural disaster. The questions do not mention anthropogenic- or natural-forced climate change to avoid a bias in participant responses.

The choice of the terms frequency, intensity, and/or duration were selected to reflect the general components of natural hazards. Natural hazards have been defined using the components magnitude, frequency, duration, areal extent, speed of onset, spatial dispersion, and temporal spacing (Burton et al. 1993). The use of the term magnitude was replaced with intensity as the term intensity was thought to be more applicable to all natural hazards by college students. In addition, the term magnitude is strongly associated with earthquakes, which could confuse participants or prevent them from considering the severity of other natural hazards included in the survey outside of earthquakes. Speed of onset was omitted to avoid delving into the causal mechanisms of specific natural hazards since this material may not be common knowledge. Finally, areal extent, spatial dispersion, and temporal spacing were omitted because this study focused on the general occurrence of natural hazards. In addition, the geographic location in which particular natural hazards typically occur may not be common knowledge.

Below each question, a recent natural disaster example was given (Table 1). The purpose of supplying a recent natural disaster was to force the memory of an event that the students may or may not then contribute to climate change of some degree. This method was chosen to initiate thought at a global or countrywide scale instead of focusing on events relevant to just the participant or the local region. Participants were given the option of responding with Likert scale-based options of strongly agree, agree, neutral, disagree, and strongly disagree.

TABLE 1. Survey questions administered to participants.

Survey question	Disaster example
Climate change has affected the frequency and/or intensity of hurricanes.	Hurricane Irene
Climate change has affected the frequency and/or intensity of tornadoes.	Joplin, Missouri, and Tuscaloosa, Alabama
Climate change has affected the duration and/or intensity of droughts.	Texas
Climate change has affected the duration and/or intensity of floods.	Northeast Northern Great Plains
Climate change has affected the frequency and/or duration of volcanic eruptions.	Eyjafjallajökull, Iceland, and Katla, Iceland
Climate change has affected the frequency and/or intensity of earthquakes.	Mineral, Virginia, and Japan
Climate change has affected the frequency and/or intensity of tsunamis.	Japan

College students were the selected demographic because it guarantees a high school education level and possible exposure to disaster discussions in school. In addition, this is a demographic of generally the same age, which has been considered part of the “Katrina generation” or those who were of an impressionable age when exposed to increased media coverage of natural disasters in recent years. Finally, college students represent a generation exposed daily to politicized statements, arguments, and discussions inside and outside of the classroom that will one day also produce future lawmakers and researchers who may have an impact on future climate change policy.

All college students surveyed were enrolled in an introductory geography course. The majority of students were freshmen and sophomores. This approach was used to decrease the likelihood that they had completed an introductory, college-level physical geography course at Kent State. During physical geography courses at Kent State, climate and climate change are discussed, thereby affecting the rate of exposure regarding climate knowledge and possibly creating a bias among the

sample. This issue is not present with regards to high school classes because climate courses are not included as an optional course but is required as part of the Ohio high school curriculum ([Ohio Department of Education 2014](#)). The participants who were enrolled in one of the surveyed physical geography courses were surveyed prior to the discussions of climate and climate change.

All surveys eligible for analysis were entered into SPSS. Nine surveys were omitted as the survey takers did not follow the instructions. The results were stratified by type of disaster and gender. Testing for this study included using chi-square analysis. To meet the required counts for statistical analysis, the answers disagree and strongly disagree for several questions were binned as were the answers agree and strongly agree. The analyses that required binning is noted. During analysis, significance at $p < 0.10$ level was noted with bold type.

4. Results

The sample included 455 participants: 49.7% female and 50.3% male. The majority of students were 18 yr of age (20.9%) or 19 yr of age (34.5%). The distribution of residence showed that 360 students or 79.1% of the sample identified Ohio as their home state. The demographics showed that a majority of the participants were freshmen (31.9%) or sophomores (36.3%).

Prior to analyzing the survey data, it was necessary to check for independence regarding responses and two variables: students enrolled in a physical geography course and students who received a climate assignment prior to the disbursement of the survey. Testing revealed that all variables proved independent except for the question regarding flooding in which responses tested were dependent upon enrollment in a physical geography class ($p = 0.079$) as well as participants who received a climate assignment ($p = 0.025$). To maintain the integrity of this study and the data, the question climate change has affected the duration and/or intensity of floods was removed from all remaining analyses.

All survey responses regarding natural disasters were reviewed ([Table 2](#)). College students generally selected agree or neutral when asked about the effects of climate change on various natural disasters. Over half of the

TABLE 2. College student participant opinion of climate change effects on natural disasters.

Category	Survey question	Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly disagree (%)
Atmospheric	Hurricanes	10	56	24	9	1
	Tornadoes	9	50	26	13	2
	Droughts	10	53	26	10	1
Nonatmospheric	Volcanic eruptions	4	19	39	31	7
	Earthquakes	8	34	24	27	7
	Tsunamis	10	47	24	14	5

TABLE 3. Gender-specific opinions and significance of climate change effects on natural disasters.

Survey question*	Females			Males			<i>P</i> value (<i>df</i> = 2)
	Binned agree (%)	Neutral (%)	Binned disagree (%)	Binned agree (%)	Neutral (%)	Binned disagree (%)	
Hurricanes	70	23	7	62	25	13	0.082
Volcanic eruptions	25	42	32	21	36	43	0.055
Earthquakes	48	24	28	37	24	39	0.037
Tsunamis	66	24	10	48	24	28	< 0.001

* The tornado and drought survey questions were omitted because of the insignificance at the 0.05 or the 0.10 level.

participants agree that climate change has affected the frequency, intensity, and/or duration of hurricanes (56%), tornadoes (50%), and droughts (53%). Participants were mostly neutral (39%) when asked whether or not climate change has impacted the frequency and/or duration of volcanic eruptions. Participants mostly agree (34%) that climate change has affected the frequency and/or intensity of earthquakes. Finally, participants mostly agree (47%) that climate change has affected the frequency and/or intensity of tsunamis.

The distribution of opinions for participants regarding atmospheric-related natural disasters (hurricanes, tornadoes, and droughts) was similar in that at least half of the participants agree. The second largest grouping of participants regarding atmospheric-related natural disasters was similar with roughly one-quarter of participants selecting neutral for each variable. Responses from participants were then split between strongly agree and disagree for all three disasters followed by strongly disagree. Generally, it can be stated that participants agree that climate change has affected the frequency, intensity, and/or duration of atmospheric-related natural disasters (hurricanes, tornadoes, and droughts).

The distribution of opinions for participants regarding nonatmospheric-related natural disasters (volcanic eruptions, earthquakes, and tsunamis) was not similar. The distribution of tsunami responses was similar to the response distribution of atmospheric-related natural disasters. The distribution of participant opinions regarding volcanic eruptions and earthquakes were not similar to any other disaster or to each other. Most participants selected neutral (39%) regarding volcanic eruptions, while most of participants selected agree (34%) regarding earthquakes. Unlike atmospheric-related natural disasters, nonatmospheric-related natural disasters showed few similarities.

All survey responses regarding natural disasters were binned and reviewed for their response to analyze the role of gender (Table 3). Comparing climate change, natural disasters, and gender, four variables of six were significant, hurricanes and volcanic eruptions ($p < 0.10$) and earthquakes and tsunamis ($p < 0.05$). For each

variable, females agree at a greater rate than males. Neutral response rates for all variables were similar for both genders. Males disagree at a greater rate than females for the four variables. All three variables that were categorized as nonatmospheric related were deemed significant to some degree. Four of the six variables used in this study were deemed significant at the 0.10 level. All significant variables had nearly the same rate of difference for each gender response. Therefore, responses can be viewed as being dependent upon gender, especially regarding the nonatmospheric-related natural disasters.

5. Discussion

College students do perceive recent climate change to be a factor influencing the frequency, intensity, and/or duration of various natural disasters. However, results vary by disaster, type of disaster (atmospheric vs non-atmospheric), and gender. For atmospheric-related disasters, the majority of students responded with strongly agree and agree for hurricanes (66%), tornadoes (59%), and droughts (63%). The hurricane response rate of 66% exceeds the Yale University findings, which asked about Hurricane Irene (57%) as well an overall future hurricane effect (56%). In contrast, the response rate of 63% regarding droughts was similar to the Yale University findings about the Texas and Oklahoma drought (65%) and overall future drought effect (60%) (Leiserowitz et al. 2011). It is possible the disagreement in results from this study to the Yale study is due to the different use of language in the surveys (global warming vs climate change). It is also possible that this disagreement in results is due to the age demographic of the surveyed participants (U.S. general population vs college age), as previous research by Feldman et al. (2010) has stated that college students are somewhat more concerned about climate change. Finally, regional difference between the samples may have also affected the outcomes. Further research is needed to clarify causation of the disparity in results between the two studies.

College students had mixed perceptions when relating climate change to the frequency, intensity, or duration of nonatmospheric-related disasters. The responses for earthquakes and volcanic eruptions were concentrated in the neutral category, with earthquake responses more evenly distributed in the neutral, agree, and disagree categories and volcanic eruptions showing a more distinct majority within the neutral category. It is believed that these response patterns suggest an overall lack of understanding about nonatmospheric disasters and their lack of a relationship with climate change as students tended to neither agree nor disagree overall. The earthquake response rate of strongly agree and agree (42%) does reflect the findings from Yale University about the East Coast Earthquake (46%) (Leiserowitz et al. 2011). This agreement in the results, as well as similar findings for droughts, questions the notion that choice of language has an effect; however, the dissimilar findings regarding hurricanes still pose uncertainties.

Surprisingly, the response pattern for tsunamis mimics that of atmospheric-related disasters. It is suspected that students mistakenly associate tsunamis with hydrologic phenomena, such as floods and droughts, or wind-driven phenomena, such as rogue waves, as opposed to geologic phenomena, such as earthquakes and volcanic eruptions. This misunderstanding is further apparent in nonatmospheric-related disaster perceptions.

Lithospheric-related disasters did not yield uniform results. Participants strongly agree and agree that climate change has affected the frequency and/or intensity/duration of volcanic eruptions (23%), earthquakes (42%), and tsunamis (57%). These findings display a lack of understanding within college students regarding lithospheric processes and their relationships with one another, atmospheric processes, and climate change.

Gender did appear to influence response patterns as hurricanes and all three nonatmospheric disasters were deemed statistically significant. In each of the four cases, females agreed at a greater rate than males, and males disagreed at a greater rate than females. However, hurricane responses demonstrated a binned agree response for an overwhelming majority of both males and females; therefore, gender differences are the most notable for nonatmospheric disasters. These findings may reflect earlier statements regarding gender and natural disaster risks. Previous research indicates that men have low-perceived risk and women feel and express more concern about risk regarding natural disasters (Finucane et al. 2000; Gustafson 1998; West and Orr 2007). Perhaps this concern in females can also be seen in their greater rates of agreement about the relationship between climate change and nonatmospheric natural disasters. However, it may also be possible that females have a lesser

understanding behind the mechanics of nonatmospheric disasters than men. More research is needed to further explore these results.

Five limitations have been identified in this study: First, the results may not represent the viewpoint of college students at large since the majority (79.1%) of students identified themselves as having lived in Ohio during the majority of their lifetime. This may have limited their ability to form an opinion when affected by so few of the natural disasters used in this study. Therefore, it would be beneficial to survey students from various universities. Surveying students from various universities and increasing the sample size would allow for more statistical testing.

Second, the survey given to students in this study offered strongly agree, agree, neutral, disagree and strongly disagree as possible responses, but did not offer I do not know. If future surveys are to be administered, it may prove beneficial to separate the neutral response into neutral, for those who believe climate change is neither increasing nor decreasing the frequency, intensity, and/or duration of various natural disasters, and I do not know, for those who may not have an adequate understanding of climate change and/or the various natural disasters to reach a conclusive decision.

Third, the surveys included recent examples of natural hazards occurring throughout the globe. This was included so participants would think about natural disasters using a global perspective instead of a national or regional perspective. In using these examples, the assumption was made that participants would recognize them; however, it is possible that some of the exemplified events may be more recognizable than others or not at all. This may have created a bias in the results.

Fourth, the participants were students enrolled in geography courses at Kent State University. These students either majored in geography or chose a geography course to meet a general requirement. Therefore, all participants self-selected geography as an area of interest and may have different views of global topics than the general populace of college students. This may limit the application of the study findings.

Finally, the methodology was formed to avoid bias. However, previous research indicates the human tendency for needing closure when presented with new information (Kruglanski 1990). Our study, similar to that of the Yale study, asks for participants' opinions on the causation of various disasters, therefore, instigating a need for closure, which may present a bias in results.

6. Conclusions

Many studies have been done to investigate climate change, but most of these studies focused on the physical

processes behind climate change rather than peoples' perceptions. Of the studies conducted that focus on the perception of the public, the language chosen may have misled participants. This study was conducted to examine college students' perceptions of climate change and its effect on the frequency, intensity, and/or duration of various natural disasters, since college students represent a portion of society regularly exposed to recent media coverage on climate change, may be more sensitive to politically charged climate change discussions and may be in a position in the future to affect climate change policy.

The results of this study show that college students do perceive climate change to be a factor influencing atmospheric-related natural disasters such as hurricanes, tornadoes, and droughts. However, the nonatmospheric natural disasters, with the exception of tsunamis, showed students to be more neutral in their responses. Several interpretations have been presented because of these findings; however, more evidence is needed to corroborate those statements.

While the Yale Project study (Leiserowitz et al. 2011) demonstrates similar findings regarding the relationship between drought, earthquakes, and climate change, the comparative results for hurricanes was different, which may be attributed to differences in terminology, age of the sample population, or regional natural hazard influences. Further research about the perceived relationship between climate change and natural disasters using neutral language is needed to further explore these disparities. In addition, a longitudinal study of college-aged students beyond Kent State University and representative of college-aged students in the United States would be advantageous.

The lack of understanding regarding climate and non-atmospheric disasters seen in this study, as well as the Yale Project study, calls for an increase in teaching of the physical sciences, specifically Earth and climate sciences, to students prior to university years (Leiserowitz et al. 2011). An increase in education would lend to more accurate knowledge of causal mechanisms for natural disasters as well as accurate perceptions of the relationship between climate change and disasters. Accurate perceptions and knowledge may lead to greater mitigation participation activities.

Moving forward, the relationship between climate change and natural disasters needs further investigation, especially regarding gender. In addition, research analyzing the quantity and efficacy of current physical science education efforts is needed. This analysis further corroborates the call for increased education in these areas to better educate citizens on climate change and natural disasters, possibly further supporting accurate perceptions of each topic and their relationship.

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