



# **Prosocial Messages and Perceptual Screens: Framing Global Climate Change**

by Philip Solomon Hart

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PROSOCIAL MESSAGES AND PERCEPTUAL SCREENS:  
FRAMING GLOBAL CLIMATE CHANGE

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PROSOCIAL MESSAGES AND PERCEPTUAL SCREENS:  
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Climate change will likely have significant negative impacts on humans, animals, and the environment. The potential severity of these effects has generated a need for effective messages that communicate both the nature of climate change and actions that may be taken to prevent the worst impacts from occurring. The studies presented in this dissertation examine how perceptual screens and message structures affect the interpretation and application of climate change messages.

Three studies respectively examine how individuals respond to messages that vary by the social identity of potential victims, episodic vs. thematic descriptions of potential victims, and the presence or absence of statistics when discussing the impacts of climate change on potential victims. Data from study 1 reveals a significant interaction between experimental participants' political party identification and the identity of climate change victims, with news stories discussing out-group victims generating a boomerang effect among Republicans. Study 2 finds that individual behavior change was not sensitive to episodic and thematic message manipulation, but thematic frames were more effective in building support for climate change policies by

increasing the attribution of responsibility to society at large. The final study examines how numeracy may moderate how the presence or absence of statistics in a news story impacts public willingness to donate to organizations working on the issue of climate change. The results from study 3 reveal that low-numerate individuals were sensitive to numeric framing effects and were willing to donate more when persuasive messages included statistics than when they did not, while high numerate individuals were not affected by presence or absence of numbers.

This dissertation demonstrates the importance of taking perceptual screens and message structure into account when designing prosocial messages. Considerations for applying these research findings and avenues for future research building from these studies are discussed.

## BIOGRAPHICAL SKETCH

P. Sol Hart is a doctoral candidate in the Department of Communication at Cornell University. Hart specializes in risk communication related to environmental, science, and health issues. He is also currently a visiting scholar at Decision Research, an Oregon-based think tank for the study of risk perception, judgment, and decision making, and serves as a consultant for Family Health International. Before beginning his doctoral studies at Cornell, Hart worked with a number of environmental organizations to design effective outreach messages and initiatives. This experience sharpened his interest in conducting research that not only develops theory but also enhances the communication efforts of government agencies, non-profit organizations, and businesses. In addition to his doctoral work at Cornell, Hart holds an M.S. in Environmental Studies from the University of Oregon and a B.S. in Environmental Policy Analysis and Planning from the University of California-Davis.

Hart's research investigates the psychological processes underlying effective risk communication, with the aim of understanding the role of the media in motivating and engaging the public around a variety of issues and how to create effective messages that can cross ideological divides and that resonate with broad sections of the public. He has studied communication processes related to climate change, AIDS prevention, poverty, and clinical health communication.

Hart's doctoral research is supported by the National Science

Foundation, the Environmental Protection Agency, and the U.S. Department of Agriculture. His research has been published in a number of peer reviewed journals, including *Society and Natural Resources*, *Human Dimensions of Wildlife*, *Environmental Communication*, and *Communication Yearbook*.

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## CHAPTER 1

### INTRODUCTION

In this dissertation, I examine how messages about climate change impact individual behavior change and policy preferences. I pay close attention to the influence of perceptual screens that cause people to interpret messages in different ways. The goal of the dissertation is to provide a greater understanding of how different choices in constructing messages can affect how messages are interpreted and applied.

The choice of climate change as a substantive domain of research places the dissertation within the realm of prosocial communication – communication that aims to have an individual engage in positive behavior for the betterment of themselves, society, or both. Scholars have investigated prosocial communication from multiple perspectives, including domains such as health (Meirick, 2008) and poverty (Slovic, 2007) and through mediums such as television (W. J. Brown & Singhal, 1990) and experiential education (Hocking & Lawrence, 2000).

I focus on the impact of climate change messages because climate change differs from most domains of prosocial message research in a critical way – it is impossible for someone, through individual behavior change, to make *any* distinguishable impact on the target of change (in this case, the global climate). A person may be able to reduce their personal carbon footprint, but they are unable to

point to any demarcated impact that their personal reduction has on the global climate. This contrasts with an issue such as poverty: if a person gives a food bar to a homeless man on the street, the charitable giver has not made a significant dent in the large issue of poverty, but is able to take comfort in the fact that he or she provided nutritious food for someone in need.

This difference provides fertile ground to test findings from other domains of prosocial communication in which an individual can make a difference through individual action. Some communication techniques, such as the use of a vivid identified exemplar (Kogut & Ritov, 2005a, 2005b), are effective at eliciting donations for those in need. But what happens when someone cannot individually make a difference? As will be shown below, the portrayal of an identified victim becomes less effective than a more abstract, systemic description of the issue when a communicator wants to elicit policy support for an issue such as climate change. The nature of the issue creates a perceptual screen for how individuals apply the message information. I also investigate two complementary message components: 1) the identity of who is affected by climate change, and 2) the use of statistics or verbal descriptors to describe the impacts of climate change. These two message tests are chosen because previous literature suggests that they are likely to have significant impacts on how climate messages are interpreted, they address significant holes in the literature, and they are likely to moderate the impact of using an identified victim or more thematic information to describe the impact of an issue. Taken together, the three studies presented here

provide information on the impact that different types of prosocial messages may have on the public, and demonstrate the importance of taking message structures and perceptual screens into account when designing messages.

### **Climate Change as a Communication Problem**

The current scientific consensus is that climate change is likely to have significant negative impacts on humans, wildlife, and the environment in the near future (Pachauri & Reisinger, 2007; Solomon et al., 2008) and that changes in government policy and individual actions may attenuate the worst changes from occurring. Scientists, environmental organizations, politicians, and a large coalition of interested parties have worked to identify how different communication techniques may affect the willingness of the public to address climate change through individual behavior change and support for climate mitigation policies. Nisbet and Mooney (2007), amongst others, have called for scientists to place a greater reliance on communication techniques that can improve how messages resonate with the public and provide a greater context for information embedded within science messages.

One suggested method is the use of *framing*, which examines, in part, how presenting information in different ways can affect the impact of messages on attitudes and behavior. This introduction provides a context for the studies to follow by discussing the obstacles that climate change poses as a communication problem, a brief

overview of the climate change communication and relevant public opinion literature, and the literature concerning framing processes.

Before beginning a discussion of how best to communicate about climate change, it is necessary to situate the issue of climate change within the broader context of risk communication. Climate change is a useful substantive domain to test and develop communication theory, but also poses unique challenges for communicators that are often not faced with other risk issues. While individuals can often directly respond to risks that they face (e.g. putting on a seatbelt when getting into a car or wearing sunscreen when going outside), an individual has few avenues to directly adjust the risk they face from climate change. This distinction provides useful opportunities to not only apply communication theories to the issue of climate change, but to also identify boundary conditions for theories developed in other substantive domains. In this section I will discuss some of the unique challenges that climate change poses and also discuss how communication theories may be applied to climate change.

Climate change fits within a general category of risk described by Hardin's *Tragedy of the Commons* (Hardin, 1968, 1998), in which a group of people rely on a resource or emit a pollution that affects the common good or health of a community. Hardin uses the example of cattle herders who individually benefit from allowing their cattle to graze on a common field. While an individual herder benefits directly from having his or her cattle graze on the field, the costs of the grazing (e.g. reduced grass quality and volume) are distributed amongst all the



herders. Because herders receive the full benefit, but only a fraction of the cost, from having their cattle graze, a self-interested herder will find short-term profit by maximizing the amount of cattle put out to pasture. However, left to their own devices in a fully unregulated structure, the collective action of the herders will lead to overgrazing and an eventual collapse of the resource. Resource depletion can only be avoided if the herders devise a system of resource allocation that allows individual use of the common resource while preventing collective overuse.

The issue of the commons occurs in multiple domains, including deforestation (Southgate, Sierra, & L. Brown, 1991), desertification (Picardi & Seifert, 1976), transboundary pollution (Kindt, 1986), and climate change (Engel & Saleska, 2005; Gardner, 2006; Ostrom, Burger, Field, Norgaard, & Policansky, 1999; Rachlinski, 2000). The utilization of common resources does not always lead to tragedy; for example, the Maine lobster industry has adopted successful regulations to maintain sustainable levels of fishing (Acheson, 2003). Mechanisms for generating agreements to protect the commons can arise through centralized government, private ownership, and non-governmental community based institutions (Feeny, Berkes, McCay, & Acheson, 1990). Recent climate negotiations, such as those that resulted in the Kyoto protocol (O'Neill & Oppenheimer, 2002), point to international efforts to protect the common resource of a favorable global climate by managing global emissions of carbon dioxide and other greenhouse gas emissions; however, to date these efforts have

failed to generate the necessary commitments from the international community to mitigate the harmful impacts of climate change.

In a review of how common resources can be effectively managed, Dietz, Ostrom, and Stern (2003) found that agreements are most successful if the following five conditions are met: 1) the resource and use of the resource can be effectively and inexpensively monitored, 2) the rates of change in resource use are moderate, 3) affected parties have frequent communication and a high degree of social capital, 4) outsiders can inexpensively be excluded from using the resource, and 5) resource users support monitoring of resource use. While most common resource issues are not favorable across all of these conditions, climate change is generally unfavorable across all of them, making it a particularly difficult commons problem to solve.

In addition to these difficulties, climate change holds a number of additional characteristics that make it a particularly troublesome issue within the domain of common resources. Moser (2010) outlines some of the challenges associated with communicating about climate change as:

- Lack of visibility: Greenhouse gases are largely invisible, which makes it difficult to visually depict their presence.
- Great physical distance between cause and effects of climate change: The impacts of climate change will be likely to occur in areas that are geographically distant from the largest emitters of greenhouse gases.
- Great temporal distance between cause and effects of climate change: The impacts of emissions today are likely

to be felt in the future, forcing a delayed impact of emissions and delayed gratification for mitigation efforts.

- Creeping warning signals: The warning signs of climate change generally arise as gradual shifts in the characteristics of natural events such as changes in sea level, severity of storms, and incidences of forest fires. The changes are unlikely to change dramatically from year to year, which would likely serve as a greater catalyst for public demands of climate mitigation efforts.
- Complexity and uncertainty of the issue: While scientific research has generally demonstrated that climate change is occurring and is likely to intensify in the years ahead without mitigating action, it remains a very complex phenomena. This makes it difficult to pinpoint what events may be due to natural variation or serve as an indicator of broader climate change.

The final difficulty faced with regulating climate emissions is that current global economic development rests largely on increasing carbon based energy production, such as burning coal (Heil & Selden, 2001). Successful long-term efforts to mitigate climate change will require the participation of developing countries as well as industrialized countries, but both developing countries and major industrial polluters have been hesitant to commit to greenhouse gas reductions either in the short or long-term (Watson, 2003). The arguments from industrialized countries that remain uncommitted have primarily been that a commitment would be damaging to the

economy and put industrialized economies at a competitive disadvantage to developing countries (Watson, 2003). Developing countries, in turn, have advocated for development needs in order to serve their impoverished populations. For example, a representative of the Indian delegation to the 2009 United Nations climate conference in Bonn, Germany, stated “If the question is whether India will take on binding emission reduction commitments, the answer is no. It is morally wrong for us to agree to reduce when 40 percent of Indians do not have access to electricity. Of course, everybody wants to go solar, but costs are very, very high” (Lakshmi, 2009). Scientists familiar with the challenges facing long-term climate change negotiations suggest that the best chance for success may rests on technological developments in the areas of solar and thermal technology (Hasselmann et al., 2003) in addition to nuclear fission and fusion (Sailor, Bodansky, Braun, Fetter, & van der Zwaan, 2000). Communication strategies may be utilized to promote government policies that will encourage the research and development of new technologies while aiding in the shift away from traditional fossil fuel sources for power.

In short, climate change negotiations must cross significant hurdles if they are to eventually be successful. While negotiations occur, there is still room for communities and countries to take an active approach to individually help mitigate the problem and also demonstrate solutions that may be effective on a global scale. Within this domain, communication can play an important role to shift the

attitudes and behaviors of individuals and public support for climate mitigation policies.

In recent year, scholars have increasingly applied communication theories to address how best to communicate with the public about climate change (Maibach, Roser-Renouf, & Leiserowitz, 2008; Moser & Dilling, 2007; Moser, 2010; Nisbet, 2009; Nisbet & Kotcher, 2009). While there is some debate in the literature on whether or not scientists should be public advocates on the issue of climate change (Fischhoff, 2007; Maibach & Priest, 2009), there is broad agreement that public advocacy will likely play a critical role in encouraging societal changes that may reduce carbon emissions.

Initiatives to reduce carbon emissions may occur primarily through voluntary individual behavior change, often encouraged through communication campaigns, or through government regulations. While both of these approaches have the potential to mitigate climate change, they both face distinct challenges in implementation. Looking at individual behavior changes, individuals face the structural constraint that most cities have been built around transportation and approaches to energy use that consume large amounts of fossil fuels – this substantially hinders the adoption of voluntary action to reduce an individual's carbon footprint (Ockwell, Whitmarsh, & O'Neill, 2009). Furthermore, even without structural constraints, if an individual sees no direct personal gain from taking action, such as a lower electric bill from more efficient lighting, then any motivation to change behavior requires the belief that enough other individuals will also change their carbon emission-related

behavior to create a substantial collective impact to mitigate the effects of climate change. However, individuals tend to believe that others are less willing to cooperate than they are (Kogut & Beyth-Marom, 2008) and are often unwilling to take action to address an issue when they believe that others will not take corresponding action to a sufficient degree to make a significant impact on the problem.

One solution to overcoming inhibitions to individual behavior change is to institute government policies that forces individuals to reduce their carbon emissions through financial incentives and regulation. Climate mitigation policies, however, have found limited traction in the political sphere because they often carry short term costs, such as higher taxes on gasoline, to address the long-term goal of attenuating the negative impacts of climate change. This is often unpalatable to politicians caught in a short term political cycle and fearing a potential public backlash (Ockwell et al., 2009).

One possible solution to the difficulties in implementing government policies on climate change is to use public advocacy campaigns to build a public desire for the government policies to be implemented (Maibach et al., 2008; Ockwell et al., 2009). From this perspective, communication strategies on climate change will be most effective if they focus squarely on changing public opinion about the role that the government should play in addressing climate change. The inclusion of research concerning framing processes provides an approach that can be utilized to identify how messages concerning climate change may resonate with different publics.

## **Framing Processes**

The framing research paradigm examines both the process of constructing messages and the subsequent impact that the messages can have in the public sphere. The domain of what can be considered a frame is broad, and depending on which research discipline is used for inquiry the operationalization of the term and scope of subsequent investigation can vary greatly. The following section will present an overview of research concerning framing processes and how it informs the studies presented in this dissertation.

The term “framing” draws from multiple theoretical approaches, including attribution theory (Kelley & Michela, 1980), expectancy value models (Ajzen & Fishbein, 1973, 2000), and Goffman’s work on interpretive schemas (Goffman, 1974). In the field of sociology, frames have primarily been defined as “schemata of interpretation” that allow individuals “to locate, perceive, identify, and label” issues and topics within their own personal context (Goffman, 1974, p. 21). Gamson and Modigliani (1989) describe frames as interpretative packages that give meaning to an issue by presenting “a central organizing idea...for making sense of relevant events, suggesting what is an issue” (p. 3). Reese (2001) states that “frames are organizing principles that are socially shared and persistent over time, that work symbolically to meaningfully structure the social world” (p. 11). Reese (2007) argues further that the term “frame” should not be merely interchangeable with using the term “topic” or “theme,” stating: “if they [researchers] cannot show how the frame does more ‘organizing’ and ‘structuring’ work, I prefer they not use the label” (p. 151). Popkin (1993) notes that

frames are used “whenever there is more than one way to think about a subject” (p. 83). Entman (1993) states that “to frame is to select some aspect of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described” (p. 52).

The framing process can thus be seen as the work of creating meaning and constructing reality (Benford & Snow, 2000). When examining the relation between framing and social movements concerning climate change, a useful approach is to use the lens of collective action frames, which Gamson (1992) defines as “not merely aggregations of individual attitudes and perceptions but also the outcome of negotiated shared meaning” (p. 111). Under this paradigm, the core functions of a frame are to identify and define: 1) a problem, 2) who is to blame for the problem, 3) an alternative to the current situation that will solve the problem, 4) what action can be taken to promote the alternative, and 5) provide motivation to take action. As this terrain is navigated by interested actors, a key determining factor in the influence of a frame is how well it resonates with targets of mobilization.

The question of resonance looks at the role that different message factors play in an individual’s decision making process to form attitudes and behavioral responses events and objects in the world around them. The expectancy value model (Fishbein & Ajzen, 1980) explains how attitudes on different object attributes may be used to construct opinions and decision making about the object.



Under this model, an attribute attitude is represented by the mathematical formula  $Attitude_i = \sum v_i * w_i$  with  $v_i$  defined as an evaluation of a specific attribute (i.e. the positive or negative evaluation of attribute<sub>i</sub>) and  $w_i$  defined as the salience, or weight, given to the attribute (i.e. the weight assigned to the evaluation of attribute<sub>i</sub>).

In a simplified model using climate change, an individual may evaluate climate mitigation policies on multiple attributes, such as the impact the policy will have on the economy, national security, energy independence, the environment, etc. For a proposal such as instituting a gas tax, an individual may believe that the tax would impact the economy negatively, improve national security by making the nation more independent, and may or may not affect the environment with an uncertain mitigation of climate change. With these conflicting evaluations of different attributes of a gas tax, the aggregate level of support, such as whether or not an individual would choose to vote for the proposal, will be guided by how salient, or how much weight, the individual assigns to each object attribute. This approach to framing informs experimental framing approaches that investigate subsets of the larger framing process, such as the emphasis framing effect (Druckman, 2001).

From a social psychology perspective, however, the term framing is often not connected to the “structuring work” that Reese (2007) focuses on, or even the emphasis framing effect from Druckman’s (2001) work, but rather refers to how small changes in the structure of messages that convey logically equivalent information can significantly alter how individuals interpret the information. While the emphasis

framing effect examines how different non-fungible attributes may affect attitudes and behaviors related to an object or issue, equivalency framing effects examine the impacts of different fungible descriptions (Kühberger & Tanner, 2009; Tversky & Kahneman, 1981). One of the most well-known examples of an equivalency framing effect is Tversky and Kahneman's Asian disease problem (Tversky & Kahneman) in which participants are asked to choose between different programs to combat a disease outbreak that has the potential to kill 600 people. The potential for saving lives is either described with a positive valence (focusing on the number of lives saved) or a negative valence (focusing the lives lost). In the positive valence condition, the choices are described as:

If Program A is adopted, 200 people will be saved.

If Program B is adopted, there is a  $1/3$  probability that 600 people will be saved and a  $2/3$  probability that no people will be saved.

In the negative valence condition the choices are described as:

If Program C is adopted, 400 people will die.

If Program D is adopted, there is a  $1/3$  probability that nobody will die, and a  $2/3$  probability that everybody will die.

In this approach to framing, participants are typically assigned to either the positive or negative valence conditions, and then asked to

choose between one of the two programs. All programs have the same outcome expectancy, although program A and C guarantee that a certain number will live and die, while programs B and D provide a probability that either everyone will live or everyone will die. With this specific problem, Tversky and Kahneman (1981) found that individuals tended to prefer the sure option in the positive valence condition (200 people will be saved) but prefer the risky option in the negative valence condition (1/3 probability nobody will die and 2/3 probability everybody will die). This result is explained in terms of prospect theory (Kahneman & Tversky, 1979) and the biases that individuals have in decision making depending on their reference point and the valence of the description of the issues. It is worth noting that scholars have recently tested different versions of the Asian disease problem and now suggest that fuzzy-trace theory (Reyna & Brainerd, 1991, 1995) may offer a better explanation for the findings than prospect theory (for a full review, see Kühberger & Tanner, 2009). Additional logically equivalent frames have also been examined for various formats, such as gain/loss frames (De Martino, Kumaran, Seymour, & Dolan, 2006; O'Keefe & Jensen, 2007) and the impact of different numeric presentations (e.g. 10 out of 100 vs. 10% out of 100; Peters et al., 2006).

In summary, the term “framing” may refer to broad sociological processes of media message construction and subsequent shaping of social reality for the general public, or it may refer to more basic psychological processes that guide how individuals may interpret messages with slightly different structures. While some scholars have

attempted to “clean up” the field by proposing clearer boundary conditions of what framing refers to (e.g. Scheufele, 2000), there are still a very limited number of citations that cross disciplinary boundaries, and in the field of communication the term remains fairly amorphous (e.g. see the different approaches adopted by Chong & Druckman, 2007; Edy & Meirick, 2007; Entman, 2007; Hyunseo Hwang, Gotlieb, Seungahn Nah, & McLeod, 2007; Kinder, 2007; Reese, 2007; Scheufele & Tewksbury, 2007; Sheafer, 2007; Van Gorp, 2007; Weaver, 2007; Yuqiong Zhou & Moy, 2007).

In this dissertation, I acknowledge the broad approach to framing offered by sociology scholars such as Benford and Snow (2000), but focus on the motivational functions of frames which draws on the social psychology literature. In other words, in this dissertation I focus on a small subset of the framing process, namely how changes in message structures can affect frame resonance with members of different publics, but do so with the understanding that the impacts of changes in these structures operate within the broader process of negotiated meaning that occurs across the framing process. In the following section, I will describe how framing scholars have generally approached the issue of climate change, and then discuss the research gap that the three studies presented in this dissertation attempt to address.

### **Framing of Climate Change**

To date, the majority of framing research examining climate change has focused on the *construction* of different climate change

frames. For example, Boykoff and Boykoff (2004) focused on how the norm of providing balanced representation of conflicting sides led to a biased representation of the science of climate change, and subsequently linked this bias to the need for the dramatization of climate coverage (Boykoff & Boykoff, 2007). Trumbo (1996) looked at climate change in terms of Downs' issue-attention cycle (Downs, 1972), and found that scientists are generally associated with discourse on the cause and effects of climate change, while politicians and interest groups are associated with discourse on how best to address climate change. Boykoff and Roberts (2007) examined how the media may influence public opinion, government policies and practices towards climate change. Weingart, Engels, and Pansegrau (2000) examined the dynamics of climate change discourse in the spheres of science, politics, and the mass media. Additional work has examined how competitive framing by liberals and conservatives has affected climate change policy, with conservative discourse contributing to the effective obstruction or delay of the adoption of government policies to address climate change (Dunlap & McCright, 2008; Dunlap, Xiao, & McCright, 2001; McCright & Dunlap, 2000, 2003).

Nisbet (2009) provides a framework for thinking about what thematic elements have been adopted in the framing of climate change, parsing the themes into categories such as "pandora's box," "scientific and technical uncertainty," "economic development and competitiveness," "morality and ethics," and "social progress."

In a "Pandora's Box" frame, left-leaning politicians, such as former Vice-President Al Gore, and leading scientists have used an

averting disaster frame by discussing global climate change in the following terms: a) the current scientific consensus that it is a human caused phenomenon; b) the potential damage to communities throughout the world may be catastrophic; and c) with urgent action it may be possible to attenuate the impact (e.g. Guggenheim, 2006). In addition, some policymakers and advocacy groups have recently begun to use a Pandora's Box/national security frame that packages policies aimed at combating global climate change as a national security issue in terms of reducing the strategic dependence on foreign oil and the need for involvement in the Middle East (e.g. CNA, 2007).

In contrast, conservative leaders have focused on highlighting and amplifying the scientific uncertainty concerning aspects of both the causes and effects of global climate change (a scientific uncertainty frame), and framed the issue in terms of the negative economic impacts (an economic frame) caused by taking action to combat it (McCright & Dunlap, 2000). While stressing the scientific uncertainty of global climate change, conservative leaders have typically taken the approach that the impacts of global climate change are inevitable, adopting measures such as greenhouse gas emission caps will ruin the economies of industrialized nations, and global leaders should focus on ways to adapt to the impacts of global climate change instead of actions to attenuate global climate change itself (McCright & Dunlap, 2003)

Beyond this partisan divide, some Christian religious leaders have adopted a moral frame to address global climate change (Bingam, 2007) with campaigns such as "what would Jesus drive?" This has

sparked counter framing by some conservative Christian groups such as the Interfaith Stewardship Alliance (2006) that stresses scientific uncertainty about human-caused climate change and that global climate change should not distract Christians from other “moral” issues such as abortion. A third moral, but more secular, frame has packaged global climate change in terms of the ethical question of contemporary society leaving a “debt” that future generations will have pay later (e.g. International Humanist and Ethical Union, 2007).

In a separate frame, community and business leaders have adopted a social progress frame, which goes beyond the strictly monetary orientation of the economic frame to include issues such as social justice, ecosystem integrity, and general improvements in the quality of life (e.g. Agyeman, Doppelt, Lynn, & Hatic, 2007). Others, such as some environmental advocacy groups, have also used a social progress frame that proposes a radical restructuring of society that de-emphasizes the role of consumption in general and promotes fundamental cultural change, rather than simply limiting consumption of products that contribute to global climate change (e.g. Swedish, n.d.).

While multiple scholars have examined how thematic differences in the presentation of climate information (e.g. a national security frame vs. an environmental frame) may impact public perceptions, there has been a dearth of studies examining how message structure (e.g. using statistics or verbal descriptors to describe the impact of climate change) may also affect the impact of the message. This is a critical area that complements the work in thematic presentation, but also provides an opportunity to examine how climate change may

provide a unique domain of inquiry with characteristics that will affect how theories concerning message structure will operate. Some researchers have examined the impacts of subtle changes in message structures concerning climate change, such as Whitmarsh's (2009) findings that the term “global warming” generates more concern in the general public than using the term “climate change,” but in general scholars have paid a limited amount of attention to this domain of research. In this dissertation, I attempt to help address this research gap by focusing on how message structures can impact the public’s willingness to address climate change.

### **Overview of Presented Studies**

The studies presented in this dissertation examine how changing the structure of a message may affect its impact. They investigate three key message manipulations that have not been previously examined in the context of climate change: the social identity of potential victims, episodic vs. thematic descriptions of potential victims, and the presence or absence of statistics when discussing the impacts of climate change on potential victims. These, respectively, look at the questions of who is affected, how many are affected, and the format the information is provided in. The manipulations are investigated separately to allow for easier interpretation of the results, but also set the stage for interactions across the manipulations, as all of the manipulations are likely to come into play when a science communicator is deciding how to construct messages regarding climate change.



In Chapter 2, the first study draws from social identity theory (Tajfel, 1974; Tajfel & Turner, 2004) to examine how the identity of potential victims of climate change may affect the willingness of the public to address the issue. The data showed a significant interaction between experimental participants' political party identification and the identity of climate change victims, with news stories discussing out-group victims generating a boomerang effect among Republicans.

In Chapter 3, the second study looks at how the adoption of episodic or thematic frames (Iyengar, 1990, 1994) may affect individual behavior change and policy preferences related to climate change. Individual behavior change was not sensitive to episodic and thematic message manipulation, but thematic frames were more effective in building support for climate change policies by increasing the attribution of responsibility to society at large.

In Chapter 4, the final study examines how numeracy (Peters et al., 2006) may moderate how the presence or absence of statistics in a news story impacts public willingness to donate to organizations working on the issue of climate change. The results showed that low-numerate individuals were sensitive to numeric framing effects and were willing to donate more when persuasive messages included statistics than when they did not, while high numerate individuals were not affected by presence or absence of numbers. Table 1 provides a summary of the studies and their respective independent and dependent variables.

The studies presented here demonstrate the impact that perceptual screens and structural changes in messages can have on

Table 1

<i>Summary of Dissertation Studies</i>		
<b>Study</b>	<b>Independent Variables</b>	<b>Dependent Variables</b>
Study 1	In-group vs. Out-group Victims Political Party Identification	Policy Preferences
Study 2	Episodic vs. Thematic Descriptions of Victims	Policy Preferences Individual Behavior
Study 3	Statistics vs. Verbal Descriptions Numeracy	Individual Behavior

predispositions for behavior, and the results set the stage for future interactions between numeracy, the identified victim effect, and the use of statistics. The results are discussed with respect to future research directions, and how science communicators may nudge (Thaler & Sunstein, 2003) individuals towards or away from action on issues such as climate change.

## CHAPTER 2

### POLITICAL PARTISANSHIP, SOCIAL IDENTITY, AND PUBLIC SUPPORT FOR CLIMATE MITIGATION

Climate change in America, in addition to being an environmental issue, is a political issue. Despite widespread scientific consensus that global climate change is largely caused by anthropogenic sources and has the potential to create substantial ecological, social, and economic harm, the American public remains largely divided on whether, and how, to approach climate change. The divide in America largely falls across political and ideological lines; most Democrats believe that climate change is caused by humans and support government policy to address climate change while most Republicans do not.

The divide between Republicans and Democrats has widened significantly over the past 10 years on measures such as the belief that climate change is caused by humans, climate change will pose a serious threat in the respondent's lifetime, and that the effects of climate change have already begun (Dunlap & McCright, 2008). During this time, climate change beliefs increasingly became a marker for political identity, making individuals likely to pay more attention to and interpret information in ways that reinforce their political beliefs and social identity. In this polarized environment, media stories on climate change may serve to amplify partisan differences on the issue

depending on what elements of climate change are highlighted in the story.

One important dynamic in media stories is the question of *who* is affected by climate change. News stories may focus on impacts in the United States, in distant areas, or a combination of the two. To the best of my knowledge, previous research has not investigated how the identity of climate change victims in news stories may interact with audience partisan identification in the formation of public opinion around climate change.

The research presented in this chapter examines the role that embedded social identity cues in climate change messages may play in amplifying partisan polarization on the issue of climate change. This chapter will first discuss political polarization on the issue of climate change and the role that framing, social identity, and political party affiliation may play in the effectiveness of climate change messages. Following this discussion, the current study will be presented, which examines the differential impacts of messages that describe the impact of climate change on in-group, located in the same geographic area as the experimental participant, or out-group victims, located far away. The results demonstrate that the group identity of climate change victims interacts with political orientation by reducing Republican support for climate change action when the impacts of climate change on perceived out-groups are highlighted, while Democratic support is not significantly affected.

## **Literature Review**

### **Ideological Polarization on Climate Change**

As scientists have become increasingly certain about the human causes of climate change and the urgent need to address it, one might expect that public opinion about climate change would follow a similar pattern in beliefs about human causation, perceptions of the threat of climate change, and support for government policies that address the issue. However, polling data shows modest changes across these measures for the public as a whole and an increasing polarization between Democrats and Republicans (Dunlap, 2008).

For example, in Gallup polling general public agreement with the question of whether “temperature changes over the last century are due more to human activities than natural changes in the environment,” has moved from 61% in 2003 to 58% in 2008 (Dunlap, 2008). While the overall public opinion has barely moved during this five-year time period, agreement with this question amongst Democrats rose from 68% in 2003 to 73% in 2008, while Republican agreement declined from 52% in 2003 to 42% in 2008 (Dunlap). Similar examples of political polarization over the last 10 years have occurred for beliefs on whether the effects of global warming have already begun, the scientific consensus on global warming, the threat that global warming will pose in the respondent’s lifetimes, and whether effects of climate change are exaggerated in the news (Dunlap & McCright, 2008).

Why has the public become more polarized on the issue of climate change during the time period that scientists have reached a stronger consensus on the issue? Layman, Carsey, and Horowitz (2006) suggest that recent years have been unique in the breadth of policy divisions between parties. While parties have historically been divided across a single policy dimension, through a process Layman et al. term “conflict extension” political parties today are largely divided on all major policy initiatives. Thus, increasing levels of political polarization on the issue of climate change may be seen as part of a larger trend of party separation across a broad range of issues. Dunlap and McCright (2008) note that there was not a strong partisan divide on environmental issues until the Reagan administration of the 1980s, under which environmental regulations were labeled as constraints on economic growth by the Republican administration. Since the Reagan administration, Democratic politicians have generally been more supportive of environmental policies than Republican politicians.

On the issue of climate change, throughout the 1990s conservatives argued that climate change would largely be beneficial, that attempts to mitigate climate change would lead to economic catastrophe, and that there was insufficient evidence that climate change was occurring (Dunlap et al., 2001; McCright & Dunlap, 2000). Frank Luntz, a conservative political consultant, played an influential role during this time period by strongly encouraging Republicans to stress that there was a great deal of scientific uncertainty about climate change, and that taking any action without the participation of developing countries would lead to economic catastrophe (Nisbet,

2009). Liberals, on the other hand, generally warned of the dire consequences that would affect humans and the environment if no action was taken. While many Democrats called for immediate action, the communication strategy of the conservative movement has largely been successful in blocking climate mitigation policies (McCright & Dunlap, 2003).

While policy positions for a political party arise through an interactive process between party leaders, political activists, and members of the general public who identify with political parties, scholars (Dunlap & McCright, 2008; Fiorina & Abrams, 2008; Layman et al., 2006) suggest that the adoption of policy positions is driven primarily through a top down process led by political elites within a party. From this viewpoint, the public ideological polarization on climate change can be seen as a phenomenon that is rooted in differences between the ideological differences of Democratic and Republican political elites.

As noted above, multiple analyses have examined the ideological divide on climate change by comparing differences in climate change narratives adopted by Democrats and Republicans (McCright & Dunlap, 2000; Nisbet, 2009) to demonstrate linkages between elite political discourse and constituent polarization on the issue. However, to the best of my knowledge researchers have not experimentally tested the potential for subtle differences in informational stories on climate change, such as the identity of potential climate change victims, to amplify polarization on the issue of climate change amongst the public. Small differences in message structure may significantly

affect how climate messages resonate with the public. Benford and Snow (2000) suggest that this may occur depending on how the messages resonate with individual predispositions. The role that social identity plays in the framing process will be discussed in the following sections.

### **Social Identity and Science Message Frames**

As stated in the introduction, framing processes include the dynamics of how message themes and structures can alter the perceived applicability, belief importance, and salience of an issue construct when individuals are evaluating an issue (Chong & Druckman, 2007). Recent calls for science communicators to pay more attention to how they frame climate change to the general public (Nisbet, 2009; Nisbet & Mooney, 2007) have been paired with research examining how science communicators can strategically communicate the issue to a variety of audiences (e.g. Moser & Dilling, 2007). Ockwell et al. (2009) argue that appeals to individual behavior change will have limited impacts due to the free-rider problem. Instead, climate change appeals can be most effective if they drive public opinion to support climate change legislation.

Public support for climate change policy is not only driven by advocacy campaigns, but can also be affected by general news stories on the issue (Corbett & Durfee, 2004; Ungar, 1992). It is important that communication scholars investigate how general climate change messages may impact public perceptions of climate change, including possible interactions between the content of the message and



characteristics of the receiver such as their political party affiliation. The research presented here takes this approach, and looks at how embedded social identity cues in media stories about climate change may amplify partisan differences on support for climate mitigation policies.

One message factor in framing climate change is *who* is affected and how message receivers identify with the affected individuals and communities. This perception is influenced by the message receiver's social identity. An individual's social identity is based on self-categorization within a group of people that promotes a feeling of uniqueness between the in-group and others (Haslam, Oakes, Reynolds, & Turner, 1999; Haslam, Powell, & Turner, 2001). Group membership consists of the psychological belief, rather than the actual occurrence, that one does or does not belong to a specific population of people. Group identity is often flexible; different social categories of group membership, such as race, gender, religion, location, and political party, are interchangeable and can be manipulated by varying the emphasis on, and thus the salience of, different traits (Tajfel, 1982; Tajfel & Turner, 2004).

Newspapers stories often focus on different population groups that will be affected by climate change, such as communities in the Mekong delta (Mydans, 2009), the Himalayas (Chhibber & Schild, 2009) and the United States (Broder, 2009). While these news stories are often intended to be informational rather than persuasive, they present different frames by focusing on victims that audiences may perceive as being part of an in-group or an out-group.

Group membership can play a powerful moderating role in whether, and why, individuals are willing to help those in need (Stürmer, Snyder, Kropp, & Siem, 2006; Stürmer, Snyder, & Omoto, 2005). A sense of community concern and protection of the group can play powerful roles in an individual's willingness to make sacrifices to help an in-group more than an out-group (Omoto & Snyder, 1995). If stories about the impact of climate change discuss the location of victims of climate change, social identity theory suggests that individuals will tend to identify more with victims who are located in the same area as they are than those who are not. Thus, it is expected that individuals will be more willing to support government policies to address climate change when the effects are described as impacting individuals in a local community compared to distant communities.

However, a message discussing climate change by focusing on distant victims may result in the message receiver being less supportive of legislation to address climate change. If the message was part of an advocacy campaign, this effect would be termed a boomerang effect. The boomerang effect occurs when a message is strategically constructed with a specific intent but produces a result that is the opposite of that intent (for a review see Byrne & Hart, 2009). For example, anti-smoking messages can increase predispositions to smoke (Wolburg, 2004), anti-litter messages can increase predispositions to litter (Reich & Robertson, 2006), and appeals for donations to impoverished children can lower donation rates (Small, Loewenstein, & Slovic, 2007). The boomerang effect can be specific to certain segments of the population. For example, Schultz

et al. (2007) found that appeals to increase energy efficiency created a boomerang effect amongst households that were already very energy efficient and increased average energy use for this population segment.

The boomerang effect occurs through two pathways: 1) receivers process the message as intended but do not properly comply, or 2) unintended constructs are activated in the receiver and drive the resulting attitude and behavioral change. The integrated theoretical framework proposed by Byrne and Hart (2009) states that when an individual receives a message, he or she will engage in competitive processing of different components of the message with certain aspects of the message becoming more salient than others.

Research on motivated cognition suggests that rather than interpreting the facts of the message in an unbiased way, individuals will tend to interpret messages in ways that reinforce previously formed opinions on the issue (Chong & Druckman, 2007). Though scholars often point to self-selection for exposure to partisan information sources (Bennett & Iyengar, 2008) as a reason for issue polarization, messages may also be interpreted in ways that reinforce, or amplify, polarization. Cultural cognition researchers find that people tend to interpret information in ways that reinforce their cultural orientation (Kahan, 2010), and Mutz (2008) asserts exposure to any information content, regardless of the source, about contentious issues such as climate change is likely to activate political predispositions and increase issue polarization due to motivated cognition. This motivated cognition process can heavily influence the competitive processing of message components to make unintended

constructs more salient (Byrne & Hart, 2009). With some climate change messages promoting action on climate change, science communicators may be unintentionally presenting their message in ways that activate unintended constructs in the receiver. In this case, a climate change message discussing the impact that climate change is having on individuals in a distant area may activate the unintended construct that climate change will only impact those who are far away and reduce support for action to address climate change.

The effects of group identity do not operate alone, but interact with the values and predispositions that an individual has in the process of opinion formation. As mentioned above, climate change has become a marker of political identity: Democrats generally believe that humans are primarily responsible for climate change and need to mitigate the effects with legislative action while Republicans generally do not (Krosnick, Holbrook, & Visser, 2000). It is likely that Democrats and Republicans will interpret climate change messages in ways that reinforce beliefs consistent with their political identity through motivated cognition. Based on this literature, I predicted that if a climate change message includes information describing the impacts of climate change on an out-group, Republicans will interpret the message in a way that reduces the need to take action on climate change while Democrats are likely to be resistant to the out-group component of the message. However, when messages describe the impacts that climate change will have on an in-group, it is likely that Democrats will find an increased need to take action while

Republicans will be resistant to the in-group aspect of the message. Formally stated, this leads to the following hypotheses:

*H1: Support for climate mitigation policies will vary by degree of audience identification with groups featured in a climate change message.*

*H2: Political partisanship will moderate the influence of audience social identification on support for climate mitigation policies.*

## **Method**

### **Procedure**

As with all of the experiments in this dissertation, participants were recruited from shopping malls in upstate New York with a sign that stated they would receive \$5 in compensation for completing an experimental study. Every participant signed an IRB approved consent form before being directed to a private location to complete the study. All participants in a stimulus condition first read a story about the effects of climate change (the story differed by study and condition) and then filled out a questionnaire (the questionnaire also differed by study and condition). Participants in the control condition only filled out the questionnaire. In all of the studies, no participant took longer than 15 minutes to complete the experiment.

## **Participants**

Participants in Study 1 were non-student adults ( $N=240$ ; mean age = 38.42 years; age range = 18 - 80 years; 54% female).

## **Experimental Design and Stimulus**

In the two stimulus conditions, participants read a simulated news story about climate change, while participants were not exposed to a news story in the control condition. The simulated new story was designed to be "non-political" as it did not contain any explicit political partisan cues and focused on the potential health impacts of climate change, an increasingly salient and important aspect of climate change (Frumkin, Hess, Luber, Malilay, & McGeehin, 2008). The story discussed the potential for climate change to increase the likelihood that individuals who spend a lot of time working outdoors, such as farmers, will be infected by diseases such as West Nile virus. The news story was generated explicitly for the experiment, but was based on facts reported in Associated Press stories. The story included pictures and names of ten farmers who were potentially at risk.

Social identification with the potential victims featured in the story was varied by manipulating whether the story exemplars were located in the region where the experimental participants resided or were from a different region (by changing the headline, body text, and exemplar names). However, the exemplar photos in each story were not varied to guard against confounding effects from different facial expressions or other individual cues. The high social identification (in-

group) condition used Upstate NY (the area where the participants were recruited from) as the location for the farmers while the low social identification (out-group) condition used either the state of Georgia or the country France. Multiple out-group samples were used to help ensure the manipulation was driving in-group and out-group identification rather than unintended group characteristics. The experimental stimuli used for the conditions are reproduced in Appendix A and Appendix B.

As a manipulation check, after reading the news story, subjects were asked questions about how much they identified with exemplars in the story as an indicator of how much they identified with the groups featured in each story. Participants were asked how much they agree with the following statements: 1) “The people in the story have problems like my own;” 2) “I identify with the people featured in the story;” 3) “The people featured in the story are like me;” and 4) “I feel connected to the people featured in the story.” The questions were measured on a seven point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) and aggregated into a single identification scale (range 4-28,  $M=12.5$ ,  $SD=6.5$ ) which had a Cronbach’s alpha of 0.92. Participants identified with the exemplars employed in the in-group condition ( $M=13.8$ ) significantly more than the exemplars in the out-group condition ( $M=11.3$ )  $t(154) = 2.45$ ,  $p < 0.05$ , indicating a successful, albeit small, identification manipulation.

## Data Analysis

OLS regression analysis was employed to test the hypotheses regarding the effect of social identification cues on support for climate mitigation, as well as the moderating influence of political identification. Political orientations, environmental values and beliefs, and experimental conditions were used as independent variables in the analysis. Support for government action on climate change was used as the dependent variable.

**Control Variables.** *Political partisanship* was measured by asking subjects “when it comes to political parties in the United States, how would you best describe yourself?” The question was measured on a seven point scale that ranged from “a strong Democrat” (0) to “a strong Republican” (6) ( $M=2.6$ ,  $SD=1.9$ ). *Role of government* was assessed by asking respondents which of two statements came closest to their opinion, with respondents selecting “the less government, the better” coded as “1” and respondents who selected “there are more things that government should be doing” coded as “0” (30.3%). *Belief in human-induced global warming* was assessed with a dichotomous variable indicating whether subjects agreed with the statement “global climate change is occurring and we humans are the primary cause” (65%). *Environmental values* were determined by using a shortened 6-item version of the New Environmental Paradigm (NEP) scale (Dunlap, 2008). Respondents were asked how much they agreed or disagreed with the following statements: a) “the balance of nature is very delicate and easily upset by human activities,” b) “modifying the



environment for human use seldom causes serious problems,” c) “the earth is like a spaceship, with only limited room and resources,” d) “there are no limits to growth for nations like the United States,” e) “plants and animals do not exist primarily to be used by humans,” and f) “mankind was created to rule over the rest of nature.”

The six NEP measures were measured on a scale that ranged from 1 (strongly disagree) to 7 (strongly agree), and then combined into a single mean environmental values scale with questions b, d, and f reverse coded (the resulting scale ranged from 1 - 7;  $M = 5.04$ ;  $SD = 1.14$ ). Cronbach’s alpha for the resulting scale was .64; while the reliability is below 0.7, it falls within the range that other researchers have identified for this abbreviated version of the full scale (see Pierce, Lovrich, Tsurutani, & Abe, 1987, for comparisons).

**Experimental conditions.** Dummy variables were coded to indicate whether the subject was in the *out-group condition* (33.3%), *in-group condition* (33.3%), or *control condition* (33.3%), with the control condition as the reference group. In addition, a dichotomous variable indicating whether a respondent in the out-group condition was exposed to a story set in either France or Georgia was included in the analysis, with France coded high (16.7%), as an additional control.

**Dependent Variable.** The dependent variable in the analysis was *support for government action on climate mitigation*. Participants were asked how much they agreed with the following statements: 1) “We should immediately increase government regulation on industries

and businesses that produce a great deal of greenhouse emissions,” and 2) “We should immediately increase taxes on industries and businesses that produce a great deal of greenhouse emissions.” These statements were chosen to present experimental participants with general climate policies that mirror those proposed by leading politicians for climate legislation (Voorhees & Bravender, 2010). The two questions were then combined into a single mean support for government policy scale (the resulting mean scale had a range of 1-7;  $M = 5.13$ ;  $SD = 1.80$ ). The two measures had a significant Pearson correlation of 0.753,  $p < 0.001$ .

## **Results**

The results of the OLS regression predicting support for government climate mitigation policy are presented in Table 2 with standardized beta coefficients and significance reported. Model 1 tests the effects of in-group and out-group message exposure on support for climate mitigation compared to control ( $H1$ ) while model 2 tests for the interaction between political party identification and the identity of the victim ( $H2$ ). A graph of the interaction between political party identification and victim identity from model 2 is provided in Figure 1.

The results in model one failed to support  $H1$ , with support for climate mitigation not significantly varying with the degree of audience identification with the groups featured in the stories. The in-group ( $\beta = .04$ , ns) and the out-group ( $\beta = -.10$ , ns) message conditions did not differ significantly from the control group in policy preferences. The only significant predictors of support for government action on climate

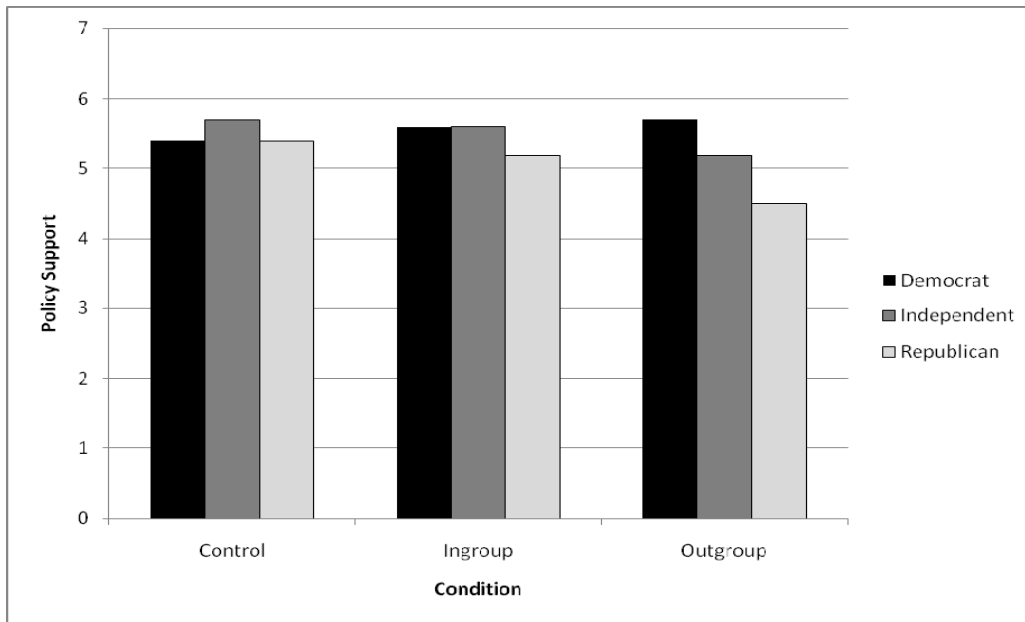
mitigation in Model 1 were political partisanship ( $\beta = -.21$ ,  $p \leq .001$ ) and belief in human-induced global warming ( $\beta = .35$ ,  $p \leq .001$ ).

However, the influence of message exposure on support for climate mitigation was contingent upon political partisanship (in support of *H2*). The results from model 2 indicate that exposure to the out-group message condition decreased support ( $\beta = -.32$ ,  $p \leq .05$ ) for climate mitigation more for Republican subjects compared to others. However, political partisanship was not a significant moderator on identification when comparing the in-group message condition to the control condition. ( $\beta = -.07$ , ns). This indicates that climate change messages focusing on out-group victims may boomerang amongst Republicans.

Table 2

<i>OLS Regression Predicting Support for Climate Mitigation Policies</i>		
Predictors	Model 1	Model 2
<u>Control Variables</u>		
Environmental Values	.35**	.33**
Political Partisanship (Strong Republican)	-.21**	-.10
Role of Government (conservative)	.11	.11
Belief in Human-Induced GW	.17*	.16**
<u>Experimental Conditions</u>		
In-group Identity Message	.04	.10
Out-group Identity Message	-.10	.17
France Message	-.01	-.02
<u>Interactions</u>		
In-group X Partisanship		-.07
Out-group X Partisanship		-.32*

Note. \*\* $p < 0.001$ , \* $p < 0.05$ . Standardized Betas are reported.



*Figure 1.* Interaction between political party identification and experimental condition on support for climate mitigation policies.

## Discussion

This study finds that informational news stories about climate change can be interpreted differently depending on the partisanship of the message receiver, demonstrating the important role that motivated cognition plays in the interpretation and application of messages discussing scientific issues such as climate change and calls into question the traditional deficit model of science communication.

Hypotheses 1 was not supported in this study; support for climate mitigation policies did not vary overall by degree of audience identification with potential victims highlighted in climate change messages. The effect of social identification on policy preferences was completely contingent on political partisanship. A possible explanation

for this null finding is that the identity manipulation in this study may have been too subtle and weak, especially in terms of out-group identification. Future research may build from this study to examine how different levels of vividness of social identity cues may moderate message effects, and also generally examine how social identity cues have been embedded in climate change news frames, as this analysis has not been included in recent content analyses (e.g. Boykoff & Boykoff, 2007; Boykoff & Boykoff, 2004; Weingart, Engels, & Pansegrau, 2000). In addition, social identification with potential victims may play either a greater or a smaller role in audience perceptions about science issues with little or no political polarization; thus, examining the role of social identity cues within other issue contexts is also desirable.

Hypothesis 2 was supported in this study: the effect of message exposure on support for climate mitigation policies was contingent upon subjects' political predispositions. The results indicated that message exposure activated motivated reasoning in subjects, which increased polarization between Democrats and Republicans in policy preferences. Among Democrats exposure to either in-group and out-group messages increased support for climate mitigation. At the same time, support for climate mitigation among Republican subjects significantly declined compared to the control group, especially after exposure to the out-group message.

These findings have implications for science communicators and our understanding of how media coverage of climate change is likely to influence public opinion. As previously mentioned, Mutz (2008) asserts

that exposure to media messages, regardless of the source, about contentious issues such as climate change is likely to activate political predispositions and increase political polarization about the issue due to the activation of biased information processes amongst audiences. This study's findings are consistent with this argument – political polarization on support for climate mitigation policies increased significantly after message exposure to news stories discussing out-group populations.

News stories often highlight the impact of climate change on different parts of the world. The results of this study suggest that broad public exposure to news stories discussing the impacts of climate change on outside the United States is likely to amplify the American partisan divide on climate mitigation policies.

These results are especially important for science communicators in light of the fact that, to date, the dominant approach used for communicating about science issues is the *deficit model* of science communication (Bauer, Allum, & S. Miller, 2007). Under the deficit model approach, or “science literacy” approach, media and education programs are utilized to provide the public with more facts and increase general knowledge about a science issues such as climate change. The underlying assumption of these efforts is that if the general public has more information about climate change individuals will adopt views in line with scientific experts. Recent scholarly work has been critical of this approach (e.g. Nisbet, 2005; Nisbet & Goidel, 2007) and points to errors in the assumptions under the scientific literacy approach. Critics assert that strong value and

ideological orientations may act as a perceptual screen (Goidel, Shields, & Peffley, 1997) that influences audiences to select and privilege a subset of considerations that are consistent or reinforce their predispositions. For example, Nisbet (2005) found that ideological and religious worldviews strongly moderated the impact of increased information awareness on public support for embryonic-stem cell research. Likewise, Druckman & Bolsen (2009) found that audience responses to factual messages about emerging technologies were heavily contingent on their ideological predispositions. Results from the study presented here point to similar perceptual screens.

Science communicators may reduce the likelihood of activating unintended constructs by focusing on messages that target specific segments of the public. Audience segmentation analysis (Maibach, Roser-Renouf, & Leiserowitz, 2009) and ongoing framing research on science and technology issues (Nisbet, 2009; Nisbet & Scheufele, 2009) may provide useful tools for targeting messages to different population segments.

This study suggests that when creating general messages for the public, science communicators and environmental organizations can lower the risk of creating a boomerang effect amongst conservative segments of the population by focusing on implications for local areas when discussing the impact that climate change may be having on distant populations. While this may not always be possible, this study demonstrates that focusing on distant impacts of global phenomena such as climate change is likely to amplify polarization.

In conclusion, this study demonstrates how the impact of messages concerning climate change may be moderated by political partisanship and social identification. As research on effective science communication continues, it will be important to identify how messages may amplify or attenuate political polarization about controversial science issues. The current elite discourse, in which Democratic political leaders have continued to push for legislation on greenhouse gases while Republican leaders have argued against government regulation, suggests that climate change beliefs will continue to serve as indicators for party affiliation in the foreseeable future.



## CHAPTER 3

### ONE OR MANY? THE INFLUENCE OF EPISODIC AND THEMATIC CLIMATE CHANGE FRAMES ON POLICY PREFERENCES AND INDIVIDUAL BEHAVIOR CHANGE

This chapter examines a complementary message structure to social identity by examining the impact of messages that present the impact of climate change episodically or thematically. An episodic frame provides a case study of the issue (e.g. the impact of climate change on an individual), while a thematic frame provides general trends and information about an issue (e.g. general trends of the impact of climate change) (Iyengar, 1994).

This chapter will focus on the impact of episodic and thematic frames in the framing process and present results from an experiment that examines the relative impact of using an episodic or a thematic frame to discuss the effects of climate change on polar bears. To the best of my knowledge, this study is the first to examine the impacts of using episodic and thematic frames in the context of climate change. It is also the first that I am aware of to examine episodic and thematic framing in a context in which the experimental participants cannot help the victim(s) directly, but instead must rely on collective action to do so. Specifically, this study looks at how episodic and thematic framing of climate change influences the perception of who is responsible for addressing climate change, support for policies that address climate change, predispositions for individual behavior

change, concern for the polar bear(s) featured in the story, and the emotional response to the story.

## **Literature Review**

### **Episodic and Thematic Frames**

Iyengar (1990, 1994) performed some of the most influential studies on episodic and thematic framing. Most relevant to this study are Iyengar's (1994) experimental tests of how presenting participants with different poverty frames in news stories could significantly change whether the responsibility for poverty was assigned to the impoverished individual or to society at large. Iyengar found that when poverty was framed as a general outcome, with an inclusion of general statistics and causes of poverty (thematic framing), individuals would generally assign responsibility for poverty to society at large; however, when poverty was framed as a description of an individual who was impoverished (episodic framing), individuals would generally assign responsibility for poverty to the impoverished individual. Related to the research presented here, Iyengar (1990, 1994) found that attribution of treatment responsibility was a critical mediator for the belief that the government should take action to address an issue. Additionally, when participants were presented with a thematic frame, their increased attribution of responsibility to societal factors increased their support of government policies to address the respective public issue. Attribution of treatment responsibility is thus included in this study to see if the use of episodic or thematic frames impacts

attribution of responsibility to address climate change and subsequent policy support.

### **The Role of Emotion in Episodic and Thematic Framing**

In addition to attribution of responsibility, emotion plays a key role in decision making about individual behavior change and policy support. In the arena of policy support, individuals often rely on cognitive shortcuts when making decision about policies (Zaller, 1992) and use affective heuristics to guide decision-making (Brader, 2006; Neuman, Marcus, Crigler, & Mackuen, 2007; Sniderman, Brody, & Tetlock, 1993). In other words, individuals will often rely on their emotional response to an issue to guide their opinion towards the enactment of related policies. To the best of my knowledge no researchers have examined how episodic and thematic framing may impact emotion related to support or opposition to the implementation of government policies. However, researchers have examined episodic and thematic framing in relation to individual behavior when a participant can directly help an individual in need. Kogut and Ritov (2005a, 2005b), Slovic (2007), and Small, Loewenstein, and Slovic (2007) have found that a single identifiable victim is more effective at eliciting donations for victims in need than the use of multiple identifiable victims or the use of thematic statistics. Kogut and Ritov (2005a, 2005b), found that when an experimental participant was presented with a short narrative of an identified victim (meaning that the name, age, and picture of the victim are provided to the participant) in need of help, the participant was more likely to feel

distress and be more willing to offer a contribution to help the victim alone compared to a small group of identified victims.

Individuals tend to have stronger affective responses towards an identified individual and express a greater willingness to help an identified individual compared to an unidentified individual (Small & Loewenstein, 2003). Small and Loewenstein suggest that this may be because individuals often use proportions to assign value to a helping behavior and find greater satisfaction in helping when they can raise the proportion of victims helped compared to victims in need (i.e. a helper will feel better about helping 10 out of 200 victims compared to helping 10 out of 2,000,000 victims). When a person sees a story about an identified victim, the identified victims plight becomes the salient object of need rather than the needs of all victims. This creates a salient helping ratio of 1 victim helped : 1 victim in need. In contrast, with an unidentified individual participants are more likely to think about similar cases (the uniqueness of the victim is not salient), and thus have a much smaller perceived proportion of victims helped compared to victims in need.

Slovic (2007) proposes that the identified victim effect may also be driven by participants paying more attention to the individual victim than the group of victims (supported by Susskind, Maurer, Thakkar, Hamilton, & Sherman, 1999), which heightens the intensity of feeling that they have in response to the victim. The feeling the individual experiences contributes to how much they are willing to help the victim. This leads to the basic helping model of:

Imagery & Attention → Feeling → Helping.

Slovic (2007) and Kogut and Ritov (2005a, 2005b) propose that the results are driven, in part, by the different ways that participants respond to narratives about individuals and groups. Single individuals serve as coherent psychological units and individuals are more likely to make more extreme attributions and make a requested judgment faster and with greater confidence for individuals compared with groups (Hamilton & Sherman, 1996; Susskind et al., 1999). Part of this process may be tied to the strength of narratives for interpretation, with the individual making a more coherent and understandable narrative focus than groups of individuals.

This narrative process may also influence the degree to which participants empathize with the victim and feel personally distressed upon hearing about the condition of the victim. Willingness to help a victim has been tied to feelings of empathy (Batson et al., 1991) and distress (Kogut & Ritov, 2005a, 2005b). Kogut & Ritov (2005a, 2005b) do not find a significant correlation between empathy and willingness to contribute (they ascribe this to a social desirability bias of their participants) but do find a significant correlation between distress and willingness to contribute. Previous research does suggest that feelings of distress and empathy should operate differently in guiding helping behavior. Eisenberg and Miller (1987), in a widely cited meta-review on empathy and altruism, find that while empathy is significantly correlated to altruistic behavior (a subset of prosocial behavior), distress is likely to cause egoistically motivated prosocial behavior, in which the desire is to remove the negative feeling associated with being in a state of distress.

This study examines how support for government policy and individual behavior change may be affected by the thematic and episodic presentation of the effects of climate change on polar bears through the mediators of attribution of treatment responsibility, emotional response, and concern for the victim(s). Because individuals face many structural barriers to personally attenuate the impacts of climate change, and are likely to believe that others will not voluntarily take action to help with the cause, it is expected that episodic and thematic message framing will have a limited effect on predispositions for individual behavior change. It is important to note that this prediction contrasts with the findings of Slovic (2007), Kogut and Ritov (2005a, 2005b) and Small et al. (2007). The main reason for the difference is that while individuals in the studies of Slovic, Kogut and Ritov, and Small et al. could easily see how their individual contribution could directly change the lives of the victims in need, individual behavior change to help climate change victims typically relies on the collective action of multiple individuals to make a significant change; the behavior of the individual, if not paired with collective action, will not have any impact on the life of the victim(s) in need.

While the message framing used in this experiment is not expected to influence individual behavior change, the research performed by Iyengar (1990, 1994) suggests that thematic framing of the issue, compared to episodic framing, will lead to a greater treatment responsibility assigned to governments who can make broad systemic changes to attenuate negative environmental effects and

improve the lives of animals. The greater assignment of responsibility may, in turn, lead to a support for government policies that address climate change. Finally, the literature cited above suggests that the emotional response to the message and concern for the polar bear(s) may mediate the framing effect. However, because the context of this study differs substantially from the previous research it is unclear whether the episodic and thematic frames used in this study will significantly impact the participants' emotional response and concern for the polar bear.

Formally stated, this study investigates the following hypotheses and research question:

*H1*: There will be no difference in predispositions for individual behavior change for individuals who see a thematic frame compared to participants who see an episodic frame.

*H2*: A thematic frame will lead to more support for government policies that address climate change than an episodic frame.

*H3*: The relationship between message framing and support for government policies will be mediated by assignment of treatment responsibility, emotional response, and concern for the victim.

*RQ1*: What role will emotional responses and concern for the victim play in mediating message framing effects?

## **Method**

### **Procedure**

As with all of the experiments in this dissertation, participants were recruited from shopping malls in upstate New York with a sign that stated they would receive \$5 in compensation for completing an experimental study. Every participant signed an IRB approved consent form before being directed to a private location to complete the study. All participants in a stimulus condition first read a story about the effects of climate change (the story differed by study and condition) and then filled out a questionnaire (the questionnaire also differed by study and condition). Participants in the control condition only filled out the questionnaire. In all of the studies, no participant took longer than 15 minutes to complete the experiment.

### **Participants**

Participants in Study 2 were non-student adults ( $N=120$ ; mean age = 42 years; age range = 18 - 86 years; 48% female).

### **Experimental Design and stimulus**

The research questions were investigated using a 2 experimental condition plus control design. Participants were randomly assigned to one of the 3 conditions, with 40 individuals in each condition. Participants assigned to one of the two experimental conditions (episodic or thematic) read a fabricated news story about the effect of climate change on polar bears, while participants in the control



condition were not exposed to a news story. While the news stories presented to participants were constructed for this experiment, the information used was taken from stories that the Associated Press had run on climate change affecting polar bears and the Arctic. Following Iyengar's (1990, 1994) differentiation between episodic and thematic conditions, the episodic condition in this experiment presented a story that focused on one polar bear that was struggling to survive as climate change melted ice in the Arctic. In the thematic condition, the story discussed statistics about the impact that climate change was having on all polar bears and the Arctic. For example, the headline of the episodic condition read "Polar bear struggles for food in the Arctic," while the headline for the thematic condition read "Thousands of polar bears struggle for food in the Arctic." The text for the stories is included in Appendix C and Appendix D.

## **Variables**

**Control variables.** Because climate change is both an environmental and political issue, environmental values and political party identification were measured to be used as control variables.

*Environmental values* were determined by using the same shortened 6-item version of the New Environmental Paradigm (NEP) scale (Dunlap, 2008) that participants used for study 1. (The resulting scale ranged from 1 - 7;  $M = 5.42$ ;  $SD = 1.08$ ). Cronbach's alpha for the resulting scale was .63.

*Political party* was measured by asking respondents to answer the question "generally speaking, when it comes to political parties in the United States, how would you describe yourself?" The question was measured on a seven point scale ranging from 1 (strong Democrat) to 7 (strong Republican) ( $M = 3.6$ ;  $SD = 1.88$ ).

**Mediating Variables.** The *emotional response* to the message was determined by asking respondents how much they agreed with the following two statements: a) "After reading the story I felt anxious," and b) "After reading the story I felt worried." The two measures were measured on a scale that ranged from 1 (strongly disagree) to 7 (strongly agree) and then combined into a single mean emotion scale (the resulting mean scale had a range of 1 - 7;  $M = 4.04$ ;  $SD = 1.73$ ). The two measures had a significant Pearson correlation of 0.756,  $p < 0.001$ .

*Concern for the polar bear(s)* featured in the story was determined by asking respondents to answer the following two questions: a) "Overall, how worried are you about the polar bear(s) featured in the story?" and b) "Overall, how concerned are you about the polar bear(s) featured in the story?" The two questions were measured on a scale that ranged from 1 (not worried/concerned at all) to 7 (extremely worried/concerned) and then combined into a single mean concern scale (the resulting mean scale had a range of 1 - 7;  $M = 5.06$ ;  $SD = 1.57$ ). The two questions had a significant Pearson correlation of 0.951,  $p < 0.001$ .

*Government treatment responsibility* for climate change was measured by asking respondents to indicate how much responsibility each of the following groups has for addressing climate change: a) "The U.S. Government," and b) "Governments of other countries." The two questions were measured on a scale that ranged from 1 (no responsibility) to 7 (great deal of responsibility) and then combined into a single mean government treatment responsibility scale (the resulting aggregate scale had a range of 1 - 7;  $M = 6.12$ ;  $SD = 1.37$ ). The two measurements had a significant Pearson correlation of 0.86,  $p < 0.001$ .

*Individual treatment responsibility* measures the treatment responsibility placed on individuals to take action on climate change using the self as a reference point. This was measured by asking respondents to indicate how much responsibility "people like me" had for addressing global climate change. The question was measured on a scale that ranged from 1 (no responsibility) to 7 (a great deal of responsibility) ( $M = 5.15$ ;  $SD = 1.67$ ).

**Dependent Variables.** *Support for government policy* was determined by asking respondents to state how much they agreed or disagreed with the following two statements: a) "We should immediately increase government regulation on industries and businesses that produce a great deal of greenhouse emissions," and b) "We should immediately increase taxes on industries and businesses that produce a great deal of greenhouse emissions." The two measures were measured on a scale that ranged from 1 (strongly disagree) to 7

(strongly agree) and then aggregated into a single mean support for government policy scale (the resulting mean scale had a range of 1-7;  $M = 5.46$ ;  $SD = 1.71$ ). The two measures had a significant Pearson correlation of 0.704,  $p < 0.001$ .

*Support for individual behavior change* was measured by asking respondents how likely they are to take each of the following actions to reduce their own greenhouse gas emissions: a) "buy compact fluorescent bulbs," b) "spend \$5 more a month for electricity produced from renewable energy sources, like wind and air," c) "use less air conditioning in the summer," and d) "turn down the thermostat in the winter." The four measures were measured on a seven point scale that ranged from 1 (not at all likely) to 7 (extremely likely) and then combined into a single mean behavior change scale (the resulting mean scale had a range of 1 - 7;  $M = 5.21$ ;  $SD = 1.53$ ). Cronbach's alpha for the resulting scale was .76.

## **Data Analysis**

ANOVAs and a chi-square test were first used to identify whether demographics or the values of the control variables significantly differed by condition. ANCOVAs were then used to examine whether the conditions had any overall effect on the two dependent variables. ANCOVAs were run to allow for participants' environmental values and political party identification to be controlled, as these variables are correlated with support for climate mitigation policies (Maibach et al., 2009). This study then examined indirect effects between the experimental condition and the dependent

variables with a bootstrapped multiple mediator model with bias corrected confidence intervals as recommended by Preacher and Hayes (2008). This approach allows for the comparison of multiple mediators and for the investigation of indirect effects through specific mediators while controlling for the variance shared with other mediators and covariates. The use of bootstrapping holds advantages over other tests for indirect effects, such as the Sobel test (Sobel, 1982), because it makes no assumptions about the normality of variables or their interactions.

## **Results**

No differences were found between conditions for the demographics of gender ( $\chi^2(2, N = 120) = 0.34, p = \text{n.s.}$ ) and age ( $F(2, 116) = 0.05, p = \text{n.s.}$ ) or the control variables of environmental values ( $F(2, 116) = 0.069, p = \text{n.s.}$ ) and political orientation ( $F(2, 116) = 0.514, p = \text{n.s.}$ ). To gauge the overall effect of episodic and thematic framing on the two dependent variables two ANCOVAs were run. The first examined the framing impact of the respective conditions on predispositions for individual behavior change and the second examined the framing impact of the conditions on support for government policies that address climate change. In both ANCOVAs the participants' scores on the environmental values scale (NEP) and the political party identification were used as covariates.

The first ANCOVA examined whether there were differences between the experimental conditions (episodic, thematic, and control) in participants' support for individual behavior change. There was no

significant effect for environmental values ( $F(1, 115) = 0.88, p = \text{n.s.}, \eta_p^2 = 0.01$ ) or political party ( $F(1, 115) = 0.01, p = \text{n.s.}, \eta_p^2 = 0.00$ ) on support for individual behavior change. After controlling for the effects of NEP and party identification the condition the participant was placed in did not have a significant effect on support for individual behavior change ( $F(2, 115) = 1.051, p = \text{n.s.}, \eta_p^2 = 0.01$ ), which does not falsify *H1*.

The second ANCOVA examined whether there were differences between the experimental conditions (episodic, thematic, and control) in participants' support for government policies. The covariates NEP ( $F(1, 116) = 46.07, p < 0.001, \eta_p^2 = 0.16$ ) and political party identification ( $F(1, 116) = 3.97, p < 0.05, \eta_p^2 = 0.033$ ) were both significantly related to support for government policies. After controlling for the effects of NEP and party identification the condition the participant was placed in did have a significant effect on support for government policy ( $F(2, 116) = 3.23, p < 0.05, \eta_p^2 = 0.053$ ). Bonferroni post-hoc tests found that participants in the episodic condition supported government policies to address climate change significantly less than participants in the thematic condition ( $p < 0.05$ ; the 95% CI for the mean difference had a lower bound of -1.67 and an upper bound of -.024), which provides support for *H2*. All other Bonferroni post-hoc comparisons for this ANCOVA were not significant.

Using the method outlined in Preacher and Hayes (2008), two bootstrapped multiple mediator models were also run examining the effect of episodic and thematic framing on support for 1) individual

behavior change and 2) policy change through direct pathways and indirect pathways mediated by emotional response, concern for the victim, attribution of individual treatment responsibility, and attribution of government treatment responsibility while controlling for NEP scores and political party identification. These mediation tests only looked at the difference between the episodic and thematic conditions (the control condition was omitted) as the mediation variables of emotional response and concern for the victim in response to the story could only be asked in these two conditions (the control condition did not have a story to respond to or a victim to be concerned for). This left a total n of 80 for each mediation model.

The results for the first mediation model examining the mediated relationship between story framing and predispositions for individual behavior change are depicted in Table 3 and Figure 2.

While there was no overall effect for episodic vs. thematic frame on individual behavior, it is still possible for mediated effects to occur as some mediators may suppress the indirect effects of others. However, as shown in Table 3 none of the indirect effects were significant at the .05 level. This is shown in Table 3, where the lower and upper bounds of the 95% confidence intervals for the indirect effects are portrayed. If both the lower and upper bound are above or below zero, the results demonstrate that there is 95% certainty that an indirect effect is occurring. However, if 0 is included in the 95% confidence interval (i.e. if the lower bound is negative and the upper bound is positive) then there is less than 95% certainty that an

Table 3

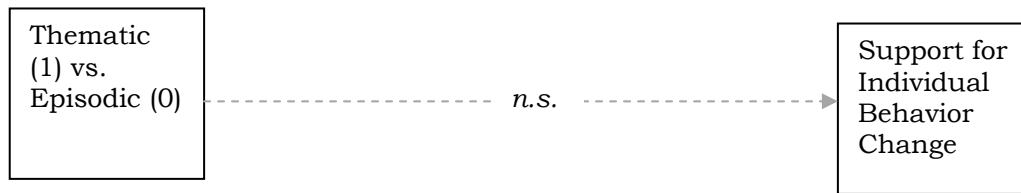
*Mediation of the Effect of Thematic Frames compared to Episodic Frames on Support for Individual Behavior Change to Address Climate Change through Individual Treatment Responsibility, Government Treatment Responsibility, Emotional Response, and Concern for Polar Bears*

		Bias Corrected 95% CI	
	Point Estimate	Lower	Upper
Indirect Effects			
Individual Treatment Responsibility	0.029	-0.081	0.189
Government Treatment Responsibility	-0.045	-0.156	0.034
Emotional Response	0.052	-0.044	0.215
Concern for Polar Bears	0.018	-0.025	0.161
Contrasts			
Emotion vs. Individual	0.023	-0.151	0.219
Government vs. Individual	-0.077	-0.329	0.053
Concern vs. Individual	-0.013	-0.188	0.129
Emotion vs. Government	0.100	-0.025	0.299
Emotion vs. Concern	0.036	-0.067	0.300
Concern vs. Government	0.064	-0.038	0.284

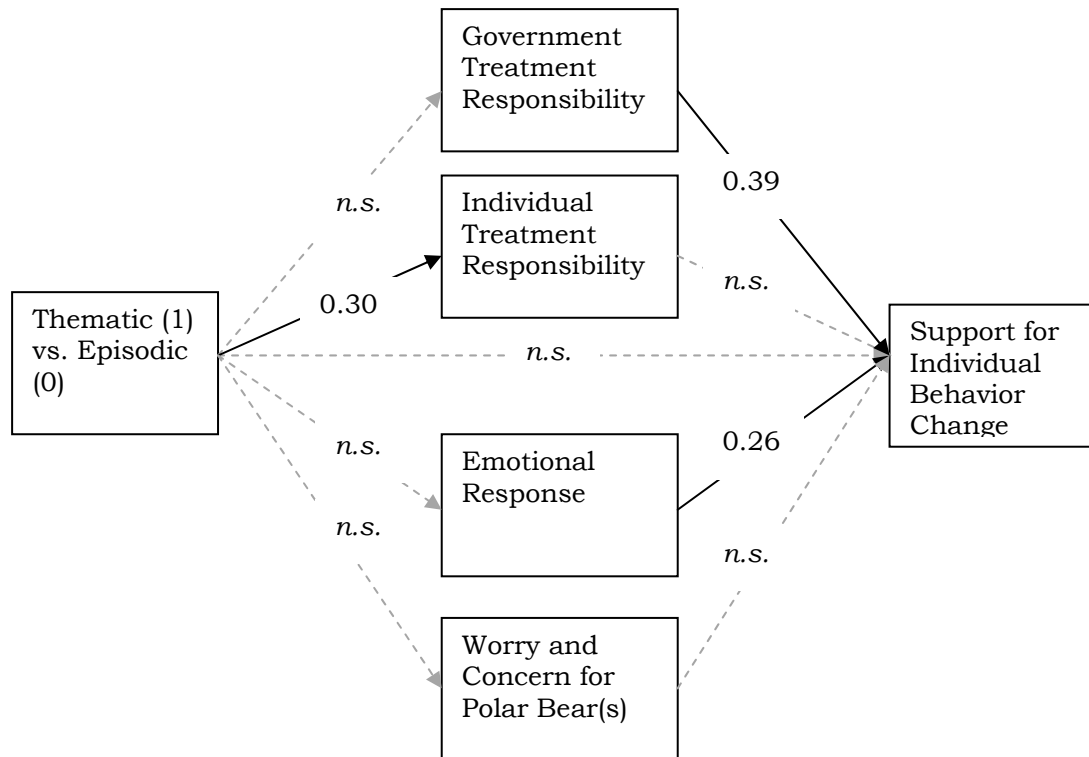
indirect effect is occurring. Table 3 shows that none of the lower and upper bounds of the confidence intervals are fully above or below zero for any of the indirect effects on individual behavior change. Table 3 also presents tests of contrast between the indirect effects. These results are included in the part of the table labeled “contrasts” and can be interpreted in a similar manner to the indirect effects. If the upper and lower bounds of the 95% confidence intervals for the contrast test between two indirect effects are fully above or below zero then there is at least 95% certainty that one indirect effect is having a greater impact than the contrasted indirect effect. As shown in Table 3, none of the contrast effects tests are significant.



*Overall Framing Effect on Support for Individual Behavior*



*Mediated Framing Effect on Support for Individual Behavior Change*



*Figure 2.* Unstandardized solution for the mediation of the effect of thematic frames compared to episodic frames on support for individual behavior change to address climate change.

The model does find evidence for discriminant validity between attribution of individual treatment responsibility and attribution of government treatment responsibility, as there is no significant direct link between the mediating variable attribution of government treatment responsibility and individual behavior change but there is a significant link between attribution of individual treatment responsibility and individual behavior change ( $B = 0.39, p < 0.05$ ). There was also a significant link between condition and assignment of government treatment responsibility ( $B = 0.30, p < 0.05$ ) and between emotional response and individual behavior change ( $B = 0.26, p < 0.05$ ). No other links were significant.

The results for the second mediation model examining the mediated relationship between episodic vs. thematic frame and support for government policies are depicted in Table 4 and Figure 3. These results may be interpreted in a similar manner to those found in Table 3.

In support of  $H2$  there was a significant overall effect for support for government policies for thematic framing compared to episodic framing ( $B = 0.42, p < 0.05$ ) (in partial support of  $H3$ ). As shown in Table 4, only government treatment responsibility was a significant mediator of condition on support for government policies ( $B=0.15, p<0.05$ ). Contrast tests found that the indirect effect of government treatment responsibility is greater than the indirect effect individual treatment responsibility with 95% confidence, but not significantly different from the other indirect effects. In addition, the direct link between emotional response and support for government policies is

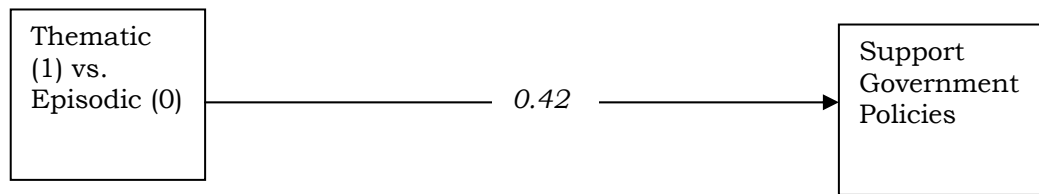
significant ( $B = 0.37$ ,  $p < 0.05$ ). No other links were significant, including the direct link between condition and support for government policies in the mediated model.

Table 4

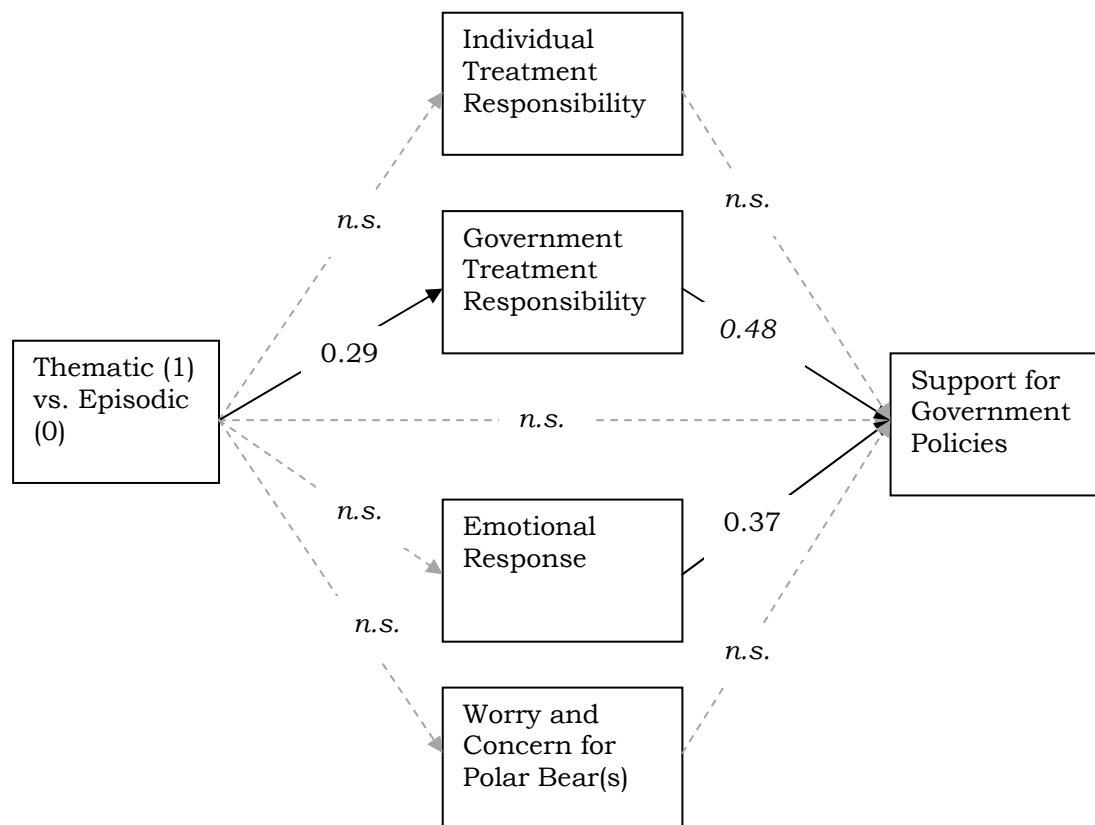
*Mediation of the Effect of Thematic Frames compared to Episodic Frames on Support for Government Policies to Address Climate Change through Individual Treatment Responsibility, Government Treatment Responsibility, Emotional Response, and Concern for Polar Bears*

		Bias Corrected 95% CI	
	Point Estimate	Lower	Upper
Indirect Effects			
Individual Treatment Responsibility	0.008	-0.108	0.017
Government Treatment Responsibility	0.146	0.029	0.325
Emotional Response	0.082	-0.039	0.277
Concern for Polar Bears	-0.001	-0.076	0.070
Contrasts			
Emotion vs. Individual	0.090	-0.045	0.306
Government vs. Individual	0.154	0.020	0.347
Concern vs. Individual	0.008	-0.059	0.130
Emotion vs. Government	-0.064	-0.260	0.150
Emotion vs. Concern	0.083	-0.042	0.357
Concern vs. Government	-0.146	-0.357	0.010

*Overall Framing Effect on Support for Government Policies*



*Mediated Framing Effect on Support for Government Policies*



*Figure 3.* Unstandardized solution for the mediation of the effect of thematic frames compared to episodic frames on support for government policies to address climate change.

## **Discussion**

This study is the first to examine the role that episodic and thematic presentations of climate change victims may have on individual behavior change and support for climate mitigation policies. It finds that while there was no impact on individual behavior change, thematic framing of climate change victims compared to episodic framing significantly increased policy support through the mediator of attribution of government responsibility. The difference between individual behavior change and policy preferences may be explained by the fact that broad government actions can have significant actions on large environmental issues such as climate change, while individual actions will not have a significant impact unless a large collective of individuals take action. When an individual is uncertain about the impact that their individual actions may have, this study demonstrates that messages are likely to be more effective in driving support for policy support rather than individual behavior change .

It is important to note that this is only one study on the impact of episodic and thematic framing of climate change, and caution should be taken in generalizing to both climate change messages and prosocial messages in general. Future research needs to identify how different types of victim exemplars and how the ability of participants to directly help the victim in need impacts the effects of thematic and episodic frames. Future research may also investigate the impact of combining episodic and thematic frames in a climate change context. Small et al. (2007) did find that individuals donated less to an identifiable victim paired with statistics than to an identified victim

alone, but this pattern may be reversed if the individuals are considering policies addressing an issue in which they cannot directly help the victim.

This study presents a situation in which individuals are asked to help animals in need in a context in which collective action is needed for aid to be delivered. This differs from the work of Slovic (2007), Kogut & Ritov (2005a, 2005b), and Small et al. (2007) by changing both the type of exemplar (polar bears vs. children) and the ability of the participant to help the victim. While previous research has found that animals have been anthropomorphized in the media (Chris, 2006) and there are multiple stories of individuals undertaking personal sacrifice to save animals in need (Slovic, 2007), it is possible that differences between this study and previous studies was also driven by differences in exemplar type. The study also does not find a difference in emotional response that was present in other studies, but this may be because no visual imagery was provided in this study, and visual imagery, rather than textual cues, may have driven the emotional differences of the previous studies.

With these cautions in place, this study does appear to support the contention that individuals will be resistant to messages calling for individual behavior change in relation to issues that require collective action (Ockwell et al., 2009) and finds evidence that thematic frames are more effective at driving policy support on an issue that requires collective action.

Looking at the direct impacts of the mediating variables on individual behavior change and policy preferences, this study found

that changes in attribution for individual treatment responsibility only had an impact on individual behavior while changes in attribution for government treatment responsibility only had an impact on policy preferences. This suggests that appeals for action need to be targeted carefully to the desired corresponding behavior – an appeal that effectively increases an individual’s attribution of individual treatment responsibility is likely to increase predispositions for individual behavior change, but is also unlikely to change policy preferences unless the appeal can shift attribution for government treatment responsibility as well.

In addition to attributions of treatment responsibility, this study examined how emotional response to the message and concern for the victim affected individual behavior change and policy preferences. While emotion was significantly associated with individual behavior change and policy preferences, concern for the victim was not associated with either dependent variable when shared variance across other variables was taken into account. These results are similar to those found by Kogut and Ritov (2005a, 2005b) and suggest that strategies for motivating action will be more effective if they can create a feeling of anxiety or worry in the receiver, which the receiver can relieve through the desired action, than if they attempt to create a feeling of concern or worry for the victim.

The results of this study also suggest that media coverage of climate change may inhibit thematic considerations of the issue and support of government policies to support the issue. Boykoff and Boykoff (2007) found that journalistic norms cause the media to cover

climate change primarily episodically, which, based on the results from this study, may cause the viewing public to assign less treatment responsibility to the government and subsequently have less support for government policies that address climate change. From an applied perspective, this study also suggests that climate change advocates will be more successful in increasing public support for climate mitigation policies if the impacts of climate change are described in thematic rather than episodic terms.

This study has found that in situations when individual behavior change cannot make a significant direct impact on a victim in need without a collective movement of similar behavior change, message effects are likely to only affect attribution for government treatment responsibility and policy support. Future research along these lines can help advocates, scientists, and interested parties develop strategies to communicate effectively with the lay public about issues such as climate change.



## CHAPTER 4

### THE ROLE OF NUMERACY IN MODERATING THE INFLUENCE OF STATISTICS IN CLIMATE CHANGE FRAMES

The previous chapters examined the impact of using an episodic or thematic theme to depict climate impacts, and the moderating role of political partisanship on discussing climate change impacts in terms of in-groups and out-groups. This study presented here examines a complimentary structural component - the impact that the absence or presence of statistics in climate change frames has on an individual's willingness to donate to organizations working on the issue of climate change, and how the effect may be moderated by the ability of the individual to understand and manipulate numbers.

The question of what type of quantitative evidence is most effective in supporting arguments has been a pervasive question in the field of communication. It is a critical area of research from an applied perspective, as science communicators are faced with the choice of whether, and in what format, numeric information may be included in messages about issues such as climate change. A substantial amount of research has examined what numeric formats are most effective in aiding the understanding of an issue (e.g. Avorn & Shrank, 2009; Gigerenzer, Gaissmaier, Kurz-Milcke, Schwartz, & Woloshin, 2008; Halvorsen, Selmer, & Kristiansen, 2007; Schwartz, Woloshin, Black, & Welch, 1997; Schwartz, Woloshin, & Welch, 2009). However, there has

been a dearth of research examining the impact that choosing to include, or not include, numbers in science messages may have.

In general the scholars in the field of communication have also yet to incorporate findings from the field of judgment and decision making demonstrating that an individual's ability to understand and interpret numbers is a significant moderator of framing effects in general, including numbers (Nelson, Reyna, Fagerlin, Lipkus, & Peters, 2008; Peters, Hibbard, Slovic, & Dieckmann, 2007; Peters & Levin, 2008; Peters et al., 2006; Reyna & Brainerd, 2007; Schwartz et al., 1997). The current study begins to fill this research gap. It examines how numeracy may moderate an individual's predisposition to donate to organizations working on the issue of climate change in response to reading a news story that includes, or does not include, statistics when describing potential impacts of climate change.

## **Literature Review**

### **Persuasion and Statistics**

The first studies examining the influence of statistics on persuasive messages focused on how message explicitness may influence a receiver's response (Knouse, 1983; Yalch & Elmore-Yalch, 1984). Under this paradigm, scholars placed a focus on both normative standards and the persuasive impact of using a numeric representation (e.g. 75%) or a verbal generalization (e.g. most). Scholars have generally considered message explicitness, including higher levels of quantitative specificity, to be normatively desirable

because it makes evidentiary claims more accessible for critical analysis (O’Keefe, 2007). Looking at the effect of using or not using numeric representations, inconsistencies have been found in studies examining how the messages are processed and their subsequent persuasive effect. For example, Yalch and Elmore-Yalch (1984) suggest that numeric information is more difficult to process than verbal information while Viswanathan and Childers (1996) find the opposite results. Looking to the persuasive impact of numeric information, a meta-analysis performed by O’Keefe (1998) did not find a reliable significant effect of quantitative specificity. However, by focusing on the level of message explicitness, scholars in this domain of research may have failed to explore the potential moderating effect of numeracy.

In a separate line of communication research, researchers have placed a stricter constraint on what is termed a “statistical” frame. Under this paradigm, evidence is typically divided between “testimonial assertions” and “factual information” (Baesler & Burgoon, 1994, p. 582), with “statistical evidence” (Allen & Preiss, 1997; Baesler & Burgoon, 1994; Hoeken & Hustinx, 2009; Hornikx, 2005). Statistical evidence typically refers to a broad aggregation of data, such as a study examining multiple cases of an event, while a testimonial typically refers to a narrative about a single event. This approach has led to the general conclusion that statistical frames are more persuasive than narrative frames (Hoeken & Hustinx, 2009), with some studies suggesting that this may be moderated by whether the message is consistent with the preferences of the message receiver (De Wit, Das, & Vet, 2008; Slater & Rouner, 1996).

This definition of what a statistical frame is, however, introduces a confounding variable that to the best of my knowledge has not been acknowledged or addressed by communication researchers. When researchers compare a statistical frame to a narrative frame, they are typically manipulating whether the message is episodic *and* non-numeric (testimonial) or thematic *and* numeric (statistical). As an example, Hoeken and Hustinx (2009) offered the following anecdotal narrative (testimonial) and statistical frames:

Anecdotal Narratives:

Study 1: “Thomas Kepers works in a large office in the Randstad corporation. He has not had to call in sick since he started using the relaxation room on the second floor.” (p. 496)

Study 2: “Since 72-year old Bernhard can Delft has been online, he feels less lonely and cut off from the world around him.” (p. 500)

Study 3: “In diner ‘Den dikken dragonder’ in Kerkrade ... extending the wine last has led to a sharp increase in the drinks turnover.” (p. 502)

Statistical Narratives:

Study 1: “from 1990 till 2002, a large-scale study was conducted on the effects of relaxation facilities at work. In companies offering such facilities, absenteeism due to illness occurred 24% less often.” (p. 496).

Study 2: “Only 31% of the elderly with access to the Internet feels cut off from the world around them. For elderly without access to the Internet, this percentage is 64%.” (p. 500)

Study 3: “A study among 829 restaurants shows that restaurants with an extended wine list have a 23% higher turnover of drinks.” (p. 503)

Due to the manipulation of the presence or absence of numeric information in addition to whether the information is presented thematically or episodically, it is impossible to parse out whether observed affects are due to the inclusion or absence of numbers, or instead due to the format of aggregating information or using an episodic exemplar-based format. The intention here is not to single out Hoeken and Hustinx (2009), as the confounding of these manipulations can be found in multiple studies (e.g. Allen & Preiss, 1997; Artz & Tybout, 1999; Baesler & Burgoon, 1994; De Wit et al., 2008; Small, Loewenstein, & Slovic, 2007), but rather to note that a number of studies in the field of communication do not account for the fact that the presence or absence of numbers, independent of other manipulations, can drive persuasive effects. Studies from this line of research have also not accounted for the moderating role that numeracy may play on framing effects (Peters et al., 2006), which will be discussed in the following section.

### **Numeracy and Framing**

When an individual is given risk information about an issue such as climate change, they are often required to interpret and utilize information regarding the benefits and risks associated with different choices and potential outcomes. Risk information is often provided in numerical form through a variety of mediums, such as text, tables,

and charts. An individual's ability to understand and use numerical information is termed numeracy.

While numeracy is a critical skill in decision making, national surveys have found that between one-quarter to one-half of Americans are not capable of more than basic quantitative tasks (Reyna & Brainerd, 2007). For example, in one survey a random sample of female veterans in New England were asked to convert a percentage to a ratio (1% to 10 in 1,000), a ratio to a percentage, and correctly identify how many heads one would expect to come up in 1,000 coin flips (Schwartz et al., 1997). These questions were respectively answered correctly by 54%, 20%, and 46% of the respondents. The surveys indicate that there is a large amount of variance in numeracy across the general population. It is also important to note that numeracy is best considered a specific type of intelligence, but not a proxy for intelligence in general (Peters et al., 2006).

In light of these findings, some researchers (e.g. Gigerenzer, Gaissmaier, Kurz-Milcke, Schwartz, & Woloshin, 2008) have called for statistical literacy initiatives to help improve the public's ability to interpret and use numbers. While education initiatives may eventually improve general numeracy, it is likely that there will continue to be a large variance in the public's numeric ability in the foreseeable future. In light of this, it is necessary to understand how numeracy may interact with different formats of information presentation.

Numeracy has been found to significantly impact decision making in a variety of domains (Dieckmann, Slovic, & Peters, 2009). Black, Nease, and Tosteson (1995) found that individuals who were

low in numeracy felt that they were at a higher risk of breast cancer than individuals high in numeracy. Schwartz et al. (1997) found that individuals with high numerical ability were better able to use information about breast cancer risk reduction associated with mammography than those who are low in numeracy. Peters et al. (2006) found that individuals high in numeracy tended to extract more precise and stronger affective information from numbers and were more likely to use correct number principles when interpreting numeric information, making them less susceptible to framing effects than individuals low in numeracy. For example, Peters et al. found that low numerate individuals were sensitive to whether risk information was presented in a percentage (10% of 100) or raw count (10 out of 100) format, while high numerate individuals were not.

While a number of studies have examined how numeracy moderates the response to different number formats, I am not aware of published work that has examined how numeracy may moderate the impact of using numeric or verbal descriptions of numeric information. While the inconsistencies in the research examining message explicitness using numeric and verbal information prevents the proposal of a hypothesis for the direction of effect that numbers may produce, the work by Peters et al. (2006) and others strongly suggests that numeracy will moderate the interpretation of numbers, with low numerate individuals affected more by a numeric framing effect than high numerate individuals. Formally stated:

*H1*: The format of numeric presentation (verbal vs. numeric) will affect message persuasiveness on low numerate individuals and will not affect message persuasiveness on high numerate individuals.

## **Method**

### **Procedure**

As with all of the experiments in this dissertation, participants were recruited from shopping malls in upstate New York with a sign that stated they would receive \$5 in compensation for completing an experimental study. Every participant signed an IRB approved consent form before being directed to a private location to complete the study. All participants in a stimulus condition first read a story about the effects of climate change (the story differed by study and condition) and then filled out a questionnaire (the questionnaire also differed by study and condition). Participants in the control condition only filled out the questionnaire. In all of the studies, no participant took longer than 15 minutes to complete the experiment.

### **Participants**

Participants in Study 3 were non-student adults ( $N=129$ ; mean age = 39.8 years; age range = 18 - 84 years; 49% female).

### **Experimental Design and stimulus**

The research questions were investigated using a 2 experimental condition (statistic vs. verbal descriptor) plus control design.



Participants were randomly assigned to one of the 3 conditions, with 43 individuals in each condition. Participants assigned to one of the two experimental conditions read a fabricated news story about the effect of climate change on polar bears, while participants assigned to the control condition did not view a news story. While the story presented to the participants was constructed for this experiment, the information used was taken from stories that the Associated Press had run on climate change affecting polar bears and the Arctic. The two experimental conditions differed by whether they presented a verbal or numeric description of the impact that climate change; the numeric description was identical to the stimulus used in the thematic condition for study 2. The verbal condition included statements such as “scientists predict that most polar bears in the world may be killed off in the near future because of thinning sea ice from global warming the arctic” while the analogous statement in the statistical condition was “scientists predict that 12,000 of the 18,000 polar bears in the world may be killed off in the near future because of thinning sea ice from global warming in the Arctic.” The complete text of the stimulus for each condition is included in Appendix D and Appendix E.

## **Variables**

**Independent Variables.** In addition to the manipulation of what condition the individual was placed in, *numeracy* was measured as a potential moderator of using verbal or statistical descriptions on donations. Numeracy was measured with the following seven

questions taken from a scales developed by Lipkus, Samsa, and Rimer (2001) and Frederick (2005):

From Lipkus et al. (2001):

1. Which of the following numbers represents the biggest risk of getting a disease? \_\_\_ 1 in 100, \_\_\_ 1 in 1000, \_\_\_ 1 in 10  
(Answer: 1 in 10)
2. If the chance of getting a disease is 10%, how many people would be expected to get the disease Out of 100?  
(Answer: 10)
3. In the BIG BUCKS LOTTERY, the chances of winning a \$10.00 prize are 1%. What is your best guess about how many people would win a \$10.00 prize if 1,000 people each buy a single ticket from BIG BUCKS?  
(Answer: 10)
4. Imagine that we roll a fair, six-sided die 1,000 times. Out of 1,000 rolls, how many times do you think the die would come up as an even number?  
(Answer: 500)
5. In the ACME PUBLISHING SWEEPSTAKES, the chance of winning a car is 1 in 1,000. What percent of tickets of ACME PUBLISHING SWEEPSTAKES win a car?  
(Answer: 0.1%)

From Frederick (2005):

6. In a lake, there is a patch of lilypads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of

the lake?

(Answer: 47 days)

7. A bat and a ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost?

(Answer: \$0.05)

This resulted in a scale that had a range of 0 - 7 (Mean = 3.53; SD = 1.71), and had a Cronbach's alpha of 0.660. A median split was used to divide participants between those that were considered high numerate and low numerate.

**Control variables.** As with the previous studies, environmental values and political party identification were measured to be used as control variables.

*Environmental values* were determined by using the same shortened 6-item version of the New Environmental Paradigm (NEP) scale (Dunlap, 2008) used for the previous studies (the resulting scale had a range of 1 - 7; M = 5.49; SD = 1.01). Cronbach's alpha for the resulting scale was .61.

*Political party* was measured by asking respondents to answer the question "Generally speaking, when it comes to political parties in the United States, how would you describe yourself" The question was measured on a seven point scale ranging from 1 (strong Democrat) to 7 (strong Republican) (M = 3.8; SD = 1.73).

**Dependent Variables.** The impact of the message on experimental participants was measured by asking participants "How

much would you be willing to contribute to organizations working on the issue of climate change?” Participants were provided a 6-point scale that ranged from \$0 to \$5, and a blank next to the \$5 option to allow for larger donations. The responses measured a stated willingness to pay rather than actual donations, and any answer greater than \$5 was coded as \$6 to minimize the impact of outlier donations. This resulted in a willingness to pay scale that ranged from 0 to 6 ( $M = 3.09$ ;  $SD = 2.40$ ).

## **Results**

No differences were found between conditions for the demographics of gender ( $\chi^2(2, N = 120) = 0.34, p = \text{n.s.}$ ), age ( $F(2, 118) = 0.02, p = \text{n.s.}$ ), or the control variables of environmental values ( $F(2, 120) = 0.18, p = \text{n.s.}$ ) and political orientation ( $F(2, 120) = 0.52, p = \text{n.s.}$ ).

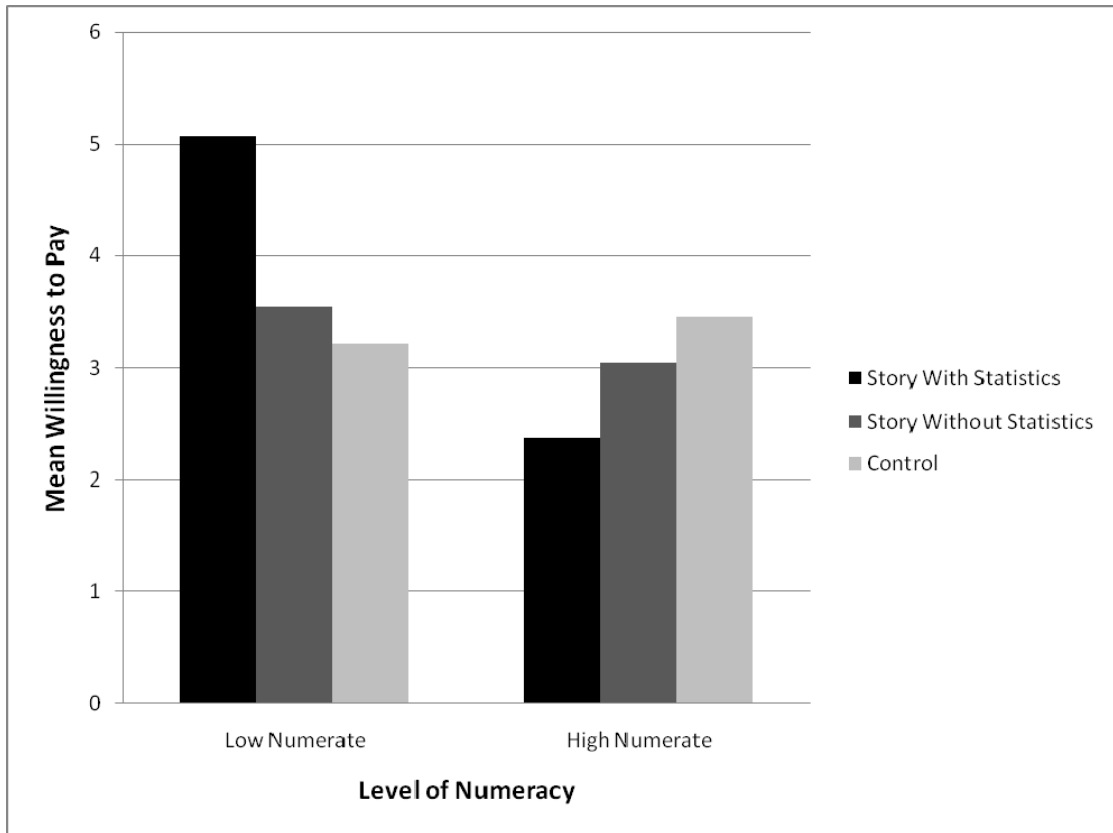
A factorial 2 (numeracy: high, low) x 3 (condition: story with statistics, story without statistics, control) ANCOVA was run that controlled for environmental values and political orientation. There was no significant effect for environmental values ( $F(1, 113) = .875, p = \text{n.s.}, \eta_p^2 = 0.02$ ) or political party ( $F(1, 113) = 1.854, p = \text{n.s.}, \eta_p^2 = 0.00$ ) on willingness to contribute. After controlling for the effects of NEP and party identification, there was a significant interaction between condition and numeracy ( $F(2, 113) = 3.559, p < 0.05, \eta_p^2 = 0.06$ ) and a significant main effect for numeracy ( $F(1, 113) = 5.515, p < 0.05, \eta_p^2 = 0.05$ ), with individuals low in numeracy donating more than

individuals high in numeracy. There was no main effect for condition ( $F(2, 113) = .408, p = \text{n.s.}, \eta_p^2 = 0.01$ ). The mean willingness to contribute for the story with statistics, the story without statistics, and the control conditions were respectively \$5.10, \$3.55, and \$3.22 for low-numerate participants and \$2.38, \$3.05, and \$3.45 for high numerate participants.

Looking at low-numerate and high-numerate participants separately, there was a significant difference between conditions in willingness to donate for low-numerate individuals ( $F(2, 52) = 3.229, p < 0.05, \eta_p^2 = 0.11$ ) while there was no significant difference for high-numerate individuals ( $F(2, 59) = 1.029, p = \text{n.s.}, \eta_p^2 = 0.03$ ), in support of *H1*. Bonferonni post hoc tests showed that for low-numerate participants there was a significant difference between participants in the statistics condition compared to participants in the control condition,  $p < 0.05$ , with no other post-hoc tests being significant. Please see figure 4 for a visual representation.

## **Discussion**

Results of the present study demonstrated that numeracy is a significant moderator of the effect that the presence or absence of numbers has on how persuasive a message may be. As predicted, significant differences arose between the responses to the different conditions for low-numerate participants, but did not for high-numerate participants. These findings have implications for research



*Figure 4.* The influence of numeracy and the numeric representation of risk data on predispositions to donate to organizations working on the issue of climate change.

on quantitative specificity, the examination of statistical, episodic, and thematic frames, and constructing effective messages about climate change.

If this study had only examined the main effect of the experimental conditions, the absence of a significant main effect would fit O'Keefe's (1998) finding that there is not reliable significant impact of the absence or presence of statistics. However, the finding that numeracy is a significant moderator suggests that previous research

may have overlooked the effect that including or not including numbers may have on low-numerate individuals compared to high-numerate individuals. This study suggests that research on numeric formats may benefit from including measures of numeracy to allow for the investigation of possible moderating impacts. Of course, this is only one study, and additional replications of this result need to be found before any firm conclusions can be made. Future research may build on the present study to examine how the moderating impact of numeracy on the inclusion or absence of numbers may be mediated by variables such as perceptions of credibility and the emotional resonance of the message. In addition, this study included both raw count and percentage formats in the numeric format. Peters et al's (2006) findings suggest that low numerate participants are likely to respond differently to percentage and raw count formats, thus future research may also build on the research presented here to isolate raw count and percentage formats in the comparison with verbal representation of quantitative information.

The present study suggests that studies examining statistical frames as thematic, numeric messages compared to episodic, non-numeric messages may benefit from including numeracy as a moderator, and from explicitly manipulating, or controlling for, the presence or absence of numbers. This speaks, in part, to study 2 of this dissertation. The finding that there is a difference between numeric and non-numeric presentation of information for low-numerate individuals suggest that the findings from study 2 (episodic vs. thematic frames) may have been driven, in part, by the inclusion of

numbers in the thematic frame. While study 2 demonstrates key differences in the impact of episodic and thematic frames when an individual can and cannot help a victim through direct individual action, future research will be required to explore the role that statistics and numeracy play in the effects of study 2 and previous research such as Small et al. (2007). The research also implicitly suggests that it would be beneficial for researchers performing content analyses of news articles to include coding for structural variables such as the presence or absence of statistics.

This study is consistent with Hoeken and Hustinx's (2009) general conclusion that including statistics makes a message more persuasive than not including statistics, but does so without the conflation of a thematic frame with statistics and suggests that this may only be true for individuals who are low in numeracy.

Looking to future research, it may be beneficial to take note of Reinard's (1988, p. 47) statement that: "methodologically, the failure of many researchers to describe the types of evidence they have used ... has made interpretation of the findings difficult at best. Moreover, since some studies have used multiple types of evidence without distinguishing their varieties, it frequently is impossible to tell which types or combinations of evidence are responsible for all effects." Reinard called for researchers to parse out what specific message manipulations drive effects, but the conflation of statistical and thematic frames in a number of studies (Allen & Preiss, 1997; Artz & Tybout, 1999; Baesler & Burgoon, 1994; De Wit et al., 2008; Hoeken & Hustinx, 2009) demonstrates that this call has often not been heeded.



Looking to how statistical frames are defined, research may be strengthened by thinking of them in terms of a definition of statistics that allows for the examination of different numeric formats and verbal descriptions in episodic and thematic frames rather than forcing the inclusion of numbers to only occur in thematic messages. Research adopting this approach will help to further our understanding of the impact that using different numbers has, and how the impacts may be moderated by characteristics such as numeracy.

## CHAPTER 5

### CONCLUSION

#### **Summary of Results**

The studies included in this dissertation demonstrate the need to take structural message manipulations into account when designing climate change messages. All three studies focused on different ways to discuss the impact that climate change may have on potential victims, and found evidence that individuals are often moved by interactions between perceptual screens and message content.

Study 1 found that climate change messages focusing on out-group victims are likely to generate greater resistance to climate change policies amongst politically conservative message receivers than if they received no message at all. The results suggest that climate change messages designed with good intentions can backfire.

Study 2 examined the difference between using episodic and thematic frames to communicate climate change, and found that episodic and thematic framing did not have an impact on predispositions for individual behavior change, but that thematic framing did increase support for climate mitigation policies relative to episodic frames, and that this increase arose through the mediator of attribution of government responsibility.

Study 3 examined how numeracy may moderate the effects of numbers being present or absent in messages describing climate change victims, and found that low-numerate message receivers were

willing to donate more money when given a numeric message, while there was no difference between messages for high-numerate receivers.

### **Future Research Directions**

The studies, taken together, address the questions of how individuals respond to messages discussing who is affected by climate change, how many are affected, and the format used to provide information about the impact that climate change is likely to have. The results also have implications for other issues that prosocial messages may be directed towards. Looking at the results of study 1, it is likely that messages concerning other controversial issues, such as embryonic stem cell research, will have the potential to amplify political polarization. A key lesson from study 2 is that when an individual cannot make a significant contribution through personal behavior change, the impact of episodic and thematic messages may be different from situations in which a person can make significant contributions individually. Looking at an issue such as genocide, these results suggest that episodic and thematic frames may have different levels of effectiveness when an individual is asked to help stop a conflict (no possibility for an individual contribution, meaning a thematic message may be more effective) or to help the victims of a conflict (possibility for an individual contribution, meaning an episodic message may be more effective). Concerning study 3, numeracy and the use of statistics and verbal descriptors are likely to play a significant role in how messages are interpreted on essentially any topic. Additional research is required, however, to determine how the

use of statistics, and different kinds of statistics (e.g. raw count or percentage), moderate the impact of a messages that promote emotional thinking (episodic messages) or analytical thinking (thematic messages). The research questions of studies 1, 2, and 3 were investigated separately, but the results set the stage for future integration and synthesis. The difficulties of integration, however, are in the complexity of the myriad ways a message may be constructed.

As an example, one can look at the stimulus materials used in Small et al. (2007), which was used as part of the theoretical foundation for study 2 of this dissertation, presented in Chapter 3. In Small et al., all participants viewed a description of impoverished individual(s), and viewed an episodic description, a statistical description, or a combination of the two. The episodic condition provided a photograph of a child, “Rokia,” and gave the following description:

Rokia, a 7-year-old girl from Mali, Africa, is desperately poor and faces a threat of severe hunger or even starvation. Her life will be changed for the better as a result of your financial gift. With your support, and the support of other caring sponsors, Save the Children will work with Rokia's family and other members of the community to help feed her, provide her with education, as well as basic medical care and hygiene education (p. 152).

In contrast, the statistical condition did not provide a photograph, and gave the following description:

- Food shortages in Malawi are affecting more than 3 million children.
- In Zambia, severe rainfall deficits have resulted in a 42% drop in maize production from 2000. As a result, an estimated 3 million Zambians face hunger.

- Four million Angolans - one third of the population - have been forced to flee their homes.
- More than 11 million people in Ethiopia need immediate food assistance (p. 152).

In Small et al. (2007) a manipulation was also introduced that changed the amount of deliberative thought that participants had about their donations. While data suggest that deliberative thought suppresses the affective response to an episodic frame, if someone wishes to look at the message types alone, it becomes very difficult to draw conclusions about the effectiveness of different message structures. Differences between the two descriptions include the presence or absence of a: 1) photograph, 2) age of victim(s), 3) name of victim(s), 4) call for a gift, 5) charity working for those in need, 6) identified projects to help those in need, 7) explicit link between a donation and aid projects 8) statistics, 9) a narrative vs. a bullet point formats, 10) a single subject (Rokia) vs. multiple subjects (different countries with individuals in need), and 11) an episodic vs. a thematic frame. It is useful to examine messages in a more natural format, as was done here, to see how a manipulation such as deliberation may alter the response to them; however, without parsing out the differences between the messages it becomes impossible to identify what variations in the message structure may be driving any message effects that are observed.

Turning a similar critical eye to the studies presented in this dissertation, studies one and three have very strong internal validity, with minimal manipulations to the message structure. In study 1 (looking at social identity), the only manipulation was the alteration of where climate change would impact in several areas of the text. In

study 3 (looking at statistics), the only manipulation was the presence or absence of numbers in several places throughout the text. Thus, it seems reasonable to conclude that the effects observed in these studies are due to the identified message manipulations. Study 2 (episodic and thematic frames), however, followed the precedent set by Iyengar (1990, 1994) for episodic and thematic frames and adopted a more naturalistic approach to the framing manipulations, similar to the manipulation used in Small et al. (2007). While this approach increases the external validity of the study, it limits the ability of the researcher to parse out exactly what characteristic of episodic or thematic frames may be driving the effect.

Looking at the message texts (Appendix C and D) of study 2, differences include the presence or absence of: 1) an identified, named polar bear vs. quantitative data on polar bears in general, 2) description of the hunting process of polar bears, 3) two statements from experts vs. one statement, 4) a description of the aggregate ice loss in the Arctic, 5) a description of why the Arctic is affected more by climate change, 6) a description of how much food the polar bear is able to eat, 7) a description of how changes in food availability affect the weight of polar bears, and 8) a statement of how polar bears may die through starvation or drowning due to climate change. As stated previously, these differences between episodic and thematic frames conform to the types of manipulations found in previous studies in this area. However, future research will be required to isolate exactly what differences between episodic and thematic frames may be driving the changes in policy support for this study.

While it may be tempting to perform a full interaction between all possible message differences, the complexity of statistical interactions makes it extremely difficult to meaningfully interpret anything greater than a 3-way interaction. Thus, when examining message structure alone, researchers are generally left with attempting to identify key manipulations and investigating them alone, or in limited 2 or 3-way interactions with other moderators or manipulations of interest. The studies examined here all concern the matter of how audiences are likely to respond to different approaches of describing the impact of climate change on victims, but are isolated to determine the impact of specific message manipulations. The option is naturally left for future research to build from these studies and begin to examine interactions among them.

A natural extension of studies 2 and 3 would be to perform additional research that helps disambiguate the conflation exemplified by Hoeken and Hustinx (2009) of pairing statistics solely with thematic frames and verbal descriptions solely with episodic frames. Looking at acceptance and persuasive impact of a general statement, this conflation could be parsed out with a 2 (frame: episodic, thematic) x 2 (statistics: absence, presence) x 2 (numeracy: high, low) interaction. This would allow for the investigation of both whether framing or the presence or absence of statistics is responsible for the “anecdotal” vs. “statistical” effects found in previous studies, and as importantly, would introduce the moderator of numeracy to identify if differences between conditions only occur for low-numerate individuals.

A second study that naturally extends from those presented in this dissertation would combine studies 1 and 2, and perform a 2 (frame: episodic, thematic) x 2 (social identity: in-group, out-group) x political ideology interaction. This would be beneficial, in part, to help clarify results recently obtained by Kogut and Ritov (2007).

As mentioned earlier, previous work by Kogut and Ritov (2005a, 2005b) found that experimental participants were willing to donate more to help an identified individual in need than a group of identified individuals in need. Kogut and Ritov (2007) found that when the identified victim individual/group manipulation included a moderator of whether the victim(s) in need were part of the experimental participant's in-group or out-group, the identified victim effect only operated for the in-group victim.

These results, however, counter the predictions of social identity theory (Tajfel, 1974; Tajfel & Turner, 2004). Under social identity theory, the description of groups, compared to individuals, makes group characteristics, rather than individual characteristics, more salient and heightens the impact of the group membership. Unfortunately, a direct comparison of the two perspectives is not possible from data in Kogut and Ritov (2007), because while Kogut and Ritov measure emotional and altruistic response, identification with the victim is not measured as a manipulation check. Thus, it is possible that Kogut and Ritov were not successful in manipulating how much the experimental participants identified with the victims. The proposed interaction between episodic and thematic framing, social identity, and political ideology, would allow for an investigation



into this domain that could directly compare identification, emotional response, and altruistic behavior through policy preferences and individual behavior change. This, in turn, would help clarify what mechanisms may be driving the differences in findings derived from the propositions of social identity theory and the identified victim effect.

The studies presented in this dissertation, then, are best viewed as a continuation of previous research, with guideposts towards areas that need continued research in the future. Results from future studies will continue to help science communicators have a greater understanding of how the choices they make in constructing climate messages may impact the public response.

### **Considerations for Application of Research**

The data presented in this dissertation do not offer a prescription for how climate change messages ought to be constructed, but rather suggest likely impacts of using different climate change message structures, as outlined in the introduction to this chapter. While the data indicate that climate messages will be most effective if they are thematic, use statistics, and focus on victims a message receiver identifies with, the question of how a message ought to be constructed is inextricably linked to what ought to be done in response to climate change. This question is as much an ethical issue (Gardner, 2006) as it is a practical one (Fankhauser, 2010; IPCC, 2007; Mortimore, 2010). Decisions on whether to take action on climate change, and if so, what actions to take, need to be made in the context

of the interests of the individual and the collective, present and future generations, and those who are responsible for and will be affected by climate change. The proper response to climate change, such as a focus on adaptation, mitigation, or a combination of both, is contested, but it is beneficial for science communicators to understand how their choices in message construction can influence the response of the public.

Thaler and Sunstein (2003) argue that it is acceptable, if not desirable, that communicators adopt a “libertarian paternalistic” paradigm when addressing issues surrounding the public good. Under this view, libertarian means that one is not coercive, while paternalistic means that one is conscious of how messages or decision making structures may guide decision making processes. This approach is desirable, in part, because individuals often do not make decisions that are in their best interest, even by their own account (Thaler & Sunstein, 2009). For example, individuals often inordinately value present consumption over future consumption, even though they are likely to regret it in the future (O'Donoghue & Rabin, 2003).

A paternalistic approach is also, in almost all communication considerations, necessary. An individual may choose not to speak about an issue, or to speak about an issue in a specific way, but it is impossible to construct a “neutral” message, as the characteristics of all messages may only be judged in relation to each other. For example, a science communicator may attempt to simply provide “the facts” about climate change, but as exemplified in the studies presented in this dissertation, facts may be presented in multiple

forms that have different effects; there is no baseline form that other approaches may be compared to. Thus, a science communicator is left with three basic choices: 1) use a message strategy that he or she thinks will make the receiver or society best off, 2) randomly choose a message strategy, or 3) use a message strategy that he or she thinks will make the receiver or society worse off (Thaler & Sunstein, 2003). In a competitive resource environment, there may also be the additional choice of creating messages that will make select individuals or communities better off than others. Confronted with these choices, a science communicator may simply choose to adopt a normatively prescribed communication approach from their discipline – but adopting messages in line with a professional tradition still amounts to a choice, and cannot be considered “neutral” or “objective.”

Under this paradigm, it becomes important that science communicators think critically about how their messages may resonate with the public, as there is little defense to randomly choosing message strategies; the message will still nudge the receiver in a direction, but it will be through random chance rather than considered deliberation. The framing of messages can then be seen as a necessary process, rather than one that is relegated to spin or coercion; the relative impact of different message structures is unavoidable. Through a considered process, the research presented here can then be applied through a rule based choice of cost-benefit analysis that hopefully will bring about the most good, and at the minimum, makes value choices explicit.

The research presented in this dissertation demonstrates the impact that subtle changes in message structures can have on the response of message receivers. Additional research is necessary to continue developing theories addressing how variation in message structures may influence policy support and individual behavior change related to climate change, amongst other issues, and provide science communicators with more information to guide their choices in constructing messages.

## APPENDIX A

### Stimulus Materials for Study 1: High Social Identification (In-Group) Condition

AP Health News Wire  
March 5, 2008

#### Does Upstate NY Have a Fever?

Global Climate Change May Lead to Health Crisis

According to scientific experts, global climate change is expected to have dramatic changes on the weather, ecosystems, and health. For instance, global climate change is expected to dramatically raise average temperatures in Upstate New York, which in turn will substantially increase the number of insects like mosquitoes and ticks. Unfortunately, more bugs means significantly more risk from West Nile Virus and other infectious diseases that are transmitted by mosquito and tick bites.

Health organizations believe this is a worrisome prospect for residents of Upstate New York who work in the agricultural sector. New York farmers who spend a considerable amount of time outdoors, like those pictured right, are especially vulnerable to catching a life-threatening disease like West Nile virus.

Recovering from a severe case of West Nile Virus is a long process. Hospitalization can last for weeks, and even then the effects often linger. Health organizations are currently researching effective methods to both prevent and treat West Nile Virus. Costly treatments include extensive muscle rehabilitation and nerve therapy.

However, researchers are now investigating how to reduce global climate change in order to avoid disastrous impacts on Upstate New York like dangerous diseases from insects. Dr. David Nichols, a noted climatologist, states, "There is an urgent need to fund research, use government regulation, and promote individual action to keep these farmers and other New York residents safe from infectious diseases and other hazardous effects of climate change."

Some farmers in Upstate NY at risk of infection



Derrick Brown



Peter Bailey



John Gutierrez



Lisa Walker



Henry Turner



Richard Ciminelli



Mark Lynch



Paul Glovak

## APPENDIX B

### Stimulus Materials for Study 1: Low Social Identification (Out-Group) Condition

AP Health News Wire  
March 5, 2008

#### Does France Have a Fever?

##### Global Climate Change May Lead to Health Crisis

According to scientific experts, global climate change is expected to have dramatic changes on the weather, ecosystems, and health. For instance, global climate change is expected to dramatically raise average temperatures in Southern France, which in turn will substantially increase the number of insects like mosquitoes and ticks. Unfortunately, more bugs means significantly more risk from West Nile Virus and other infectious diseases that are transmitted by mosquito and tick bites.

Health organizations believe this is a worrisome prospect for residents of Southern France who work in the agricultural sector. French farmers who spend a considerable amount of time outdoors, like those pictured right, are especially vulnerable to catching a life-threatening disease like West Nile virus.

Recovering from a severe case of West Nile Virus is a long process. Hospitalization can last for weeks, and even then the effects often linger. Health organizations are currently researching effective methods to both prevent and treat West Nile Virus. Costly treatments include extensive muscle rehabilitation and nerve therapy.

However, researchers are now investigating how to reduce global climate change in order to avoid disastrous impacts on Southern France like dangerous diseases from insects. Dr. David Nichols, a noted climatologist, states, "There is an urgent need to fund research, use government regulation, and promote individual action to keep these farmers and other French residents safe from infectious diseases and other hazardous effects of climate change."

Some farmers in Southern France at risk of infection



Marc Guillaume



Adrien Sommer



Jacques Guischart



Colette Badeau



Henri Folliot



Gérard Delafloite



Thierry Bontecou



Bernard Wischard

## APPENDIX C

### Stimulus Materials for Study 2: Episodic Condition

#### Polar bear struggles for food in the arctic

WASHINGTON — An Alaskan polar bear tracked by government scientists has struggled to cross ice flows and find enough food to survive.

The researchers were startled to find that the bear, a female they have nicknamed Frosty, has to swim up to 60 miles across open sea to find food. She is forced into the long voyages because the ice floes from which she feeds are melting, becoming smaller and drifting farther apart.

Frosty would typically eat one seal every 4 or 5 days. However, as climate change has reduced ice floes, she has had to go without food for long stretches of time. As a result, her average weight has dropped dramatically over the past year.

“The odds for Frosty’s survival do not look good,” said Steven Amstrup, a U.S. Geological Survey (USGS) wildlife research biologist in Anchorage, Alaska, and leader of the polar bear studies. “Without immediate action, it is likely that Frosty will either starve or drown in the near future.”

This a call to action, not despair," said Kirstie Siegel of the Arizona-based Center for Biological Diversity. "The good news is that there is still time to save Frosty. Our hope lies in a rapid response. It is critical to make both deep and immediate carbon dioxide reductions to save Frosty’s habitat and list the polar bear as an endangered species. People can help save Frosty by donating to wildlife preservation funds, and also by addressing climate change by pushing for comprehensive government policies and changing their individual behavior."

## APPENDIX D

### Stimulus Materials for Studies 2 and 3: Thematic Condition with Numbers

#### Thousands of Polar bears struggle for food in the arctic

WASHINGTON — Climate change is having a dramatic impact on polar bears in the arctic. Most polar bears already find it harder to find food, and scientists predict that 12,000 of the 18,000 polar bears in the world may be killed off in the near future because of thinning sea ice from global warming in the Arctic.

The U.S. Geological Survey projects that polar bears will disappear along the north coasts of Alaska and Russia during the next half-century and lose 714,000 square miles (1.85 million square kilometers) of the Arctic range they need to live in during summer in the Polar Basin when they hunt and breed.

The Arctic had been predicted to be hit first by global warming, principally because warming at the northern pole is enhanced by positive feedback. Snow and ice reflect 80% to 90% of solar radiation back into space. But when these white surfaces disappear, more solar radiation is absorbed by the underlying land or sea as heat. This heat, in turn, melts more snow and ice. As of September, 2007, sea-ice extent had fallen to 1.70 million square miles (4.42 million square kilometers)—beating the previous record low of 2.05 million square miles (5.32 million square kilometers) set on September 21, 2005.

This a call to action, not despair," said Kirstie Siegel of the Arizona-based Center for Biological Diversity. "The good news is that there is still time to the polar bear. Our hope lies in a rapid response. It is critical to make both deep and immediate carbon dioxide reductions to save habitat for polar bears and list the polar bear as an endangered species. People can help save the polar bear by donating to wildlife preservation funds, and also by addressing climate change by pushing for comprehensive government policies and changing their individual behavior."



## APPENDIX E

### Stimulus Materials for Study 3: Thematic Condition without Numbers

#### Many Polar bears struggle for food in the arctic

WASHINGTON — Climate change is having a dramatic impact on polar bears in the arctic. Most polar bears already find it harder to find food, and scientists predict that most polar bears in the world may be killed off in the near future because of thinning sea ice from global warming in the Arctic.

The U.S. Geological Survey projects that polar bears will disappear along the north coasts of Alaska and Russia during the next half-century and lose much of the Arctic range they need to live in during summer in the Polar Basin when they hunt and breed.

The Arctic had been predicted to be hit first by global warming, principally because warming at the northern pole is enhanced by positive feedback. Snow and ice reflect 80% to 90% of solar radiation back into space. But when these white surfaces disappear, more solar radiation is absorbed by the underlying land or sea as heat. This heat, in turn, melts more snow and ice. As of September, 2007, sea-ice extent had fallen to the lowest level on record—beating the previous record low set on September 21, 2005.

This a call to action, not despair," said Kirstie Siegel of the Arizona-based Center for Biological Diversity. "The good news is that there is still time to the polar bear. Our hope lies in a rapid response. It is critical to make both deep and immediate carbon dioxide reductions to save habitat for polar bears and list the polar bear as an endangered species. People can help save the polar bear by donating to wildlife preservation funds, and also by addressing climate change by pushing for comprehensive government policies and changing their individual behavior."

# APPENDIX F

## IRB APPROVAL FOR STUDIES IN DISSERTATION



Cornell University  
Office of Research Integrity  
and Assurance

Institutional Review Board  
for Human Participants  
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### NOTIFICATION OF EXPEDITED APPROVAL

Protocol ID# 07-10-001

Termination Date: 10/15/2008

To: Erik C. Nisbet

From: Jennifer Gerner, IRB Chair

Date of approval: October 17, 2007

Project(s): *Communicating Global Climate Change*

*Jennifer Gerner*  
(If you are using a consent form, enter this date at the bottom of it now.)

A member of the IRB has reviewed and given an expedited approval to the above referenced project as far as the use of human participants is concerned.

#### *Please take note of the following:*

The reviewer suggests changing your title for "Infrahumanization."

The terms of Cornell University's Federalwide Assurance (FWA) with the federal government mandate the following important conditions for investigators:

1. All consent forms, records of study participation, and other consent materials **must** be held by the investigator for **three years** after the close of the study.
2. Investigators must submit to the IRB any **proposed amendment** to the study protocol, consent forms, interviews, recruiting strategies, and other materials. Investigators may not use these materials with human participants until the IRB has reviewed them. For information about study amendment procedures and access to the Amendments application form, please refer to the IRB website: [http://www.osp.cornell.edu/Compliance/UCHS/Approval\\_Requests.htm](http://www.osp.cornell.edu/Compliance/UCHS/Approval_Requests.htm)
3. Investigators must promptly report to the IRB any **adverse events** involving human participants. The definition of prompt reporting depends upon the seriousness of the adverse event. For guidance on recognizing, defining, and reporting adverse events to the IRB, please refer to the IRB website: <http://www.osp.cornell.edu/Compliance/UCHS/Adverse.htm>.

If the use of human participants is to continue beyond the assigned approval period, federal requirements mandate that the protocol be re-reviewed and receive an updated approval. **You may not continue to use human participants beyond the stated approval period without an updated approval.** Please note that the terms of our FWA with the federal government do not allow for an extension of this period without review. Continuing without an updated approval constitutes a violation of University policy and federal regulations. Research funds administered by Sponsored Programs Services will not be released to any project that does not have a current IRB approval.

Approximately six weeks before the expiration of your approval, you will be sent a notification of pending expiration, and an explanation of the renewal process. Applications for renewal of approval must be submitted sufficiently in advance of the expiration date to permit the IRB to conduct its review before the current approval expires. Please allow at least two weeks for the review.

**\*\*If you do not plan to renew your protocol approval at the end of the year, please provide the IRB with a Project Closure form. A link to the Project Closure form can be found at [http://www.osp.cornell.edu/Compliance/UCHS/Approval\\_Requests.htm](http://www.osp.cornell.edu/Compliance/UCHS/Approval_Requests.htm).**

C:

Cornell University is an equal opportunity, affirmative action educator and employer.

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