

Tell Me More: Release of the 2014 IPCC AR5 Synthesis Report and Climate Change Opinions in the United States

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Abstract

Climate change is a consequential and urgent issue. Now more than ever, there is a strong global scientific consensus on the occurrence of climate change and its human causes, as demonstrated in the Intergovernmental Panel on Climate Change's (IPCC) most recent assessment report—the 2014 AR5 Synthesis Report. Understanding public opinion on this issue is essential due to the public's ability to set the policy agenda and establish policymakers' goals. Using repeated cross-sectional survey data from 2011 to 2017 from the Yale Program on Climate Change Communications' "Climate Change in the American Mind" study, the objective of this paper is to examine the influence of the 2014 IPCC AR5 Synthesis Report on public belief in the occurrence and cause of climate change in the United States. Conducting a series of linear probability models (LPMs), this paper finds no significant change in the public's belief that climate change is happening and human activities are mostly to blame directly stemming from the Synthesis Report's release. However, this analysis confirms and builds upon prior literature and polling data revealing growing partisan differences in climate change beliefs. Despite the growing partisan divide on climate change opinions, this analysis does find a significant, increasing shift in opinion toward the scientific consensus. This paper concludes that, while the direct influence of the AR5 Synthesis Report on public opinion is not statistically significant, the Report is likely one of many factors contributing to the public's growing belief in climate change and its anthropogenic influences.

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Data for this research was obtained from the Climate Change in the American Mind survey from the Yale Program on Climate Change Communication (YPCCC), Yale University, New Haven, Connecticut. The YPCCC bears no responsibility for the analyses or interpretations of the data presented here.

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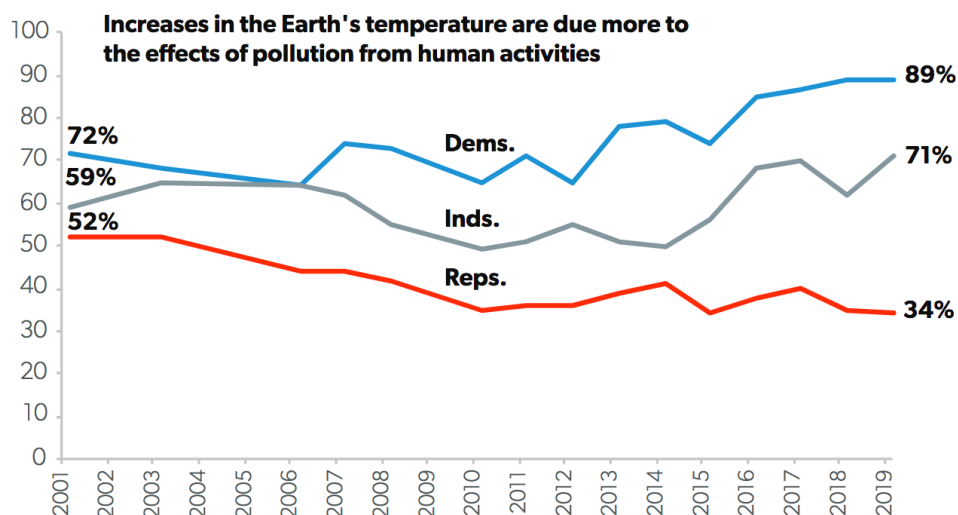
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Introduction

Climate change is one of the most pressing issues the world faces today. Scientists from both the United States and around the world agree that climate change not only poses an immediate and long-term threat to the existence of the planet, but that it is mainly caused by human influences. Scientists also warn that if actions to mitigate the effects of climate change are not rapidly taken, its impacts may be permanent. While the science behind the issue may appear to be clear, methodical, and objective, it is not always seen that way in the public image. According to an October 2018 CBS News poll, 61 percent of adults in the United States say global warming is due to human activity. Contrastingly, approximately 97 percent of climate scientists agree that climate change is occurring and is due to human activity (American Association for the Advancement of Science, n.d.).

Variation in climate change beliefs also exists by age category and education level. For instance, in 2017, approximately 61 percent of adults ages 18-34 believe climate change is mostly a result of human activity, whereas only 49 percent of adults age 55 and older share these views (Yale Program on Climate Change Communication, 2019). Also in 2017, among adults with less than a high school education, 59 percent believe climate change is predominantly human caused, compared to 52 percent of adults with a high school education, 51 percent of adults with some college education, and 62 percent of adults who hold a bachelor's degree or higher (Yale Program on Climate Change Communication, 2019). Differences among partisans regarding climate change opinions paint a much starker contrast. According to an October 2018 CBS News poll, 85 percent of Democrats believe that climate change is due to human activity, compared to only 34 percent of Republicans. Data from Gallup polling yield similar findings, as demonstrated in the graph below. Although members of the scientific community agree on the anthropogenic causes of climate change, this consensus does not extend to the general public.

Q: And from what you have heard or read, do you believe increases in the Earth's temperature over the last century are due more to the effects of pollution from human activities or natural changes in the environment that are not due to human activities?



Sources: Gallup, via American Enterprise Institute Political Report, 2019; Graph from the American Enterprise Institute Political Report, 2019.

The absence of a climate change consensus among the public in the United States is concerning, given that the U.S. is one of the primary emitters of greenhouse gases driving the issue. As of 2014, the U.S. is the second largest emitter of carbon dioxide (CO₂) in the world, only behind China (Boden, Andres, & Marland, n.d.). While the discovered link between human activities and climate change is not new, some members of the public remain unpersuaded that, indeed, the science is clear and convincing—climate change is occurring and humans are the primary cause.

However, in 2014, the Intergovernmental Panel on Climate Change released a consequential and alarming climate change publication—the Fifth Assessment Synthesis Report (IPCC AR5 Synthesis Report). In this publication, scientists highlight the causes and widespread impacts of climate change and the consequences of public inaction. Due to the pressing nature of climate change, as well as the large number of resources needed to organize scientists from around the world to conduct research and publish and disseminate the reports, it is important to analyze public opinion surrounding climate change and whether the release of high profile publications, such as the 2014 IPCC AR5 Synthesis Report, impacts people's perceptions of climate change. Public opinion is

also important to analyze, as people's perceptions of consequential issues like climate change influence policymakers' priorities. While the central motivation for releasing the IPCC reports is not necessarily to alter public opinion, because of the significance and relevance of the reports in highlighting the implications of an important global issue, such reports may still influence the public's climate change perceptions (Brulle et al., 2012). Although current public opinion polling suggests, evidenced by the CBS News and Gallup data cited, that Americans are still divided, particularly among partisans, on climate change issues, this study will analyze the shift in climate change views in response to the IPCC AR5 Synthesis Report.

Literature Review: Climate Change and Public Opinion

Intergovernmental Panel on Climate Change 2014 IPCC AR5 Synthesis Report

Over 30 years ago, in 1988, the United Nations formed the Intergovernmental Panel on Climate Change, encompassing a body of international scientists, in order to review the state of knowledge of the science behind climate change, evaluate the consequences of climate change, and identify strategies to effectively respond to the global issue (IPCC, n.d.). In October 2014, the IPCC released its fifth and most recent climate synthesis assessment, also known as the IPCC AR5 Synthesis Report. According to this new report, there is increased scientific confidence that climate change is occurring and that human activities, such as releasing greenhouse gases into the atmosphere, are a major influence (IPCC, 2014).

The IPCC AR5 Synthesis Report is a comprehensive assessment that discusses many aspects of the climate change phenomenon, including its occurrence, causes, risks, influences, and future impacts, in addition to an analysis of global adaptation and mitigation options (IPCC, 2014). According to the AR5 Synthesis Report, "The Synthesis Report (SYR) distills and integrates the findings of the three Working Group contributions to the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), the most comprehensive assessment of climate

change undertaken thus far by the IPCC: Climate Change 2013: The Physical Science Basis; Climate Change 2014: Impacts, Adaptation, and Vulnerability; and Climate Change 2014: Mitigation of Climate Change. The SYR also incorporates the findings of two Special Reports on Renewable Energy Sources and Climate Change Mitigation (2011) and on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (2011)” (IPCC, 2014).

While the IPCC reviews and evaluates various scientific climate opinions and determines areas that require further study, the organization does not conduct its own original climate change research (IPCC, n.d.). Therefore, as with all scientific reports, there are varying levels of confidence and certainty in the results. Throughout the Synthesis Report, the authors attempt to communicate the level of certainty of their findings in order to ensure the objectivity and clarity of their analyses (IPCC, 2014). The authors calculate the level of certainty of their findings based on characteristics such as, “...the type, amount, quality, and consistency (e.g., data, mechanistic understanding, theory, models, expert judgment) and the degree of agreement” (IPCC, 2014). Level of scientific evidence is grouped by limited, medium, and robust evidence (IPCC, 2014). Level of agreement is categorized by low, medium, and high agreement, while level of confidence is grouped into five categories: very low, low, medium, high, and very high confidence (IPCC, 2014). Additionally, the probability of the occurrence of past, present, and future events is defined in the report as, “...virtually certain, 99–100% probability; extremely likely, 95–100%; very likely, 90–100%; likely, 66–100%; more likely than not, >50–100%; about as likely as not, 33–66%; unlikely, 0–33%; very unlikely, 0–10%; extremely unlikely, 0–5%; and exceptionally unlikely, 0–1%” (IPCC, 2014). Thus, by highlighting and defining levels of evidence, levels of agreement, levels of confidence, and probabilities of climate change events, the Report attempts to clearly illustrate the precision of its findings and ultimately strengthen its conclusions.

Scientific Certainty of Climate Change

According to the AR5 Synthesis Report, there is now increased scientific confidence that climate change is occurring and that human activities, such as releasing greenhouse gasses into the atmosphere, are a major influence (IPCC, 2014). For instance, since the release of the IPCC's AR4 Assessment Report published in 2007, scientists have increased their level of confidence— now at 95%— that humans are a substantial driver of climate change and the resulting global temperature increases (IPCC, 2014). As stated in the AR5 Synthesis Report, “it is extremely likely that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in [greenhouse gas] concentrations and other anthropogenic forcings together” (IPCC, 2014).

The IPCC AR5 Synthesis Report is not the only scientific publication that supports the conclusion that climate change is occurring and humans are a significant contributing factor. The Fourth National Climate Assessment is a report published by the U.S. Global Change Research Program, which is required to provide information approximately every four years to Congress and the President regarding the state of knowledge of climate change, its overall effects, and details on current and future climate change trends (Fourth National Climate Assessment, n.d.). According to the Fourth National Climate Assessment (2018), throughout the industrial era, atmospheric carbon dioxide (CO₂) levels have increased by approximately 40 percent. This increase in CO₂ escalates the greenhouse effect—where greenhouse gasses, like CO₂, trap heat before it is released into space—which is now, “...driving an increase in global surface temperatures and other widespread changes in Earth's climate that are unprecedented in the history of modern civilization” (Fourth National Climate Assessment, 2018). Further, the report concludes, “...the unambiguous long-term warming trend in global average temperature over the last century cannot be explained by natural factors alone. Greenhouse gas emissions from human activities are the only factors that can account for the observed warming over the last century; there are no credible alternative human or natural

explanations supported by the observational evidence. Without human activities, the influence of natural factors alone would actually have had a slight cooling effect on global climate over the last 50 years” (Fourth National Climate Assessment, 2018). Plainly, the Fourth National Climate Assessment (2018) unambiguously finds that climate change is occurring and its effects are primarily attributed to human activities.

The paper “The Scientific Consensus on Climate Change” by Harvard environmental science historian, Naomi Oreskes (2004), reinforces the notion that climate change is real and humans are significant contributors. Oreskes (2004) found that one of the country’s leading scientific institutions, the National Academy of Sciences, and the IPCC share similar opinions regarding the occurrence of human-caused climate change. Oreskes quotes a National Academy of Sciences publication examining climate change issues, which states, “the IPCC's conclusion that most of the observed warming of the last 50 years is likely to have been due to the increase in greenhouse gas concentrations accurately reflects the current thinking of the scientific community on this issue” (National Academy of Sciences, 2001; Oreskes, 2004). Oreskes (2004) also discusses how other prominent scientific institutions, such as the American Meteorological Society, the American Geophysical Union, and the American Association for the Advancement of Science, all agree that “...evidence for human modification of climate is compelling” (Oreskes, 2004). Further, in her paper, Oreskes (2004) researched whether or not scientific organizations were seriously considering diverging scientific opinions regarding climate change in their conclusions on the subject. After examining 928 abstracts of papers published in scientific journals from the year 1993 to 2003, Oreskes (2004) found that not one of the papers studied disputed the scientific consensus that climate change is occurring and human activities are likely to blame. Hence, Oreskes (2004) concluded that scientists who publish their research in peer-reviewed, scientific journals support the scientific consensus expressed by the IPCC and other prominent scientific institutions.

A publication by the American Association for the Advancement of Science compares the scientific agreement that smoking results in detrimental health outcomes to the scientific consensus that humans are causing climate change (American Association for the Advancement of Science, n.d.). According to the report, “The science linking human activities to climate change is analogous to the science linking smoking to lung and cardiovascular diseases. Physicians, cardiovascular scientists, public health experts, and others all agree smoking causes cancer. And this consensus among the health community has convinced most Americans that the health risks from smoking are real. A similar consensus now exists among climate scientists, a consensus that maintains that climate change is happening and that human activity is the cause” (American Association for the Advancement of Science, n.d.). This agreement within both existing literature and the scientific community demonstrates the confidence and strength behind the science of anthropogenic climate change.

Impacts of Climate Change

According to NASA, as of May 2013, for the first time in human history, atmospheric CO₂ concentrations have surpassed 400 parts per million (ppm) (NASA, n.d.). The last time CO₂ levels were above 400 ppm, three to five million years ago, sea levels were approximately 16 to 131 feet higher than their normal levels, global temperatures were warmer by between 5.4 and 7.2 degrees Fahrenheit, and the North and South Poles were about 18 degrees Fahrenheit warmer than they are today (NASA, n.d.). In context, CO₂ concentrations were approximately 200 ppm during the ice age periods, and around 280 ppm throughout the interglacial periods (NASA, n.d.). Further, NASA warns that if humans continue this phenomenon of rapid CO₂ emissions without any mitigation efforts, and utilize all of the existing fossil fuel reserves over the next 300 years, CO₂ concentrations may reach 1500 ppm, resulting in dramatic changes to the climate lasting thousands of years (NASA, n.d.).

The consequences of human-induced climate change are far reaching. According to the National Oceanic and Atmospheric Administration (NOAA), climate change will result in increased water stress, reducing the amount of water available for approximately 50 percent of the United States by the middle of the 21st century (Lindsey, 2013). An analysis by the Centers for Disease Control and Prevention (CDC) finds that climate change may contribute to “...increased respiratory and cardiovascular disease, injuries and premature deaths related to extreme weather events, changes in the prevalence and geographical distribution of food- and water-borne illnesses and other infectious diseases, and threats to mental health” (CDC, 2019).

Climate change may also harm the U.S. economy. The Fourth National Climate Assessment (2018) finds that, annually, some sectors in the United States may lose hundreds of billions of dollars by the year 2100. Specific industries that may be particularly vulnerable to climate change are tourism, fisheries, and agriculture due to their reliance on good weather conditions and sufficient availability of certain natural resources (Fourth National Climate Assessment, 2018). Temperature increases will also increase the demand for energy while simultaneously limiting the amount of electricity generated, causing higher electricity prices (Fourth National Climate Assessment, 2018). This would be a particularly economically regressive result of climate change, as low-income people would be more negatively impacted by higher electricity costs than wealthier individuals. Although some parts of the economy may experience a small benefit from short-term warming, the long-term impacts of climate change will result in overall net negative harm to the U.S. economy if significant mitigation and adaptation efforts are not undertaken (Fourth National Climate Assessment, 2018).

Current literature in this domain seeks to test and evaluate the various factors that may influence the public’s climate change opinions. Research from Brulle et al. (2012) sought to examine five different factors that may impact public concern of climate change: extreme weather occurrences, ability to obtain accurate scientific climate change information, coverage of climate

change in the media, “elite cues,” such as statements made by government officials, and climate change movements/counter-movements. Analyzing data from approximately 84,000 observations in the United States between the years 2002 and 2010 stemming from 74 different surveys and encompassing 14 different questions, Brulle et al. (2012) formulated a Climate Change Threat Index (CCTI). This comprehensive measure includes the public’s responses to questions related to their perceived level of threat of climate change (Brulle et al., 2012).

To decipher the factors that significantly influence public concern of climate change, the authors utilized a time-series regression approach including robust standard errors (Brulle et al., 2012). The dependent variable in their analysis was the CCTI (Brulle et al., 2012). The authors included six independent variables in their regression: extreme weather occurrences; scientific climate change information; coverage of climate change in the media; the amount of advocacy in the media by broadcasting the issue of climate change through multiple lenses, including conservative media outlets and magazines covering the environment; elite cues, or the influence of government officials discussing and acting on the issue of climate change; and a series of control variables, such as GDP, the unemployment rate, the number of deaths from the wars in Iraq and Afghanistan, and oil prices (Brulle et al., 2012).

Through their analysis, the authors found that while factors such as extreme weather occurrences do not have a statistically significant influence on the public’s concern over climate change, factors such as media coverage and elite cues produced the most significant changes in public concern (Brulle et al., 2012). Within elite cues, the most salient factors that resulted in a change in public concern are statements from Congressional Democrats, resulting in a statistically significant increase in concern, and votes by Congressional Republicans on climate change issues, resulting in a statistically significant decrease in climate change concern (Brulle et al., 2012). Further, although it is not the most significant influencer of public concern over climate change, Brulle et al.

(2012) did find that the release of climate change assessment reports is indeed positively, and significantly, associated with public concern over climate change. This finding is particularly important in the context of this research, as it demonstrates, more generally, that climate change assessment reports do significantly influence public concern of climate change (Brulle et al., 2012).

A main limitation of the authors' overall approach was that their use of time-series survey data prevented them from analyzing factors that influence public concern of climate change in the short-term (Brulle et al., 2012). Particularly, the various times of polling collection in the time-series data hindered the authors' abilities to assemble a monthly assessment of changes in public concern of climate change (Brulle et al., 2012). As also indicated in their paper, Brulle et al. (2012) did not include in their analysis the influence of cable news programming, from outlets such as Fox News and MSNBC, on shaping public concern of climate change. Due to the widespread reach and potential influence of these media outlets, it perhaps would have been beneficial to test whether exposure to other cable news platforms like Fox News and MSNBC also impacts the public's climate change concerns. Still, the analysis offered by Brulle et al. (2012) provides valuable insights into the influential factors shaping public concern over climate change, such as media coverage and actions from government officials, as well as the release of climate change assessments, which will be the focus of this analysis.

The media is an important outlet for disseminating information highlighted in the 2014 IPCC AR5 Synthesis Report. Therefore, it is important to examine how different media organizations cover climate change, and determine the influence of media exposure on the public's climate change opinions. While research by Brulle et al. (2012) did not examine the effects of watching cable news on people's climate change opinions, a paper by Feldman et al. (2011) focuses on evaluating the influence of watching the news outlets Fox News, CNN, and MSNBC on viewers' opinions on climate change. The main empirical methodologies used by the authors included

conducting both a content analysis examining how Fox News, CNN, and MSNBC cover climate change, as well as evaluating the results of a survey of U.S. adults on their climate change opinions (Feldman et al., 2011). The content analysis was conducted through a database search of Lexis Nexis between 2007 and 2008, while the survey, which was nationally representative of U.S. adults, included a sample size of approximately 2,000 people and was administered in 2008 (Feldman et al., 2011). The results of the content analysis showed that Fox News broadcasted more disparaging coverage of climate change relative to CNN and MSNBC (Feldman et al., 2011). Further, regression results using the survey data demonstrated that, even after controlling for factors such as demographic characteristics and personal values, such as attitudes toward science, Fox News viewership is negatively associated with believing in climate change, while CNN and MSNBC viewership is positively associated with a person's climate change beliefs (Feldman et al., 2011).

However, the authors note that, because they utilize cross-sectional survey data, it is challenging to make causal inferences regarding watching cable news and people's climate change opinions (Feldman et al., 2011). Further, since the survey was cross-sectional, the directionality of the relationship between watching cable news and people's climate change beliefs is not conclusive (Feldman et al., 2011). Although further study, such as a longitudinal study, is required to determine the causal impact of cable news on climate change opinions, this research is still relevant, as it points out the variation in climate change coverage between the country's most prominent media outlets, while also demonstrating that such differential climate change reporting may have an influence on viewers' climate change opinions (Feldman et al., 2011).

Another study by Lee et al. (2015) examined the various influences of awareness of climate change, as well as people's climate change risk perceptions, in different countries throughout the world. The authors use data from 119 nations collected from the Gallup World Poll, gathered between 2007 and 2008, in their analysis (Lee et al., 2015). The Gallup World Poll dataset also

incorporated specific information about respondents, including, but not limited to, their demographic characteristics (for instance, gender, marital status, age, religion, education level, etc.), as well as their climate change beliefs (Lee et al., 2015). Further, the authors used non-parametric unbiased recursive partitioning as their main empirical methodology to determine the most influential factors of both awareness and risk perceptions of climate change within each country evaluated (Lee et al., 2015).

Through their analysis, the authors found that one of the most important factors predicting a person's awareness of climate change in the United States was his or her level of civic engagement, where more civic engagement corresponded with more awareness of the occurrence of climate change (Lee et al., 2015). Additionally, Lee et al. (2015) concluded that the most salient factors predicting people's risk perceptions toward climate change in the United States were their opinions on climate change causes—such as human-caused or naturally occurring—how they perceive changing temperatures in their local environment, and their satisfaction with governmental efforts in confronting environmental issues. Americans who view climate change as a human-caused phenomenon and who believe that the average temperatures in their local area are increasing tend to view climate change as a large risk (Lee et al., 2015). Contrastingly, Americans tend to view climate change as a low or no risk phenomenon if they believe climate change is a naturally occurring event, the average temperatures in their local area are not changing or are becoming colder, and the government is already making satisfactory efforts to confront environmental issues (Lee et al., 2015). On a global scale, the authors discovered that the most awareness of the occurrence of climate change exists in the global north, such as in North America and Europe (Lee et al., 2015). However, individuals in countries in the global south, such as countries in Africa, who are aware of climate change tend to have greater risk perceptions regarding its effects on them personally compared to people living in countries in the global north (Lee et al., 2015). Overall, this paper highlights the

various factors and characteristics influencing people's awareness and risk perceptions of climate change, not only on a global level, but also in the United States, which will be the main focus of my analysis.

Political ideology may also be a moderating factor, serving as an influential variable impacting the public's opinion on climate change. Research from McCright and Dunlap (2011) examines the influence of political partisanship and polarization on people's climate change beliefs and concerns in the United States. Using data from Gallup's annual environmental poll conducted between 2001 and 2010, the authors were able to obtain polling information from a national representative sample of over 10,000 total U.S. adults (McCright & Dunlap, 2011). In order to evaluate the influence of political ideology on the public's beliefs and concerns of climate change, the empirical methodology the authors used was a multivariate logistical regression approach, controlling for factors such as age, gender, race, and income (McCright & Dunlap, 2011). The authors specifically controlled for these demographic characteristics, as they may be associated with people's climate change beliefs (McCright & Dunlap, 2011).

Through their analysis, McCright and Dunlap (2011) find that the existing discourse over climate change beliefs and concerns among members of the government and partisan organizations is also present in the U.S. general public. In other words, the controversy over the existence and threat of climate change between liberal and conservative government officials and organizations now also exists among the U.S. public (as noted in the introduction of this paper) (McCright & Dunlap, 2011). The authors' regressions find a statistically significant association between political ideology and beliefs and concerns over climate change (McCright & Dunlap, 2011). In the context of this paper, this finding demonstrates that political liberals and those who identify as Democrats are significantly more likely to believe in climate change and are more concerned about its effects than political conservatives and those who identify as Republicans (McCright & Dunlap, 2011). Due

to the apparent strength of political ideology in predicting climate change beliefs and concerns, people with deep political conservative or liberal ideologies may respond differently to the important information shock that is the subject of this research—the release of the 2014 IPCC AR5 Synthesis Report. However, in order to reduce its impact on the main variable of interest, this study’s regression analysis controls for political ideology in the attempt to determine the relationship between the release of the 2014 IPCC AR5 Synthesis Report and the public’s climate change opinions.

A New Analysis

The research highlighted in my paper is both unique and adds an additional layer of depth to previous work in this area. The analysis presented here focuses on data obtained from repeated cross-sectional surveys, or surveys containing the same or similar questions given to different samples over an extended period of time (Rafferty et al., 2015). While existing studies analyzing the IPCC AR5 Report focus on elements including, but not limited to, its framing in news media and social media (see O’Neill et al., 2015), its assessment of climate change risks (see Mach et al., 2016), and its inclusivity of perspectives from vulnerable populations, such as the Indigenous community (see Ford et al., 2011), my research specifically focuses on the AR5 Synthesis Report and its influence on public opinion in the United States. Further, while other studies have examined the factors that may influence public perception of climate change (see Brulle et al., 2012; Feldman et al., 2011; Lee et al., 2015; and McCright & Dunlap, 2011), this paper is one of the first to study the direct link between the release of the 2014 IPCC AR5 Synthesis Report and public opinion on climate change. The AR5 Synthesis Report is a comprehensive, scientifically-driven, and conclusive body of research that further highlights the climate issue and the urgent need to take action. Thus, through this research, it is important to determine whether or not this most recent IPCC climate assessment has impacted Americans’ perceptions of this consequential issue.

Hypotheses

Some people are firm in their respective beliefs regarding climate change issues. Exposure to new research, media influences, or outside climate change information from family and friends will not alter some segment of the population's beliefs (Brulle et al., 2012). However, while many people hold strong climate change opinions, many people are indeed flexible in their views and responsive to new information, such as new climate change research, how the media portrays the issue, and how members of the government respond to climate change through actions like speeches and votes (Brulle et al., 2012).

Consistent with prior literature on what influences the public's climate change opinions, and because of the increasing scientific consensus on climate change and the present impacts the issue poses, it is fair to hypothesize that the release and dissemination of a high profile and consequential report like the IPCC AR5 Synthesis Report may influence multiple levels of the public's climate change opinions. In particular, the most consequential aspect of the publication is its clear findings that climate change is indeed occurring and human activities are a significant contributor to the issue (IPCC, 2014). Thus, based upon these findings, I develop the following hypotheses:

H_0 : The release of the IPCC AR5 Synthesis Report has no influence on the likelihood that the public believes climate change is occurring.

H_A : The release of the IPCC AR5 Synthesis Report does influence the likelihood that the public believes climate change is occurring.

H_0 : The release of the IPCC AR5 Synthesis Report has no influence on the likelihood that the public believes climate change is mostly a result of human activities.

H_A : The release of the IPCC AR5 Synthesis Report does influence the likelihood that the public believes climate change is mostly a result of human activities.

Data: Yale Climate Change in the American Mind

The main dataset I will be using is the Yale Climate Change in the American Mind survey conducted by the Yale Program on Climate Change Communication (YPCCC). This repeated cross-sectional survey was initially conducted online in 17 waves between the years 2008 and 2017 and is representative of U.S. adults age 18 and older (Yale Program on Climate Change Communication, 2019). The survey was conducted only once in 2008, and was not conducted in 2009. Between 2010 and 2017, the survey was conducted twice per year, with varying data collection times. See the Appendix for the survey data collection times. To assemble a random sample, the survey utilized random digit dialing and address-based sampling measures, which encompassed nearly all U.S. residential phone numbers and addresses (Yale Program on Climate Change Communication, 2019). A major advantage of this dataset is its consistency, asking similar questions to respondents over a long period of time. However, a con of this dataset is its use of repeated cross-sectional data, rather than longitudinal data. Using longitudinal data, where the same respondents are asked the same questions over time, would have enhanced my ability to evaluate the causal effect of the treatment—the release of the 2014 IPCC AR5 Synthesis Report—on public opinion.

To improve the concision of my analysis, I restricted the data to only include the surveys from three years before and three years after the treatment. Hence, only 14 waves were included in my final sample, beginning with the May 2011 survey and ending with the October 2017 survey, which is also the final survey administered by the YPCCC. Additionally, only questions that were asked of all waves were included in my analysis in order to ensure consistency and to better examine long-term trends in the data. Therefore, I dropped six questions that were not asked in each wave. Further, one question on the survey, asking respondents about their beliefs regarding the cause of global warming/climate change, consisted of three variables, including an original variable, a variable including open-ended responses, and a recoded variable encompassing both the original and open-

ended variables. For consistency reasons, I only included the recoded variable in my analysis, dropping the other two variables. These data cleaning procedures eliminated 4,189 observations, decreasing the sample size from 20,024 responses to 15,835 responses. However, this data cleaning enabled me to better examine long-term trends in the data and examine observations closer to the treatment date, allowing for improved evaluation of the impact of the treatment while enhancing the validity of the results.

The survey did not require an answer to every question, and therefore included a “refused” option to most questions. Further, some questions included an “other” option, allowing for open-ended responses. I dropped these “refused” and open-ended responses in each variable, as they represent a small number of observations, and including them in my analysis does not add additional value. The response categories included in the survey are relatively exhaustive of the mainstream opinions respondents may have regarding climate change, so refusing to answer the question or offering an answer beyond the provided response categories was both rare and provided no additional insight. Most questions included in the survey were neither highly personal nor particularly invasive, making it challenging to discern exactly why a respondent may refuse to answer a question. Due to the low number of respondents choosing the “refused” and “other” options, and because of the relatively large sample size, dropping these categories likely does not impact the results.

One question on the survey asked about a respondent’s voter registration. However, the question wording changed between one of the versions of the survey. Altered question wording may influence respondents’ answers between different survey dates. Additionally, the response categories are complex. Therefore, due to this change in wording and complexity in response categories, I dropped this nonessential variable. I also dropped a variable asking respondents, if they were non-Christian, to elaborate on their religion. Because the responses were entirely open-ended and not

numerical, this variable did not add value to my analysis. By dropping the “refused” and “other” responses, as well as the voter registration variable and the open-ended “non-Christian” variable, the final number of observations in the data went from 15,835 observations to 14,250 observations, a small decrease compared to the overall sample size.

Conceptual Model

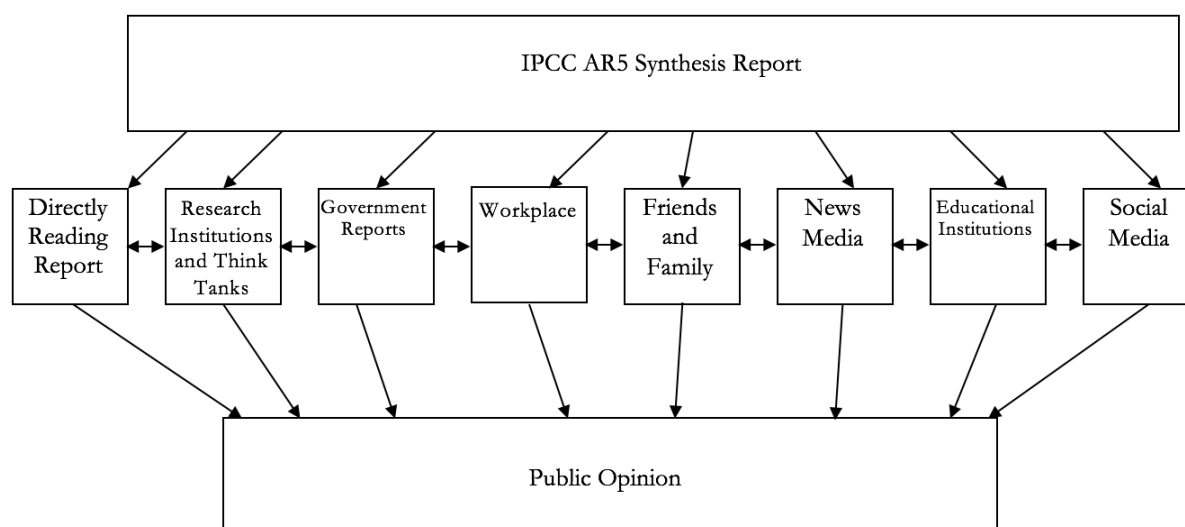
While many factors may influence an individual’s climate change opinions, the focus of this analysis is how the IPCC AR5 Synthesis Report specifically impacts the public’s climate change opinions in the United States. There are a variety of channels through which the report may be disseminated to the public, including directly reading the report; exposure through research institutions and think tanks; through government reports; through the news media, including newspapers, local news, and cable media outlets; through social media platforms, such as Facebook and Twitter; through an individual’s educational institution, if he or she is a student; through the workplace; or via acquaintances, friends, or family.

However, each distribution channel may not be equal with respect to the amount and depth of information exchanged regarding the report. For instance, learning about the report in school may give individuals a more thorough understanding of its findings than through casual conversation at work or with friends and family. Likewise, a newspaper publication offering in depth analysis of the report may offer readers an enhanced view of the report compared to a short cable news segment. It is also important to recognize that people may get their information of the report from biased or misleading sources. Research from Feldman et al. (2011) (previously cited) and Boykoff and Boykoff (2004) (discussed later in this paper) find that news organizations can be biased in their presentations of climate change issues. Research institutions and think tanks may lean in a political direction, directly influencing what and how they choose to communicate certain issues, such as climate change. Research from Jacques, Dunlap, and Freeman (2008) found that, of the

conservative think tanks studying environmental problems, approximately 90 percent promote skepticism by either downplaying the gravity of environmental issues or questioning the validity of environmental science. Further, of 141 published books between 1972 and 2005 focusing on environmental skepticism, about 92 percent were connected to conservative think tanks (Jacques, Dunlap, & Freeman, 2008). Thus, politically leaning think tanks, such as conservative think tanks, may provide biased environmental information to consumers.

Similarly, government reports issued by officials who do not believe in climate change or cast doubt on climate science likely differ from reports released from officials who do believe in anthropogenic climate change. For example, U.S. Senator Bob Casey, a Democrat from Pennsylvania, touts his pro-environmental stance and explicitly discusses his support for climate change policy on his official Senate webpage (Casey, n.d.). Contrastingly, U.S. Senator Pat Toomey, Senator Casey's Republican counterpart from Pennsylvania, supports the continued use of coal and does not address climate change in the "issues" section of his official Senate webpage (Toomey, n.d.).

There also may be interactions between channels, where, for instance, a person has many climate denying friends and family yet watches CNN as a primary source of news. Hence, depending on where they get their information from, individuals may be exposed to different aspects of the Report as well as biased or misleading commentary on its findings. Nevertheless, each communication channel is important to highlight and consider since people must get their information from some source. The following graphic visually displays the various, though highly simplified and not completely exhaustive, distribution channels and their interactions:

Figure 1: Conceptual Model of Distribution Channels:

Empirical Model

Consistent with research from McCright and Dunlap (2011), I recoded the responses to each key dependent variable to be binary, with “1” equating to responses that align with the scientific consensus on climate change—which broadly confirms that climate change is occurring, humans are the main drivers behind the issue, and urgent action is necessary to mediate its effects—and “0” equating to responses that are not consistent with the scientific consensus (see Codebook in the Appendix for full coding of the data). I also converted my main control variables to be binary. Specifically, I changed “marital status” to be coded “1” if married and “0” otherwise; “employment status” to equal “1” if working and “0” otherwise; “house type” to equal “1” if the respondent lives in a single family home and “0” otherwise; formulated a binary variable for each political party (i.e. “Democrat”=1 if a respondent is a Democrat, and “Democrat”=0 if not, etc.); created a binary variable for “generation,” which equals “1” if the respondent is older than, or is, a Baby Boomer (e.g. Greatest or Silent Generation), and equals “0” if the respondent is younger than a Baby Boomer (e.g. Generation X, Milleneal, iGen/Gen Z); generated a binary variable for each education

category (e.g. “educelh” equals “1” if the respondent has less than a high school education, and equals “0” otherwise, etc.); generated a binary variable for each region: Northeast, Midwest, South, West (e.g. “ne” equals “1” if an individual lives in the Northeast, and equals “0” otherwise); formulated a binary variable that equals “1” if a respondent is an Evangelical, and equals “0” otherwise; created a binary variable for race, where a respondent equals “1” if he or she is African American, and equals “0” otherwise; and generated a binary variable for each income category (e.g. “Less_than_50000” equals “1” if a respondent makes less than \$50,000, and equals “0” otherwise, “50000_99999” equals “1” if a respondent makes between \$50,000 and \$99,999, and equals “0” otherwise, etc.). Lastly, I generated a squared age term (age squared), since the relationship between an individual’s climate change beliefs and his or her age is likely nonlinear (for instance, the change in climate change beliefs is likely not the same between people who are 20 and 25 years old and people who are 55 and 60 years old).

The two main dependent variables I will be analyzing, based on my previously outlined hypotheses, are (1) whether a respondent believes climate change is happening (“happening”), and (2) whether a respondent believes climate change is mostly a result of human activities (“cause”) (Yale Program on Climate Change Communication, 2019). The independent variable of interest is also a dummy variable, with “1” representing the survey waves in the post period after which the IPCC AR5 Synthesis Report was released (but including the month and year it was released—October 2014 to October 2017), and “0” representing the survey waves in the pre period before the release of the AR5 Synthesis Report (May 2011 to April 2014). Using binary dependent variables allows me to conduct linear probability models (LPM) in order to present my findings in a clear, consistent, and straightforward manner (McCright & Dunlap, 2011).

I will utilize three different main regression equations. The first equation will represent the impact of being in the “post period,” or the period following and including the release of the 2014

IPCC AR5 Synthesis Report, on the likelihood an individual believes climate change is occurring and humans are the main drivers of the issue. The second equation will be similar to the first, with the inclusion of a set of specific control variables that may influence an individual's climate change opinions, including age, gender, education, region of residence, and variables representing a respondent's political ideology. The last equation is the same as the second equation, with the exception of an interaction term between the post variable and party variables (Democrat, Republican, Independent). In each case, I will use robust standard errors due to the heteroscedasticity of the error term in an LPM (Econometrics with R, n.d.).

$$Y_{it} = \alpha + \beta x_t + \varepsilon_{it}$$

$$Y_{it} = \alpha + \beta x_t + \delta z_{it} + \gamma_t + \varepsilon_{it}$$

$$Y_{it} = \alpha + \beta x_t + \sigma x_t * p_{it} + \delta z_{it} + \gamma_t + \varepsilon_{it}$$

Where:

Y: Main outcome variables: whether a respondent believes climate change is happening, and whether a respondent believes climate change is mostly attributed to human causes;

x: Post variable (=1 if in post period of October 2014 to October 2017, =0 if in May 2011 to April 2014)

i: Individual, i

t: Time, t

z: Vector of controls, including: gender, age, age squared, generation (e.g. baby boomer), income category (less than \$50,000 per year, between \$50,000 and \$99,999 per year, with \$100,000 or more as the omitted group), race (African American or not), education category (less than high school, high school, some college, with bachelor's degree or higher as the omitted group), political party (with Republican as omitted group), specific region of residence (Midwest, South, West, and

Northeast as the omitted group), whether a respondent is Evangelical or not, marital status (married or not), employment status (working or not), who a respondent shares a household with (e.g. a male 15 year old; note: these variables are included in the vector of controls and in the codebook (house_ages0to1, etc.), but are not meaningful to this analysis. Hence, their coefficients are not included in the tables found in the “Results” section), and the type of residence a respondent lives in (single family home or not).

$x_t * p_{it}$: Interaction term between the post variable and political party variables.

γ : Control variable including the specific month the survey was administered (which is already included in the vector of controls, z , but highlighted separately to further delineate its presence).

ϵ : Error term

All equations included appropriate survey weights, based on the “weight_wave” variable contained in the YPCCC data.

Results

To begin my analysis, I first conducted t-tests of means between the pre period and post period groups. The purpose of these tests is to capture a preliminary understanding of the data and to gain a broad overview of the potential differences in climate change beliefs between the pre and post period groups. Table 1 displays the mean value of each key variable in the data. The results of the t-tests are found in Table 2 below:

Table 1: Summary Statistics

Restricted Sample n=14,250				
<i>Variable</i>	(1) Mean	(2) Standard Deviation	(3) Min	(4) Max
Happening	.679	.467	0	1
Cause	.525	.499	0	1
<i>Demographics</i>				
Female	.507	.500	0	1
Age	50.74	16.99	18	97
Baby Boomer	.564	.496	0	1
African American	.088	.284	0	1
Less Than High School	.073	.261	0	1
High School	.283	.451	0	1
Some College	.294	.455	0	1
Bachelor's Degree and Higher	.350	.477	0	1
Income of Less Than \$50,000 Per Year	.377	.485	0	1
Income of \$50,000 to \$99,999 Per Year	.340	.474	0	1
Income of Over \$100,000 Per Year	.283	.450	0	1
No Political Party	.109	.311	0	1
Republican	.283	.450	0	1
Independent	.263	.441	0	1
Democrat	.345	.475	0	1
Northeast	.185	.388	0	1
Midwest	.241	.428	0	1
South	.348	.476	0	1
West	.227	.419	0	1
Evangelical	.248	.432	0	1
Married	.583	.493	0	1
Working	.566	.496	0	1
Single Family Home	.719	.449	0	1

Table 2: t-test
Results

	Before Release n=6,058				After ¹ Release n=8,192			
	(1) Mean	(2) Standard Deviation	(3) Min	(4) Max	(5) Mean	(6) Standard Deviation	(7) Min	(8) Max
<i>Variable</i>								
Happening	.662*** (.006)	.473	0	1	.691*** (.005)	.462	0	1
Cause	.505*** (.006)	.500	0	1	.540*** (.006)	.498	0	1
<i>Demographics</i>								
Female	.501 (.006)	.500	0	1	.511 (.006)	.500	0	1
Age	50.08*** (.217)	16.88	18	97	51.24*** (.188)	17.06	18	94
Baby Boomer	.579** (.006)	.494	0	1	.553** (.005)	.497	0	1
African American	.088 (.004)	.283	0	1	.089 (.003)	.284	0	1
Less Than High School	.075 (.003)	.264	0	1	.072 (.003)	.258	0	1
High School	.285 (.006)	.451	0	1	.282 (.005)	.450	0	1
Some College	.302* (.006)	.459	0	1	.287* (.005)	.452	0	1
Bachelor's Degree and Higher	.338** (.006)	.473	0	1	.359** (.005)	.480	0	1
Income of Less Than \$50,000 Per Year	.389** (.006)	.488	0	1	.369** (.005)	.482	0	1
Income of \$50,000 to \$99,999 Per Year	.347 (.006)	.476	0	1	.335 (.005)	.472	0	1
Income of Over \$100,000 Per Year	.263*** (.006)	.441	0	1	.297*** (.005)	.457	0	1

No Political Party	.107 (.004)	.309	0	1	.110 (.003)	.313	0	1
Republican	.276 (.006)	.447	0	1	.288 (.005)	.453	0	1
Independent	.269 (.006)	.443	0	1	.259 (.005)	.438	0	1
Democrat	.348 (.006)	.476	0	1	.343 (.005)	.475	0	1
Northeast	.185 (.005)	.389	0	1	.184 (.004)	.387	0	1
Midwest	.238 (.005)	.426	0	1	.243 (.005)	.429	0	1
South	.348 (.006)	.476	0	1	.348 (.005)	.476	0	1
West	.228 (.005)	.420	0	1	.225 (.005)	.418	0	1
Evangelical	.242 (.006)	.428	0	1	.253 (.005)	.435	0	1
Married	.580 (.006)	.494	0	1	.585 (.005)	.493	0	1
Working	.554** (.006)	.497	0	1	.574** (.005)	.495	0	1
Single Family Home	.723 (.006)	.448	0	1	.717 (.005)	.451	0	1

¹Includes both the month of the release of the IPCC AR5 Synthesis Report (October 2014), as well as the three years following the release.

*p<.10 **p<.05 ***p<.001; parentheses indicate standard errors

The two main variables of interest are “happening,” which details whether a respondent believes climate change is happening, and “cause,” whether a respondent believes climate change is mostly attributed to human activities. Based on the t-test results, the difference in means between the pre and post period for these two variables is significant at the 99.9% confidence level, with the

means in the post period, after, including the month of, the release of the AR5 Synthesis Report, being higher than the means in the pre period, before the release of the AR5 Synthesis Report.

There are also significant differences in seven control variables—age, baby boomer, some college level of education, bachelor's degree or higher level of education, income of less than \$50,000 per year, income of over \$100,000 per year, and working—between the pre and post period. While these control variables may be statistically significantly different from their pre period means, the magnitude of the differences is not sufficiently large to constitute a cause for concern regarding the validity of the results of my analysis.

The results of my main regressions are found in Table 3 and Table 4 below:

Table 3: Regression Results for
“Happening”

Post Period Variable =1 if in Period During and After Release of AR5 Report, =0 if not			
Dependent Variable: Probability a respondent believes climate change is happening	(1)	(2)	(3)
Post Period	0.024*** (0.009)	-0.005 (0.017)	0.008 (0.023)
Post X No Political Party			-0.057* (0.034)
Post X Independent			-0.020 (0.025)
Post X Democrat			-0.000 (0.022)
Female		0.020** (0.009)	0.020** (0.009)
Age		0.003 (0.002)	0.003 (0.002)
Age Squared		-0.000* (0.000)	-0.000* (0.000)
Baby Boomer		0.006 (0.017)	0.006 (0.017)
Income of Less Than \$50,000 Per Year		-0.028** (0.013)	-0.028** (0.013)
Income of \$50,000 to \$99,999 Per Year		-0.016 (0.011)	-0.016 (0.011)
African American		-0.049*** (0.016)	-0.048*** (0.016)
Less Than High School		-0.096*** (0.019)	-0.095*** (0.019)
High School		-0.086*** (0.012)	-0.085*** (0.012)
Some College		-0.054*** (0.011)	-0.054*** (0.011)
No Political Party		0.139*** (0.018)	0.172*** (0.028)
Independent		0.201*** (0.013)	0.212*** (0.020)
Democrat		0.361*** (0.012)	0.361*** (0.019)

Midwest		-0.010 (0.013)	-0.010 (0.013)
South		0.003 (0.013)	0.003 (0.013)
West		0.013 (0.013)	0.013 (0.013)
Evangelical		-0.073*** (0.011)	-0.073*** (0.011)
Married		-0.029*** (0.010)	-0.029*** (0.010)
Working		0.015 (0.010)	0.016 (0.010)
Household with People Ages 0 to 1		0.026 (0.020)	0.025 (0.020)
Household with People Ages 2 to 5		0.005 (0.013)	0.005 (0.013)
Household with People Ages 6 to 12		-0.003 (0.008)	-0.003 (0.008)
Household with People Ages 13 to 17		-0.007 (0.010)	-0.007 (0.010)
Household with People Ages 18 and Older		0.002 (0.006)	0.002 (0.006)
Single Family Home		-0.031*** (0.010)	-0.031*** (0.010)
Month		0.001** (0.000)	0.001** (0.000)
Constant	0.670*** (0.007)	0.518*** (0.047)	0.510*** (0.048)
n (observations)	14,250	14,250	14,250

*p<.10 **p<.05 ***p<.001; parentheses indicate robust standard errors.

Table 4: Regression Results for “Cause”

Post Period Variable =1 if in Period During and After Release of AR5 Report, =0 if not			
Dependent Variable: Probability a respondent believes climate change is mostly due to human causes			
	(1)	(2)	(3)
Post Period	0.040*** (0.010)	-0.003 (0.018)	-0.028 (0.023)
Post X No Political Party			-0.038 (0.035)
Post X Independent			0.063** (0.026)
Post X Democrat			0.041* (0.024)
Female		0.006 (0.009)	0.006 (0.009)
Age		0.003 (0.002)	0.003 (0.002)
Age Squared		-0.000*** (0.000)	-0.000*** (0.000)
Baby Boomer		0.009 (0.018)	0.008 (0.018)
Income of Less Than \$50,000 Per Year		-0.036*** (0.014)	-0.035*** (0.014)
Income of \$50,000 to \$99,999 Per Year		-0.006 (0.012)	-0.006 (0.012)
African American		-0.117*** (0.018)	-0.116*** (0.018)
Less Than High School		-0.078*** (0.020)	-0.078*** (0.020)
High School		-0.085*** (0.013)	-0.084*** (0.013)
Some College		-0.052*** (0.012)	-0.053*** (0.012)
No Political Party		0.188*** (0.018)	0.211*** (0.028)
Independent		0.175*** (0.013)	0.138*** (0.021)
Democrat		0.341*** (0.012)	0.318*** (0.019)
Midwest		-0.003 (0.015)	-0.003 (0.015)
South		-0.007	-0.007

		(0.014)	(0.014)
West		0.012	0.012
		(0.015)	(0.015)
Evangelical		-0.077***	-0.077***
		(0.012)	(0.012)
Married		-0.031***	-0.030***
		(0.011)	(0.011)
Working		0.007	0.007
		(0.011)	(0.011)
Household with		0.007	0.005
People Ages 0 to 1		(0.022)	(0.022)
Household with		0.006	0.007
People Ages 2 to 5		(0.014)	(0.014)
Household with		-0.004	-0.004
People Ages 6 to 12		(0.009)	(0.009)
Household with		0.006	0.005
People Ages 13 to 17		(0.010)	(0.010)
Household with		0.009	0.008
People Ages 18 and		(0.006)	(0.006)
Older			
Single Family Home		-0.038***	-0.039***
		(0.011)	(0.011)
Month		0.001***	0.001***
		(0.000)	(0.000)
Constant	0.510***	0.396***	0.410***
	(0.008)	(0.051)	(0.051)
n (observations)	14,250	14,250	14,250

*p<.10 **p<.05 ***p<.001; parentheses indicate robust standard errors.

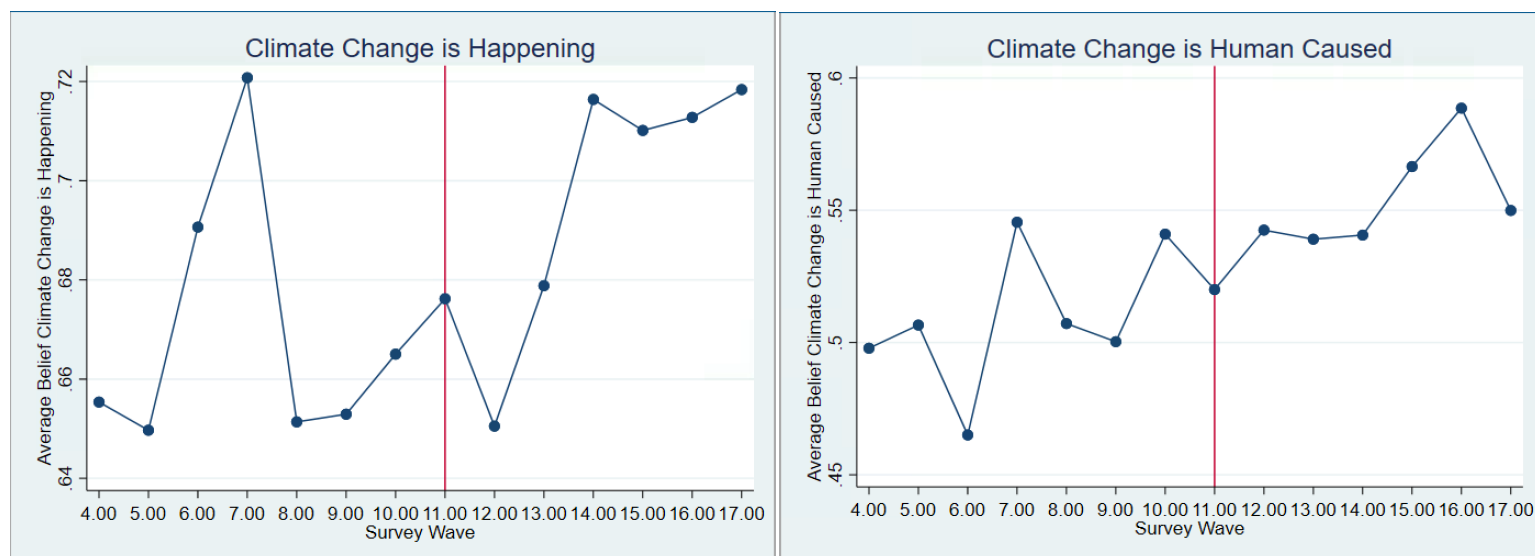
These results demonstrate a number of interesting findings. First, the results from model (1) regressions highlighted in Table 3 and Table 4 above reveal that both the “happening” and “cause” regressands are positive and statistically significant. Specifically, in the post period following the release of the IPCC AR5 Synthesis Report (including the month of the Report’s release), a respondent is approximately two percentage points more likely to believe that climate change is happening and four percentage points more likely to believe that the issue is mostly due to human causes, relative to the pre period before the release of the Synthesis Report. Though this model specification contains no controls, it still demonstrates a preliminary finding of significance in the public’s increasing beliefs that climate change is occurring and is mostly due to human influences.

An interesting drop in magnitude and significance occurs in model specifications (2) and (3) for both the “happening” and “cause” variables with the addition of full controls. The β coefficient for the “happening” variable in Table 3 goes from a statistically significant two percentage point increase in the probability a respondent believes climate change is happening in the post period in model specification (1), to an insignificant 0.5 percentage point decrease in the probability a person believes climate change is occurring in the post period in model specification (2). In model specification (3), the “post period” variable is positive, but remains statistically insignificant. A similar change in significance materializes in Table 4 between model specification (1) and specifications (2) and (3), where the β coefficient is now statistically insignificant in models (2) and (3) with the presence of full control variables.

This change in significance between models is attributed to the addition of a key control variable included in specifications (2) and (3): the specific month the survey was administered. When I added this “month” variable to my vector of controls, the “post period” variable dropped its significance. To determine why this statistical insignificance occurs, I conducted a series of tests using several month control variations. Particularly, I wanted to decipher whether a specific survey month (e.g. the May 2011 survey, the November 2011 survey, etc.) was attributed to the significance drop. Therefore, I generated fourteen binary variables (due to the fourteen different waves, where the variable =1 if it is the specific month of the survey, and =0 if otherwise). I then conducted fourteen different regressions for each model specification—(2) and (3)—for both the “happening” and “cause” variables. However, following these regressions with the various month control additions, the “post period” variable remained statistically significant. In other words, the drop in significance that occurs between model specification (1) and specifications (2) and (3) may not be attributed to one specific month the survey was administered.

To further decipher the cause of the drop in significance between model specifications with the addition of the month controls, I examined the trend line of the “happening” and “cause” variables. Although after the release of the AR5 Synthesis Report, there is an increase in people’s beliefs that climate change is occurring and is mostly due to human activities, this increase appears to be part of an underlying upward trend that exists prior to the Report’s release. Graphs 1 and 2 below demonstrate the change in the “happening” and “cause” variables. The implications of this finding are further explored in the “Discussion” section of this analysis.

Graphs 1 and 2: Graph Survey Responses



While the main independent variable of interest (“post period” variable) was insignificant in specifications (2) and (3) with the addition of full controls, the political party variables remained statistically significant between models. As demonstrated in Tables 3 and 4, “No Political Party,” “Independent,” and “Democrat” all remained statistically significant in model specifications (2) and (3) for both the “happening” and “cause” variables. The “No Political Party” coefficient signifies that a person with no political party or interest in politics is approximately 14 to 17 percentage

points more likely to believe climate change is occurring and approximately 19 to 21 percentage points more likely to believe that humans are the main cause, compared to the omitted group—Republicans. A person who identifies as an independent is approximately 20 to 21 percentage points more likely to believe that climate change is happening, and about 14 to 18 percentage points more likely to believe that climate change is mostly due to human causes relative to Republicans. A person who identifies as a Democrat is about 36 percentage points more likely to believe that climate change is occurring and about 32 to 34 percentage points more likely to believe that climate change is mostly due to human causes relative to Republicans. Thus, people with no political party or interest in politics, independents, and Democrats are far more likely to hold the belief that climate change is occurring and that humans are the main cause compared to Republicans.

Model specification (3) also includes interaction terms between the “post period” variable and political party variables. The results demonstrate that the report did not have a direct, substantial impact on partisans’ previously held climate change beliefs. In other words, while people with no political orientation, independents, and Democrats are significantly more likely to believe that climate change is occurring and that humans are the main cause compared to Republicans, the report does not greatly alter these beliefs. Although the coefficients on the interaction terms between the “post period” variable and the “No Political Party” variable in Table 3 and the “post period” variable and “Democrat” variable in Table 4 are slightly statistically significant, they are not economically significant; people who have no party affiliation and who are Democrats are not substantially more likely to shift their climate change opinions relative to Republicans following the Report’s release. The coefficient on the interaction term between the “post period” variable and “Independent” variable in Table 4 suggests that independents are slightly more likely to believe that climate change is due to human causes after the Report’s release relative to Republicans, with a statistically significant coefficient at the 95% confidence level.

Other significant findings include gender, where females are statistically significantly more likely to believe in the occurrence of climate change, compared to males. This finding remains significant between model specifications (2) and (3), as seen in Table 3. However, there are no significant differences between males and females in the likelihood they believe climate change is mainly attributed to human activities. Further, respondents with “less than high school,” “high school,” or “some college” level of education are significantly less likely to believe that climate change is occurring and that humans are the main cause, relative to people with a bachelor’s degree or higher level of education. Evangelicals are also significantly less likely to believe climate change is happening and humans are the main cause, compared to people who do not identify as Evangelical, while people who are married are also significantly less likely to believe in the occurrence of climate change and that humans are primarily to blame, relative to non-married people. Additionally, people who live in single family homes are significantly less likely to believe in the occurrence of climate change and that humans are the main cause, compared to people who reside in other living arrangements (e.g. townhouse, apartment complex, mobile home, RV, etc.).

Lastly, as demonstrated by the “month” variable in model specifications (2) and (3) for both the “happening” and “cause” variables (Tables 3 and 4, respectively), people are significantly more likely to believe that climate change is happening and is mostly due to human activities over time. This underlying, increasing trend, discussed above, is analyzed further in the “Discussion” section of this paper.

Discussion

This analysis was one of the first to directly study the influence of the IPCC AR5 Synthesis Report on public opinion in the United States. The hypotheses I presented in this paper were:

H_0 : The release of the IPCC AR5 Synthesis Report has no influence on the likelihood that the public believes climate change is occurring.

H_A : The release of the IPCC AR5 Synthesis Report does influence the likelihood that the public believes climate change is occurring.

H_0 : The release of the IPCC AR5 Synthesis Report has no influence on the likelihood that the public believes climate change is mostly a result of human activities.

H_A : The release of the IPCC AR5 Synthesis Report does influence the likelihood that the public believes climate change is mostly a result of human activities.

Due to the statistically insignificant findings, there is not sufficient evidence to reject the null hypotheses and ultimately support the research hypotheses. However, there is an underlying growing trend, where, over time, there is an increase in people's beliefs that climate change is occurring and humans are a significant contributor to the issue.

Overall, this analysis builds upon the abundance of previous literature that finds that political party and ideology are indeed significant drivers of an individual's climate change beliefs (see McCright and Dunlap (2011), Oreskes (2016), Oreskes and Conway (2011)), and is consistent with recent public opinion polls, including an October 2018 CBS News poll, a December 2018 Quinnipiac University poll, and Gallup trends polling data (see American Enterprise Institute Political Report, 2019). This divide stimulates a discussion as to why these separations exist, persist, and appear to get stronger over time. One plausible hypothesis that explains the partisan divide on climate change beliefs is political conservatives' and political liberals' respective views on free markets and government intervention. Political conservatives believe in free market enterprise and limited government intervention (McCright & Dunlap, 2011; Oreskes, 2016). Political liberals, on the other hand, believe in regulation of the market and government intervention to correct market failures (McCright & Dunlap, 2011; Oreskes, 2016). Environmental issues like climate change are immense global problems that typically require governmental intervention, which may involve regulating markets and restricting individual freedoms through actions such as limiting fossil fuel

use, for example (McCright & Dunlap, 2011; Oreskes, 2016). Therefore, as noted in Oreskes (2016), conservatives may be more apt to doubt climate science, since governmental intervention to address climate change may appear to be an invasion on free markets and individual liberties, which may lead to growing government control. Conversely, political liberals are more likely to be accepting of the science, since they may be more likely to support the governmental interventions required to address the issue (McCright & Dunlap, 2011). See Oreskes and Conway (2011) and Oreskes (2016) for additional scientific evidence on the linkage between ideological belief in governmental intervention and acceptance of climate change science.

In addition to previously cited research by Feldman et al. (2011) finding differential media coverage of climate change issues among cable news outlets and the possible implications on consumers' climate change opinions, Boykoff and Boykoff (2004) found that even popular newspaper outlets such as *The New York Times*, the *Washington Post*, the *Los Angeles Times*, and the *Wall Street Journal* contribute to biased reporting of climate change issues. These differences in climate change presentations between media outlets demonstrate the variability in how the media frames the issue of climate change and how such framing potentially influences consumers' and partisans' perceptions of climate change reports, like the AR5 Synthesis Report.

Yet, despite differential media coverage of climate change and the growing partisan divide, this analysis shows that, overall, people in the United States are, in fact, shifting their opinions of climate change issues toward the scientific consensus (which finds that climate change is occurring and human activities are mostly to blame). As noted by Sterman (2011), "...whether policymakers seek to understand the science depends on whether the public values leaders who value science. Even if policymakers fully understood climate science, their ability to implement policies consistent with that knowledge, given societal goals, is constrained by the lack of grassroots political support. The public cannot be ignored." Therefore, as stated in the introduction of this paper, if the IPCC is

to be effective in influencing climate change policy, shaping both policymakers' and the public's climate change opinions is paramount (Sterman, 2011).

The increasing trend in public opinion toward the scientific consensus may be a sign that the public is responding to scientific climate change research, such as the evidence presented in the Fourth National Climate Assessment and the AR5 Synthesis Report. However, differential media coverage of climate change (see Boykoff and Boykoff (2004) and Feldman et al. (2011)) may indeed be a contributing factor as to why growing partisan differences on climate change continue to exist and persist despite additional scientific research, like the AR5 Synthesis Report (as previously stated, Brulle et al. (2012) found that media coverage is significantly related with an individual's climate change perceptions). Further, while the AR5 Synthesis Report may not have directly caused a shift in public opinion, this does not imply the Report does not contribute at all to the public's climate change opinions and their understanding of climate change issues. Many factors may be contributing to this increase in public opinion toward the scientific consensus, including education, improved communication techniques, clearer scientific findings, changes in levels of civic engagement, and additional scientific evidence, such as the release of the 2018 Fourth National Climate Assessment (also see research by Brulle et al., 2012 and Lee et al., 2015 cited above discussing other factors that may influence one's climate change beliefs). The AR5 Synthesis Report may be just one of many factors impacting the public's climate change opinions.

Conclusion

As stated in the "Literature Review," Brulle et al. (2012) found that climate change assessment reports are positively, and significantly, associated with public concern over climate change issues. Though, this analysis did not find a significant alteration in public belief that climate change is occurring and humans are the main cause directly attributable to the 2014 IPCC AR5 Synthesis Report. However, determining how future Synthesis Reports and other high profile IPCC

releases influence public opinion both in the United States and around the world should be the focus of additional research in this area, as it is important to understand public opinion due to its impact on setting the political agenda and policymakers' goals (Sterman, 2011). Future research may also help in bridging the shortcomings of this analysis, namely the reliance on repeated cross-sectional surveys. Cross-sectional surveys are valuable in understanding public perceptions at one specific point in time. Future research should use longitudinal survey data (although sometimes difficult to obtain) in order to better determine the causal impact of future IPCC and other governmental reports on public opinion.

The IPCC may further enhance its communication techniques for future reports, so that policymakers and the public alike are better able to understand the reports and use them as a basis for climate change policy. Tailoring future IPCC reports to persons and policymakers with differing political ideologies by addressing concerns such as conservatives' fears of increased government intervention to address climate change may help in effectively closing the gap between partisans and scientists (Oreskes, 2016).

According to research by Sterman (2011), the level of educational attainment a person must possess in order to properly comprehend the IPCC AR4 Summary for Policymakers Report, the predecessor to the AR5 Report, was 17 years of education. Although the intended audience for the Summary for Policymakers Report is, obviously, policymakers and others who do not have a scientific background, the average person must have one-year of graduate school study to properly understand the IPCC's findings (Sterman, 2011). As Sterman (2011) notes, "the IPCC can also learn from the experience of other organizations whose scientific work is effective only to the extent it affects the beliefs and behaviors of policymakers and the public..." Thus, to improve the effectiveness of the reports, and to bolster their impact on public opinion, IPCC authors should adapt their communication strategies for future reports by, whenever possible, maintaining plain

language, recognizing people's "poor inquiry skills," better assisting the public in comprehending climate change's impact on complex environmental systems, and integrating "interactive learning through simulation" into future assessments (Sterman, 2011).

While, over time, the public's climate change views are shifting toward the scientific consensus, gaps between scientists, policymakers, and the public, particularly among partisans, evidently remain. By modifying future reports to address people's biases and increasing the accessibility of the reports to the public—enabling people with varying levels of education and scientific understanding to comprehend their findings—the IPCC may be more effective in its communication strategies and ensure the public and policymakers are able to understand the science behind climate change and use such knowledge as a basis for future policy change.

References

- About the IPCC. (n.d.). Retrieved October 30, 2019, from <https://www.ipcc.ch/about/>.
- American Association for the Advancement of Science. (n.d.). What We Know: The Reality, Risks, and Response to Climate Change. Retrieved March 25, 2020, from https://whatweknow.aaas.org/wp-content/uploads/2014/07/whatweknow_website.pdf
- Ballew, M. T., Leiserowitz, A., Roser-Renouf, C., Rosenthal, S. A., Kotcher, J. E., Marlon, J. R., Lyon, E., Goldberg, M. H., & Maibach, E. W. (2019). Climate Change in the American Mind: Data, tools, and trends. *Environment: Science and Policy for Sustainable Development*, 61(3), 4-18. doi: [10.1080/00139157.2019.1589300](https://doi.org/10.1080/00139157.2019.1589300)
- Boden, T., Andres, B., & Marland, G. (n.d.). Retrieved March 25, 2020, from <https://cdiac.ess-dive.lbl.gov/trends/emis/top2014.tot>
- Bowman, K., O'Neil, E., Fallk, M., & Aubert, C. (2019, April 1). AEI Political Report: Partisan Polarization on the Green New Deal and Climate Change; NATO at 70; Trump and Taxes. Retrieved March 23, 2020, from <https://www.aei.org/research-products/report/aei-political-report-partisan-polarization-on-the-green-new-deal-and-climate-change-nato-at-70-trump-and-taxes/>
- Boykoff, M. T., & Boykoff, J. M. (2004). Balance as bias: global warming and the US prestige press. *Global Environmental Change*, 14(2), 125–136. doi: [10.1016/j.gloenvcha.2003.10.001](https://doi.org/10.1016/j.gloenvcha.2003.10.001)
- Brulle, R. J., Carmichael, J., & Jenkins, J. C. (2012). Shifting public opinion on climate change: An empirical assessment of factors influencing concern over climate change in the U.S., 2002–2010. *Climatic Change*, 114(2), 169–188. doi: [10.1007/s10584-012-0403-y](https://doi.org/10.1007/s10584-012-0403-y)
- Carbon dioxide hits new high – Climate change: Vital signs of the planet, NASA climate change website. (n.d.). Retrieved October 30, 2019, from https://climate.nasa.gov/climate_resources/7/graphic-carbon-dioxide-hits-new-high/.

- Casey, B. (n.d.). Environment. Retrieved March 23, 2020, from <https://www.casey.senate.gov/issues/environment>
- CBS News. (2018, October 19). Partisans view the other side's rallies, protests with suspicion - CBS News poll. Retrieved March 24, 2020, from <https://www.cbsnews.com/news/partisans-view-the-other-sides-rallies-protests-with-suspicion-cbs-news-poll/>
- Climate change and public health - Climate effects on health. (2019). Retrieved October 30, 2019, from <https://www.cdc.gov/climateandhealth/effects/default.htm>.
- Climate change science: An analysis of some key questions at NAP.edu, National Academy of Sciences, National Academy of Engineering, Institute of Medicine, National Research Council. (2001). Retrieved October 31, 2019, from <https://www.nap.edu/read/10139/chapter/2>.
- Core Writing Team, Pachauri, R. K., & Meyer, L. K. (eds.). Climate change 2014: Synthesis report. Contribution of working groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. (2014). Retrieved from https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf
- Feldman, L., Maibach, E. W., Roser-Renouf, C., & Leiserowitz, A. (2011). Climate on cable: The nature and impact of global warming coverage on Fox News, CNN, and MSNBC. *The International Journal of Press/Politics*, 17(1), 3–31. doi: 10.1177/1940161211425410
- Ford, J. D., Vanderbilt, W., & Berrang-Ford, L. (2011). Authorship in IPCC AR5 and its implications for content: Climate change and Indigenous populations in WGII. *Climatic Change*, 113(2), 201–213. doi: 10.1007/s10584-011-0350-z
- Fourth National Climate Assessment, Fourth National Climate Assessment (2018). Retrieved from <https://nca2018.globalchange.gov/>

Fourth National Climate Assessment: About this report. (n.d.). Retrieved October 30, 2019, from

<https://nca2018.globalchange.gov/chapter/front-matter-about/>.

Introduction to Econometrics with R. (n.d.). Retrieved March 25, 2020, from

<https://www.econometrics-with-r.org/11-1-binary-dependent-variables-and-the-linear-probability-model.html>

Jacques, P. J., Dunlap, R. E., & Freeman, M. (2008). The organisation of denial: Conservative think tanks and environmental scepticism. *Environmental Politics*, 17(3), 349–385. doi: 10.1080/09644010802055576

Lee, T. M., Markowitz, E. M., Howe, P. D., Ko, C.-Y., & Leiserowitz, A. A. (2015). Predictors of public climate change awareness and risk perception around the world. *Nature Climate Change*, 5(11), 1014–1020. doi: 10.1038/nclimate2728

Lindsey, R. (2013). Climate change to increase water stress in many parts of U.S.: NOAA Climate.gov. Retrieved November 3, 2019, from <https://www.climate.gov/news-features/featured-images/climate-change-increase-water-stress-many-parts-us>.

Mach, K. J., Mastrandrea, M. D., Bilir, T. E., & Field, C. B. (2016). Understanding and responding to danger from climate change: The role of key risks in the IPCC AR5. *Climatic Change*, 136(3-4), 427–444. doi: 10.1007/s10584-016-1645-x

McCright, A. M., & Dunlap, R. E. (2011). The politicization of climate change and polarization in the American public's views of global warming, 2001–2010. *The Sociological Quarterly*, 52(2), 155–194. doi: 10.1111/j.1533-8525.2011.01198.x

O'Neill, S., Williams, H. T. P., Kurz, T., Wiersma, B., & Boykoff, M. (2015). Dominant frames in legacy and social media coverage of the IPCC Fifth Assessment Report. *Nature Climate Change*, 5(4), 380–385. doi: 10.1038/nclimate2535

Oreskes, N. (2004). The scientific consensus on climate change. *Science*, 306(5702), 1686–1686. doi: 10.1126/science.1103618

Oreskes, N. (2016). Harvard Speaks on Climate Change. Retrieved March 24, 2020, from <https://climatechange.environment.harvard.edu/naomi-oreskes>

Oreskes, N., & Conway, E. M. (2011). *Merchants of doubt: how a handful of scientists obscured the truth on issues from tobacco smoke to global warming*. London: Bloomsbury.

Rafferty, A., Walthery, P., & King-Hele, S. (2015). Analysing change over time: Repeated cross sectional and longitudinal survey data UK Data Service, University of Essex and University of Manchester. Retrieved October 31, 2019, from <https://www.ukdataservice.ac.uk/media/455362/changevertime.pdf>.

Sterman, J. D. (2011). Communicating climate change risks in a skeptical world. *Climatic Change*, 108(4), 811–826. doi: 10.1007/s10584-011-0189-3

The relentless rise of carbon dioxide – Climate change: Vital signs of the planet, NASA climate change website. (n.d.). Retrieved October 30, 2019, from https://climate.nasa.gov/climate_resources/24/graphic-the-relentless-rise-of-carbon-dioxide/.

Toomey, P. (n.d.). Energy and Environment. Retrieved March 23, 2020, from <https://www.toomey.senate.gov/?p=issue&id=32>

Yale Program on Climate Change Communication (YPCCC) & George Mason University Center for Climate Change Communication (Mason 4C). (2019). *Climate Change in the American Mind: National survey data on public opinion (2008-2017)* [Data file and codebook]. doi: 10.17605/OSF.IO/W36GN

Appendix

Codebook

Variable Name	Survey Question	Response Options	Included in Waves
case_ID	Case identifier	--	All waves
wave	Survey wave	Starting with Wave 4 4. May 2011 5. Nov 2011 6. Mar 2012 7. Sep 2012 8. Apr 2013 9. Nov 2013 10. Apr 2014 11. Oct 2014 12. Mar 2015 13. Oct 2015 14. Mar 2016 15. Nov 2016 16. May 2017 17. Oct 2017	All waves
year	Year of wave	Starting in Year 2011 3. 2011 4. 2012 5. 2013 6. 2014 7. 2015 8. 2016 9. 2017	All waves
weight_wave	Sampling weight specific to each wave	--	All waves
weight_aggregate	Sampling weight if aggregating multiple waves	--	All waves
happening	Recently, you may have noticed that global warming has been getting some attention in the news. Global warming refers to the idea that the world's average temperature has been increasing over the past 150 years, may be	0.No/Don't Know 1.Yes	All waves

	increasing more in the future, and that the world's climate may change as a result. What do you think: Do you think that global warming is happening?		
cause_recoded	Assuming global warming is happening, do you think it is...	0. Don't know/ Neither because global warming isn't happening/ Caused mostly by natural changes in the environment/ Caused by human activities and natural changes 1. Caused mostly by human activities	All waves
worry	How worried are you about global warming?	0. Not at all worried 1. Not very worried/ Somewhat worried/ Very worried	All waves
harm_personally	[The following five risk perception questions were asked together as a set] How much do you think global warming will harm: You personally	0. Don't Know/Not at all 1. Only a little/A moderate amount/A great deal	All waves
harm_US	How much do you think global warming will harm: People in the United States	0. Don't know/Not at all 1. Only a little/A moderate amount/A great deal	All waves
harm_dev_countries	How much do you think global warming will harm: People in developing countries	0. Don't know/Not at all 1. Only a little/A moderate amount/A great deal	All waves

harm_future_gen	How much do you think global warming will harm: Future generations of people	0. Don't know/Not at all 1. Only a little/A moderate amount/A great deal	All waves
when_harm_US	When do you think global warming will start to harm people in the United States?	0. Never 1. In 100 years/In 50 years/In 25 years/In 10 years/They are being harmed right now	All waves
fund_research	How much do you support or oppose the following policies? Fund more research into renewable energy sources, such as solar and wind power.	0. Strongly oppose/Somewhat oppose 1. Somewhat support/Strongly support	All waves
discuss_GW	How often do you discuss global warming with your family and friends?	0. Never 1. Rarely/Occasionally/Often	All waves
gender	Are you...?	0. Male 1. Female	All waves
age	How old are you?	Open-ended	All waves
age_category	Computed based on open-ended response to age	1. 18-34 years 2. 35-54 years 3. 55+ years	All waves
generation	Computed based on respondents' age at the time of data collection. Given that generation is estimated, some respondents may be miscategorized.	1. iGen/Gen Z (1997 –) 2. Millennials (1981 – 1996) 3. Generation X (1965 – 1980) 4. Baby Boomers (1946 – 1964) 5. Silent (1928 – 1945) 6. Greatest (Before 1928)	All waves

educ	What is the highest level of school you have completed?	1. No formal education 2. 1st, 2nd, 3rd, or 4th grade 3. 5th or 6th grade 4. 7th or 8th grade 5. 9th grade 6. 10th grade 7. 11th grade 8. 12th grade no diploma 9. High school graduate – high school diploma or the equivalent (GED) 10. Some college, no degree 11. Associate's degree 12. Bachelor's degree 13. Master's degree 14. Professional or doctorate degree	All waves
educ_category	Responses to “educ” were categorized into four groups: responses 1-8 were coded as “Less than high school”, 9 was coded as “High school,” 10 and 11 were coded as “Some college,” and 12-14 were coded as “Bachelor's degree or higher”	1. Less than high school 2. High school 3. Some college 4. Bachelor's degree or higher	All waves
income	We would like to get a better estimate of your total HOUSEHOLD income in the past 12 months before taxes. Was it...	1. Less than \$5,000 2. \$5,000 to \$7,499 3. \$7,500 to \$9,999 4. \$10,000 to \$12,499 5. \$12,500 to \$14,999 6. \$15,000 to \$19,999 7. \$20,000 to \$24,999 8. \$25,000 to \$29,999 9. \$30,000 to \$34,999 10. \$35,000 to \$39,999 11. \$40,000 to \$49,999 12. \$50,000 to \$59,999	All waves Response options changed from Mar 2016 on to include higher levels of income

		13. \$60,000 to \$74,999 14. \$75,000 to \$84,999 15. \$85,000 to \$99,999 16. \$100,000 to \$124,999 17. \$125,000 to \$149,999 18. \$150,000 to \$174,999 19. \$175,000 to \$199,999 [“\$175,000 or more” Nov 2008 – Mar 2016] 20. \$200,000 to \$249,999 [Nov 2016 on] 21. \$250,000 or more [Nov 2016 on]	
income_category	Responses to “income” were categorized into the following three groups.	1. Less than \$50,000 2. \$50,000 to \$99,999 3. \$100,000 or more	All waves
race	Respondents were first asked “Are you Spanish, Hispanic, or Latino?” Respondents who said “Yes” were coded as 4 = “Hispanic.” Following this question, all respondents were asked to “Please choose one or more race(s) that you consider yourself to be” with 6 response options, “White,” “Black or African American,” “American Indian or Alaska Native,” “Asian,” “Native Hawaiian or other Pacific Islander,” or “Some other race.” Respondents who said they were not Spanish, Hispanic, or Latino to first question and said “White” were coded as 1	1. White, non-Hispanic 2. Black, non-Hispanic 3. Other, non-Hispanic 4. Hispanic	All waves

	= “White, non-Hispanic;” “Black or African American” were coded as 2 = “Black, non-Hispanic;” “American Indian or Alaska Native,” “Asian,” “Native Hawaiian or other Pacific Islander,” or “Some other race” were coded as 3 = “Other, non-Hispanic.” Respondents who said they were not Spanish, Hispanic, or Latino and selected more than one race were also coded as 3 = “Other, non-Hispanic”		
ideology	In general, do you think of yourself as...	1. Very liberal 2. Somewhat liberal 3. Moderate, middle of the road 4. Somewhat conservative 5. Very conservative	All waves
party	Generally speaking, do you think of yourself as a...	0. No party/not interested in politics 1. Republican 2. Independent 3. Democrat	All waves
party_w_leaners	Computed based on responses to “party” and a follow-up question “Do you think of yourself as closer to the...” with four response options, “Republican Party,” “Democratic Party,” “Neither,” or “No response.” Respondents who initially identified as either a Republican or Democrat, as well as	1. Republicans 2. Democrats 3. Independent/Other 4. No party/not interested in politics	All waves

	those who did not initially identify as “Republican” or “Democrat” but who say they “are closer to” one party or the other (i.e., “leaners”) in the follow-up question were categorized as Republican or Democrat, respectively. The category “Independents” does not include any of these leaners, only those who chose “Independent” or “Other” to the “party” question.		
party_x_ideo	Computed based on responses to the “party_w_leaners” and “ideology” items. Democrats were categorized as “Liberal Democrats” if they said they are “Very” or “Somewhat” liberal, or “Conservative/Moderate Democrats” if they said they are “Moderate, middle of the road” or “Very” or “Somewhat” conservative. Similarly, Republicans who self-reported that they are “Very” or “Somewhat” conservative were categorized as “Conservative Republicans,” whereas those who said they are “Moderate, middle of the road” or “Very” or “Somewhat” liberal were categorized as “Liberal/Moderate Republicans.” The	-2. No party/not interested in politics 1. Liberal Democrat 2. Moderate/Conservative Democrat 3. Independent (non-leaning) 4. Liberal/Moderate Republican 5. Conservative Republican	All waves

	category “Independent (non-leaning)” refers to those categorized as “Independent/Other” in the “party_w_leaners” variable.		
region9	Computed based on state of residence: New England = CT, MA, ME, NH, RI, VT; Mid-Atlantic = NJ, NY, PA; East-North Central = IL, IN, MI, OH, WI; West-North Central = IA, KS, MN, MO, ND, NE, SD; South Atlantic = DC, DE, FL, GA, MD, NC, SC, VA, WV; East-South Central = AL, KY, MS, TN; West-South Central = AR, LA, OK, TX; Mountain = AZ, CO, ID, MT, NM, NV, UT, WY; Pacific = AK, CA, HI, OR, WA.	1. New England 2. Mid-Atlantic 3. East-North Central 4. West-North Central 5. South Atlantic 6. East-South Central 7. West-South Central 8. Mountain 9. Pacific	All waves
region4	Computed based on “region9”: Northeast = New England, Mid-Atlantic; Midwest = East-North Central, West-North Central; South = South-Atlantic, East-South Central, West-South Central; West = Mountain, Pacific.	1. Northeast 2. Midwest 3. South 4. West	All waves
religion	What is your religion?	1. Baptist – any denomination 2. Protestant (e.g., Methodist, Lutheran, Presbyterian, Episcopal) 3. Catholic 4. Mormon 5. Jewish 6. Muslim	All waves Response options changed from Apr 2014 on

		7. Hindu 8. Buddhist 9. Pentecostal 10. Eastern Orthodox 11. Other Christian 12. Other – non-Christian (Please specify) 13. Agnostic [Apr 2014 on] 14. Atheist [Apr 2014 on] 15. None of the above [Apr 2014 on; “None” Nov 2008 – Dec 2013]	
evangelical	Would you describe yourself as "born-again" or evangelical?	1. Yes 2. No 3. Don't know	All waves
service_attendance	How often do you attend religious services?	1. Never 2. Once a year or less 3. A few times a year 4. Once or twice a month 5. Once a week 6. More than once a week	All waves
marit_status	Respondents were first asked “Are you now...?” with response options 1-5. Respondents who indicated they were not “Married” (i.e., responses 2-5) were asked a follow-up, “Are you currently living with a partner to whom you are not married?” Respondents who said “Yes” were coded as 6 = “Living with partner”	1. Married 2. Widowed 3. Divorced 4. Separated 5. Never married 6. Living with partner	All waves
employment	Do any of the following currently describe you?	1. Working – as a paid employee 2. Working – self-employed 3. Not working – on temporary layoff from a job 4. Not working – looking for work 5. Not working – retired 6. Not working – disabled	All waves

		7. Not working – other	
house_head	Respondents were asked “Is your residence in...” with response options “Your name only,” “Your name with someone else’s name (jointly owned or rented),” or “Someone else’s name only.” Respondents who said “Someone else’s name only” were coded as 1 = “Not head of household;” the other two responses were coded as 2 = “Head of household”	1. Not head of household 2. Head of household	All waves
house_size	Respondents were asked two questions: “Including yourself, how many people are 18 years of age or older and currently live in your household at least 50% of the time? Please include unrelated individuals (such as roommates), and also include those now away traveling, away at school, or in a hospital” and “Next, how many people are 17 years of age or younger and currently live in your household at least 50% of the time? If none, enter 0. Include babies and small children.” Responses to these questions were combined to calculate overall household size.	Open-ended	All waves
house_ages0to1 house_ages2to5 house_ages6to12	Please tell us a little more about the people you share your	Open-ended	All waves

house_ages13to17 house_ages18plus	household with. For each person in your household (up to 10 people), enter their age on their last birthday and indicate if they are male or female. For infants who are less than 1 year old, please enter a 0 for age.		
house_type	Which best describes the building where you live?	1. One-family house detached from any other house 2. One-family house attached to one or more houses (such as a condo or townhouse) 3. Building with 2 or more apartments 4. Mobile home 5. Boat, RV, van, etc.	All waves
house_own	Are your living quarters...	1. Owned by you or someone in your household 2. Rented 3. Occupied without payment of rent	All waves
Month	Month of the survey. Computed by starting with the month of the first survey (May 2011) and adding intervals between months based on the month of the next survey (e.g. started at 5 (May), then add 6 to get 11 (November is the next survey date, which is 6 months after May), and then get 15 (March, the month of the next survey, is 4 months after November), etc.)	5. May 2011 11. Nov 2011 15. Mar 2012 21. Sep 2012 28. Apr 2013 35. Nov 2013 40. Apr 2014 46. Oct 2014 51. Mar 2015 58. Oct 2015 63. Mar 2016 71. Nov 2016 77. May 2017 82. Oct 2017	All waves

*Survey Waves**

Wave	N	Dates Fielded
November 2008	2,164	October 7 – November 12
January 2010	1,001	December 24, 2009 – January 3, 2010
June 2010	1,024	May 14 – June 1
May 2011	1,010	April 23 – May 12
November 2011	1,000	October 20 – November 16
March 2012	1,008	March 12 – March 30
September 2012	1,061	August 31 – September 12
April 2013	1,045	April 10 – 15
November 2013	830	November 23 – December 9
April 2014	1,013	April 15 – 22
October 2014	1,275	October 17 – 28
March 2015	1,263	February 27 – March 10
October 2015	1,330	September 30 – October 19
March 2016	1,204	March 18 – 31
November 2016	1,226	November 18 – December 1
May 2017	1,266	May 18 – June 6
October 2017	1,304	October 20 – November 1

*Table from the Yale Program on Climate Change Communication, Climate Change in the American Mind survey. Highlighted box represents the survey waves included in this paper.