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Literature Review: How Abnormal Temperatures Affect Climate Change Behaviors and Attitudes

Polls continue to reveal that the majority of American citizens support governmental intervention in limiting carbon output (Leiserowitz, Maibach, Roser-Renouf, & Feinberg, 2010; Leiserowitz, Maibach, Roser-Renouf, Feinberg, & Howe, 2013). Social scientists have sought to discover what creates the discrepancy between these polls' results and election results, which continue to indicate a lack of care for mitigating the possible effects of climate change (Popovich, Schwartz, Schlossberg, 2017). Existing studies – largely in the field of psychology – have attempted to address this discrepancy with studies of participant's ideologies and attitudes, and possible changes in attitudes over time (Mccright, & Dunlap, 2011; Poortinga, Spence, Whitmarsh, Capstick, & Pidgeon, 2011). However, many of these studies were correlational and based on survey responses. Furthermore, in the case of huge national surveys, there has been a great deal of controversy about potentially crippling non-response bias, which often negatively impacts national opinion surveys (very similar to those included in the cited studies) (Brehm, 1993). In the context of these biases and limitations of survey methodology, I argue that the current literature investigating fluctuating American attitudes towards climate change is flawed. I propose to investigate this phenomenon using computational techniques that avoid the biases inherent in survey methodologies.

One focus of the literature investigating mechanisms of climate change attitude fluctuation has been to investigate how and why participants perceive the repercussions of climate change as distal, but a more critical question for interpreting the role of cognitive biases is how individuals change their beliefs and attitudes regarding climate change when they are

confronted with repercussions such as abnormal temperatures or extreme weather events (Nerlich, Koteyko, & Brown, 2009; Spence, & Pidgeon, 2010). Some researchers have looked to investigate how climate change attitudes may change over time and be affected by a number of factors such as nearness to major elections, and abnormal temperature (Bergquist, & Warshaw, 2017; Brooks, Oxley, Vedlitz, Zahran, Lindsey, 2014). Concerning research investigating abnormal weather and climate change concern, there is the implicit assumption that individual's outside surroundings can influence their perception of risk – and indeed research shows this (Howe et al., 2014). Furthermore, research also indicates that support is stronger for climate protective policies following local abnormal weather events – lending more evidence to this theory (Rudman et al., 2013).

However, given the variation in survey response reliability, which can vary based on reactance, framing effects, observer-expectancy bias (when a participant may feel pressure to yield a certain result and acts accordingly), and several other biases – these studies should be taken with a measure of doubt (Balph &, Balph, 1983; Miller, 1976; Robins, Fraley, & Krueger, 2010). The weaknesses of the survey approach can also be found in the research conducted by Nerlich, Koteyko, & Brown (2009) where only single items from large surveys are used as their central dependent variable– for example, in the cited study it was a single item inquiring about climate change concern. The problem with such studies is that they are mostly devoid of explanatory power and lack the ability to give insight as to what mechanisms may be causing this concern or the lack thereof.

Moreover, existing studies that have considered how weather affects climate change attitudes only sought to measure the perceived concern towards climate change, a metric which is telling, but incomplete in accurately illustrating how temperature fluctuations may be altering

behaviors and what mechanisms may be at play. For example, researchers investigating potential biases leading to climate change disbelief implicate a mechanism by which participants dispel the riskiness of climate change to dismiss its potential threat towards their conservative identity (i.e., if climate change exists and has anthropogenic causes, then part of a conservative's world view is flawed and this is threatening, so it is easier to deny climate change outright) (Mccright, & Dunlap, 2011). Supporting this claim, researchers found that even conservative individuals who self-report as "very knowledgeable" about climate change are often still in disbelief regarding its existence and may seek out means with which they can reinforce this disbelief (e.g., find aggregable opinions).

This cognitive bias implies a clear disconnect between climate change related behaviors and belief in the existence of climate change that is likely troubling for the validity of survey measures simply inquiring about constructs such as concern or disbelief. It seems evident that if an individual indicates low climate change concern on a survey that they should also exhibit a low amount of behaviors that indicate concern about climate change. However, in line with the previously discussed identity protection bias, if an individual Google searches "climate change lies" multiple times a week to consume deliberately biased information, they are also likely to indicate low climate change concern on a survey measure begging the question - is this survey measure of concern truly accurate? Due to biases which may motivate individuals to inaccurately report their climate change attitudes survey measures risk a lack of accuracy that threatens internal validity, highlighting again a need for newer more accurate measures of how individuals interact with the idea of climate change.

To address internal validity weaknesses in the literature, taking a computational approach, which can provide data that measures participant's real-time, organic responses to

changes in temperature may more accurately reveal mechanisms, behaviors, and attitudes relating to climate change. Due to the biases and problems in the extant literature which investigates abnormal temperature's role in climate change attitude fluctuation, there exists a need for further research to both contextualize previous results and integrate literature on cognitive biases with these ideas. Therefore, the central research question for this project is to investigate how abnormal temperatures may alter climate change attitudes and the mechanisms at play in this relationship using more representative computational data. Due to this change and others, this study should hopefully be able to provide a perspective on this research question that other studies in the literature have not.

In order to more adequately capture the entire picture of American attitudes and behaviors regarding climate change and the underlying mechanisms at play, I propose research in which Google search results regarding climate change are tracked across states which have experienced the largest and smallest average discrepancy in temperatures previous to the analyzed timeframe and after. Research finds that this data is unlikely to be biased by censoring and that most of individual's "Googling" occurs when they are alone (Kreuter, Presser, & Tourangeau, 2009). This database has been used to capture nationwide trends; for instance, GoogleFlu has been found to accurately track flu epidemics showcasing the scale of explanatory and predictive power of the database. Dr. Stephens-Davidowitz has utilized Google search data to investigate hidden racist behaviors, showcasing the revelatory power of Google search data (Ginsberg, Mohebbi, Patel, R. S., Brammer, Smolinski, & Brilliant, 2008; King, 2011; Stephens-Davidowitz, 2017). Because of the way literature indicates individuals often use the internet – without reservations for privacy – Google search data seems like a perfect tool to undermine some of the biases present in survey work (Conti and Sobiesk, 2007; Kornblum, 2005).

Furthermore, the internet is the second most common place where Americans receive their news, and Google is overwhelmingly the most popular search engine – if someone's feelings about climate change fluctuate after abnormal temperatures and they want to learn more (or learn why they should not worry), these patterns should emerge here. But this measure is not without its limitations. It has led to potentially biased pictures of societal trends (as in GoogleFlu) and is not always ideal as a stand-alone database (Lazer, Kennedy, King, & Vespignani, 2014).

I believe, however, that this study has the ability to both strengthen the cases set forth by the previous literature investigating the effect of temperature on climate change and provide insight into potential mechanisms at work (Talhelm, Haidt, Oishi, Zhang, Miao, Chen, 2012). Researchers need to develop measures that are more flexible to the potential manifestations of changed climate change attitudes, if they hope to truly capture the mechanisms behind individual interactions with information on climate change, particularly when people are confronted with its repercussions. Google search data offers one source of data to more reliably investigate these shifting attitudes. To investigate the role of media consumption in this study I will also scrape articles about climate change from a liberal news site and a conservative news site to compare the number of articles written during times of abnormal temperature as a possible confound.

References

Balph, D., Balph, M. (1983). On the Psychology of Watching Birds: The Observer Expectancy Bias. *American Ornithological Society, 100*, 755-757.

Bergquist, P., & Warshaw, C. (2017). Beyond politics: Climate concern responds to changing temperatures in the American states. *MIT Urban Planning*.

Brehm, J. (1993). *The Phantom Respondents.* Ann Harbor: University of Michigan Press.

Brooks, J., Oxley, D., Vedlitz, A., Zahran, S., & Lindsey, C. (2014). Abnormal Daily Temperature and Concern about Climate Change Across the United States. *Review of Policy Research,31*(3), 199-217.

Conti, G., & Sobiesk, E. "An Honest Man Has Nothing to Fear," in Proceedings of the 3rd Symposium on Usable Privacy and Security - SOUPS '07. ACM Press New York, New York, USA. p. 112

Gifford, R. (2011). The dragons of inaction: Psychological barriers that limit climate change mitigation and adaptation. *American Psychologist,66*(4), 290-302. doi:10.1037/a0023566

Ginsberg, J., Mohebbi, M. H., Patel, R. S., Brammer, L., Smolinski, M. S., & Brilliant, L. (2008). Detecting influenza epidemics using search engine query data. *Nature,457*(7232), 1012-1014.

Howe PD, Boudet H, Leiserowitz A, Maibach EW (2014) Mapping the shadow of experience of extreme weather events. Clim Chang 127(2):381–389

King, L. (2011). The Social Science Data Revolution [PowerPoint slides]. Retrieved From https://gking.harvard.edu/files/gking/files/evbase-horizonsp.pdf

Kornblum, J. (2005). Teens Wear Their Hearts on Their Blog. Retrieved January 25, 2018, from https://usatoday30.usatoday.com/tech/news/techinnovations/2005-10-30-teen-blogs_x.htm

Kreuter, F., Presser, S., & Tourangeau, R. (2009) Social Desirability Bias in CATI, IVR, and Web Surveys: The Effects of Mode and Question Sensitivity. Public Opinion Quarterly, 72 (5), 847–865.

Lazer, D., Kennedy, R., King, G., & Vespignani, A. (2014). The Parable of Google Flu: Traps in Big Data Analysis. *Science*,*343*(6176), 1203-1205.

Leiserowitz, A., Maibach, E. W., Roser-Renouf, C., & Feinberg, G. (2010). Climate Change in the American Mind: Americans Global Warming Beliefs and Attitudes in June 2010. *SSRN Electronic Journal*.

Leiserowitz, A., Maibach, E. W., Roser-Renouf, C., Feinberg, G., & Howe, P. (2013). Climate Change in the American Mind: Americans Global Warming Beliefs and Attitudes in April 2013. *SSRN Electronic Journal*.

Poortinga, W., Spence, A., Whitmarsh, L., Capstick, S., & Pidgeon, N. F. (2011). Uncertain climate: An investigation into public scepticism about anthropogenic climate change. *Global Environmental Change*,*21*(3), 1015-1024.

Popovich, N., Schwartz, J., & Schlossberg, T. (2017) How Americans Think About Climate Change in Six Maps. *The New York Times*. Retrieved from https://www.nytimes.com/interactive/2017/03/21/climate/how-americans-think-about-climate-change-in-six-maps.html

Mccright, A. M., & Dunlap, R. E. (2011). Cool dudes: The denial of climate change among conservative white males in the United States. *Global Environmental Change*,*21*(4), 1163-1172.

Miller, R. L. (1976). Mere exposure, psychological reactance and attitude change. *PsycEXTRA Dataset*.

Nerlich, B., Koteyko, N., & Brown, B. (2009). Theory and language of climate change communication. *Wiley Interdisciplinary Reviews: Climate Change,1*(1), 97-110.

Robins, R. W., Fraley, R. C., & Krueger, R. F. (2010). *Handbook of research methods in personality psychology*. New York: Guilford.

Rudman LA, McLean MC, Bunzl M (2013) When truth is personally inconvenient, attitudes change the impact of extreme weather on implicit support for green politicians and explicit climate-change beliefs. Psychol Sci 24(11):2290–2296

Scheitle, C. P. (2011). Googles Insights for Search: A Note Evaluating the Use of Search Engine Data in Social Research*. *Social Science Quarterly,92*(1), 285-295.

Spence, A., & Pidgeon, N. (2010). Framing and communicating climate change: The effects of distance and outcome frame manipulations. *Global Environmental Change,20*(4), 656-667.

Stephens-Davidowitz, S. (2017). *Everybody Lies: Big Data, New Data, and What the Internet can Tell us About Who we Really are*. Harper Collins.

Talhelm, T., Haidt, J., Oishi, S., Zhang, X., Miao, F., & Chen, S. (2012). Liberals Think More Analytically (More Weird) than Conservatives. *SSRN Electronic Journal*.