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Analyzing Environmental Data

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Risk Perception of Global Climate Change

 For decades, scientists have been trying to convey evidence to the general public exposing the detrimental issue of global climate change on our planet. Much scientific research has concluded that the earth’s climate is rapidly changing, and has had various effects on our environment over the past few decades. However, scientists remain puzzled by the staggering low concern for global climate change among members of the general public. It appears as if increasing education and awareness of the topic are not sufficient enough to change people’s decisions or actions. Perceived vulnerability to risk varies among cultures and individuals. Risk perception is a culmination of numerous factors worthy of discussion. With a recent increase in the effects of climate change, it has become imperative for scientists to explore new ways to convey information about global climate change to the public in order to stimulate action. Unfortunately, humans have a persistent reputation of choosing to believe only what they want to be true.

 As one begins research on global climate change, there appears to be must scientific evidence to support it. One of the pieces of evidence is from the Intergovernmental Panel for Climate Change (IPCC) assessment of data for temperatures between 1906-2005, which revealed a 0.74 **°** Celsius increase in the northern hemisphere. There have also been recent claims that there is evidence supporting global warming in areas experiencing increases in weather extremes. In 2010, the Proceedings of the National Academy of Sciences reported that 97 percent of scientists believe climate change is caused by human activity. Of those three percent who remain unconvinced, a study found that their expertise was much lower than that of their colleagues, as measured by publication and citation rates (Rice). However, as of April 4, 2013, the Public Policy Polling (PPP) firm reported 37% of Americans believe global warming to be a hoax. Much of the discrepancy between the scientific community and the general public can be attributed to the massive campaign by the companies making up the oil and gas industry. The general public is unquestionably ill informed about the reality of our climate change.

 Despite the imperative evidence of global climate change, a gap exists between the general public and the scientific community. This gap is not necessarily a demonstration of the ignorance of our society but rather the miscommunication and confusion that coincide with scientific inquiries. In 2012, Chowdhury, Haque, and Driedger published a study on “Public versus expert knowledge and perception of climate change-induced heat wave risk.” Because of recent extreme environmental events, these scientists recognized the severity and urgency of communicating risks involved with climate change. Some groups of scientists attribute this gap to dissemination and communication procedures, while others feel it can largely depend on an individual’s personal risk perception and response to the message (Chowdhury et al. 2012). It is not uncommon for experts to neglect the gap between their knowledge and the knowledge of the general public, merely out of convenience.

 The results of *The Tragedy of the Risk-Perception Commons* shocked me. I did not understand their findings that the more mathematic and scientifically literate people were, the less risk they would associate with climate change, provided the evidence in the scientific community (Kahan, et al. 2011). I was curious enough to create a survey to give out to Holy Cross students, on campus, to see if the results would differ from Kahan’s study, at Yale. One of my classmates, Jonah Choe, and I developed a survey to evaluate mathematic and scientific literacy alongside risk perception of global climate change. We used some of the same questions Kahan and his team used in their study, but also drafted a few of our own questions. We borrowed nine questions from Kahan’s study looking at scientific and mathematic literacy. We also asked their gender, whether they had been previously educated on climate change, their main sources of media, and opinions on government intervention. In order to minimize volunteers’ bias, we went door to door in the Mulledy dormitory, asking freshmen and sophomores to complete the survey. Our sample ended up consisting of 64 girls and 26 boys, in which we hope will represent the population of Holy Cross as a whole. One way we could have improved this survey’s accuracy would be to ensure all students at Holy Cross take it, rather than just our dormitory. Given our time and resource limitations, this was not an option for us.

 I interpreted the results in a few different ways, testing different variables for correlations, but rarely found what I hoped to see. First, I found the math and science scores by adding up the number of questions the participant got right. With that information I found the mean score to be about 7.6 with a standard deviation of 1.35. The distribution of the scores came out to be negatively skewed, as many Holy Cross students were able to answer most of the questions on our survey correctly. Next, I looked at the responses for our global climate change opinion poll. Students were asked, “how much of an impact do humans have on global climate change?” and, “how big of a threat is global climate change to the survival of humans?” Responses to both of these questions were on a 7-point scale, one being the last amount of concern, and seven being the most amount of concern. Since both human impact on climate change and threat to survival of humans reveal high risk perceptions, I took the sum of the answers to those two questions and titled it the “GCC Opinion Poll Total” (GCC standing for global climate change). This is how I chose to give numerical values to risk perception of global climate change. Next, I plotted those scores against their math and science literacy results and looked for any correlation. The r2 value, or correlation coefficient, came out to be .002, so we can conclude there does not appear to be any correlation between mathematic and scientific literacy and risk perception of climate change.

 Another interesting hypothesis I wanted to test was whether having previously taken a course on global climate change would have any lasting effects on opinions of the matter. With this question, I compared the mean GCC opinion total of those who said they had taken a course previously to those who said they had not. Surprisingly, I discovered the mean score for those without prior education on the subject was 10.414, while those with prior teaching was 10.232. Knowing the sample sizes were 30 and 60, I was able to calculate the standard deviations, 2.612 and 2.546, and the t-score on the null hypothesis that there is no difference between the two groups came out to be .314. This is a fairly small t-score, and not in the rejection region. Therefore, we do not have significant evidence to say there is a difference between the opinions or risk perceptions of those educated in global climate change and those never educated in global climate change. Prior to the collection of this data I would have guessed that those educated in global climate change would have higher risk perceptions of climate change than those without taking classes on the matter. However, it appears that there are some issues deeper than education, among the general public, that are causing people’s perceptions to be dangerously low. Further research might want to look into which course each subject took prior to this survey, to see which courses resulted in the highest perceived risk.

 In Erin Mead’s study, *Climate Change Among Adolescents*, the risk perception attitude is broken down into four groups. Risk perception is often thought to be closely related to one’s response efficacy beliefs, or the belief that one’s actions will effectively reduce an impending threat. The following attitudinal groups explain the different perspectives held by members of our society. First is the responsive group, who have strong efficacy beliefs and also have high perceived risk. They are aware of the risks and believe they have the skills to avert the threats. Members of the responsive group are expected to be the most motivated in taking action against those threats. Avoidance group members are people with high-risk perceptions but low efficacy beliefs. They are concerned, on one hand, but on the other hand they do not believe they have the power to avert impending threats. The third group is the proactive group, characterized by low-risk perception but strong efficacy beliefs. Their motivation to act does not come from the perceived risk but rather their perceived ability to address the danger. Lastly, those with low risk perception and low efficacy beliefs are said to be members of the indifference group. These people have low motivation as they do not feel vulnerable, nor do they believe in their ability to aver the threat. Our society is a combination of all these groups, which breeds conflicting ideas on how to solve the dilemma of misinterpretation of impending threats. Mead and her colleagues also found that the risk perceptions and efficacy beliefs of adolescents often mirrored those of their parents (Mead, et al. 2012). Parental influence is one of the most important factors in cultivating higher risk perceptions that could contribute to climate change intervention.

 Sometimes it is quite frightening how common low risk perception has become in our culture. Overtime, people have begun to feel less personally threatened by certain types of hazards. Ghozlane Fleury-Bahi, a French psychologist, did a study in 2008 on risk perception on a local versus global evaluation. Unsurprisingly, his participants, 113 French adults, demonstrated most concern with risks that would have direct effects on their local communities. Those risks difficult to conceptualize, with long-term consequences, and high uncertainty (like climate change) were perceived to be less of a threat to oneself and their fellow inhabitants. On the contrary, concrete and immediate risks (like chemical spills) were perceived as high risk to oneself. Technological and chemical hazards had the highest perception of risk to oneself associated with it, while hazards related to climate change and loss of biodiversity were significantly lower. This study also found a significant increase in risk when one moves up from an individual to local communities to humanity as a whole, in terms of who is at risk. In the conclusion of his study, Fleury-Bahi stated that “technological and chemical issues are likely to be perceived as being more probable than risks deriving from scientific uncertainty even today (climate change and loss of biodiversity) (Fleury-Bahi p. 192). Since technological and chemical hazards are easier to envision as potential, immediate threats, people tend to view these hazards as posing a higher risk to them individually.

The scientific uncertainty of today needs to be addressed before we can make progress in our culture. In the United Kingdom, a few studies found, “Uncertainty about climate change can be exaggerated by the media, which tends to emphasize the scientific and political controversy surrounding the issue… which in turn is used to justify denial and inaction on the part of governments and individuals who feel responding to the issue threatens their values and lifestyles” (Whitmarsh p. 353). There is an apparent skepticism and uncertainty among members of the general public that needs to be eradicated, or at the very least diminished. What is deemed “dangerous” to humans is undetermined and often debated. Scientists tend to define dangerous risks in terms of how threatening they are to an entire population, whereas the public is more concerned with the effects on individuals. Until a large percent of the population begin recognize their significant role as a member of our planet, there will not be enough people who act upon their personal responsibility.

 Anthony Leiserowitz decided to do a cross-cultural study to compare the opinions of British and American populations. Despite their uncertainty, Leiserowitz found, “most Americans demonstrate a high awareness of global climate change, a strong belief that it is real, and significant concern about the issue” (Leiserowitz p. 1440). In other words, it is not that Americans are incompetent to comprehend what issues we have in front of us, but rather willingness to take action remains limited. Both Americans and British people demonstrated similar amounts of understanding on the subject. Most people do not see global climate change as an imminent danger, and will only affect geographically or temporally distant people. In order to look at the effects of direct experience on opinions of climate change, Lorraine Whitmarsh studied victims in the UK of the most widespread impact from climate change: flooding. Whitmarsh, like many other scientists, hypothesized that being a victim of flooding might influence understanding of or response to climate change. Although some victims of other direct experiences, like air pollution, were more likely to see global climate change as a salient risk, they were not necessarily any more responsive. As a matter of fact, most flood victims of Whitmarsh’s study saw flooding and climate change as completely separate issues, unrelated to one another (Whitmarsh).

There is a prevailing belief that was confirmed in Whitmarsh’s study, saying that global climate change is a distant and future problem. In Britain, only a minority of the population takes an energy conservation measures that would reduce greenhouse gas emissions. One-third of the British population buys energy efficient light bulbs, 42% reduce car usage, and in 2002 only about 5% of the population was taking protective measures against flooding (Whitmarsh). Even in the United States, people have a hard time actually reducing their personal fossil fuel consumption—despite their intent to do so. The intangibility of global climate change serves as a hindrance to personal engagement in preventative or protective action. Lorraine Whitmarsh explains that “climate change in itself cannot be experienced, but its effects can.” Unfortunately, it might take a lot of effects in order to get people taking preventative measures. Taking action to avert the threat global climate changes poses means significant changes to important societal structures and values. However, some propose that this can be done through a series of solutions that would produce local benefits. For example, communities can reduce emissions in hopes of improving their local air quality, therefore emphasizing the association between air pollution and climate change to inhabitants.

Who should implement these new ideas is heavily debated. Is this responsibility to avert climate change a personal responsibility or a responsibility of society as a whole? Parnali Chowdhury and colleagues found that most participants believed institutions, like government agencies, have the primary responsibility to mitigate global climate change risks. In general, participants felt that little can be done at the individual level, so why bother? One participant noted, “Personally I cannot change everything. But I will participate if it comes from the city or government laws.” Participants also felt citizens would respond positively to stringent government regulations of climate change (Chowdhury p. 8). This may not be completely accurate, considering the likely negative effects these regulations will have on industrial companies. Environmental law and creating new regulations is an arduous process. Considering the wide variety of risk perceptions, values, and opinions associated with climate change, bringing in government regulation is most likely going to be a slow, tedious process—but appears to be necessary. Many argue that these regulations will be costly, however the IPCC reports, “Taken as a whole, the range of published evidence indicates that the net damage costs of climate change are likely to be significant and to increase over time” (NASA 2013). As time progresses, we are likely to see more and more consequences for our lack in action to suppress climate change. Tornadoes, hurricanes, floods are all common effects of climate change, and all of these can cause immense amounts of damage. For example, Hurricane Sandy this past fall hit New York City and consubstantially required all subway systems in the city to be shut down.

Some of the differences in opinions stem from parental influence, political views, occupation, religiosity, safety concerns, family roles, and even gendered risk perceptions. Xiao and McCright issued a study in 2012 on the gender differences in concern about environmental problems. Previous research had shown that women generally demonstrate higher environmental concern in the past few decades. Since women have a tendency to perceive the world to be a riskier place, Xiao and McCright hypothesized that women would demonstrate significantly higher environmental concern than men. Indeed, this is what they found. Gender has a significant influence on risk perception, risk perception influences environmental concern, and therefore gender has been found to have a consistent effect on environmental concern (Xiao & McCright 2011). The PPP survey, which found 37% of the public believes global warming to be a hoax, also found 35% of women and 39% of men believe it to be a hoax. This gender gap was not said to be large enough to be considered statistically significant.

In our study here at Holy Cross, I decided to compare the average GCC opinion poll totals of men to women. Men had an average concern level of 9.52, while women had a higher value of 10.64. However, when I tested for statistical significance, on the null hypothesis that there is no difference between men and women, the t-score of their differences came out to be -1.94. This is not quite in the rejection region in which a t-score would need to be less than -1.96, using an alpha value of .05. Therefore, we were able to conclude that our study provided no significant evident to support a difference between the opinions of men and women on the topic of global climate change, here at Holy Cross.

“To survive in the world we have transformed, we must learn to think in a new way. As never before, the future of each depends on the good of all.” This excerpt is from a larger statement that one hundred Nobel laureates chose to sign in December 2001, published in the Toronto Globe & Mail. These Nobel laureates advocate that the culmination of all people’s actions will benefit humanity in its entirety. If being aware of global climate change is not the issue, we must find what it is that will encourage action among members of the general public. As members of our society, we must learn how to make moral decisions between what is easy and what is true. Denial is never a efficient mechanism to solve problems. Mending the diverging gap between the general public and the scientific community would not only be advantageous, it is also imperative. This predicament is much bigger than a few organizations working together, but is going to require the contribution of all of humanity.

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