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It's a Matter of Trust: American Judgments of the Credibility of Informal Communicators on Solutions to Climate Change

David Sleeth-Keppler, Robert Perkowitz & Meighen Speiser

*Using an October 2013 national probability sample of US adults (N = 1737), we examine the credibility of informal communicators (e.g. neighbors, co-workers, religious leaders, and health professionals) on solutions to climate change (regulatory and technological solutions). We present our analysis in terms of Kruglanski et al.'s [(2005). Says who? Epistemic authority effects in social judgment. *Advances in Experimental Social Psychology*, 37, 345–392] epistemic authority framework, which explains dynamics of trust in formal sources of authority with specific expertise (e.g. climate scientists) and informal sources of authority in a person's life (e.g. a priest). Trust in formal communicators (scientists and President Obama) consistently predicts trust in informal communicators (e.g. health professionals), and perceived effectiveness of climate solutions. Results further show that social and demographic groups that do not primarily rely on formal communicators on solutions to climate change instead rely more on various informal communicators. For example, political conservatism positively predicts trust in religious leaders, and religiosity further predicts trust in congregants, neighbors, co-workers, bosses and health professionals on solutions to climate change. Discussion focuses on implications for future research, and recommendations for policy actors, environmental communicators, and social marketers interested in broadening the scope of climate outreach.*

Keywords: *Epistemic authority; climate change; demographics; persuasion; trust*

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One of the ways that people can [transition to sustainability] is through actively organizing in their communities. (Bill McKibben)

Organizations designing campaigns to mobilize the US population to mitigate and prepare for the effects of climate change, such as Bill McKibben's 350.org, have made significant strides recently, perhaps best exemplified by the September 2014 People's Climate March. The event mobilized over 300,000 people in New York City and saw endorsement by over 1500 organizations. Even though the march represents the largest street-mobilization of individuals around climate change in the USA to date, doubts linger whether the event signals enough of a turning point among the majority of Americans to effectively mitigate the negative effects of climate change. For example, Luers (2013) recently argued that in light of the continued lack of consistent engagement among Americans, and the associated congressional failure in the USA to pass comprehensive climate change legislation, climate change outreach needs to be rethought (see also *ecoAmerica*, 2014). Luers (2013), after interviewing a large group of climate advocates, foundation executives, and academics, identified a profound lack of consideration of people's values in existing climate change communications. She recommended a shift away from the overuse of scientific information about carbon emissions as a primary means to communicate the urgency of the climate problem. Importantly, she argued that a values-based approach to climate change engagement can be an effective means to partially depoliticize the climate message (McCright & Dunlap, 2010) and create new norms for climate change mitigation or preparation among different groups of people.

The present paper addresses the question of how to increase the personal relevance of climate change communications from the perspective of who might deliver messages to various audiences to promote climate policies or various other solutions. As Maibach, Leiserowitz, Roser-Renouf, and Mertz (2011) have shown, different audiences in America vary reliably in their degree of concern about climate change, ranging from "dismissive" audiences to those who are "alarmed" about climate change, with various shades of concern in the middle. An important question for practical future climate change outreach is how to effectively reach audiences that dismiss the issue, or are otherwise skeptical or unwilling to act. According to Maibach et al. (2011), moving dismissive or skeptical audiences toward concern about climate change poses difficult challenges, because these segments largely distrust official channels of communication, such as the mainstream media, politicians, and other formal sources of communication on the subject. The political scientist Putnam (2000) has similarly commented on the declining trust many Americans place in their own government, reducing the likelihood of success of regulatory intervention (see also Twenge, Campbell, & Carter, 2014).

One approach to increase engagement among resisting or indifferent audiences would be to connect with people on climate change where they live, using informal communicators. People's social networks, including family, neighbors, religious congregations, co-workers, local community officials, and health care providers, can serve as seed beds for successful climate change interventions (e.g. Bale, McCullen, Foxon,

Rucklidge, & Gale, 2013; Maibach, Roser-Renouf, & Leiserowitz, 2008). As Ockwell, Whitmarsh, and O'Neill (2009) have argued, embedding communication efforts within existing social networks has the advantage of generating natural or voluntary support for otherwise unpopular initiatives, including climate regulations. Along those lines, Maibach et al. (2008) have specifically called for research to identify opinion leaders in social networks, because of these individuals' superior ability to affect change from within.

In the following sections, we develop the theoretical underpinnings of the assertion that informal climate communicators in various domains of social life, including neighbors, religious leaders, members of religious congregations, and health care providers, can serve as effective messengers of climate-related information. Specifically, our analysis, based on a nationally representative sample of US adults, focuses on relationships between different social and demographic variables and trust in various *types* of informal communicators on solutions to climate change (e.g. health professionals versus religious leaders), rather than on the general characteristics of potential opinion leaders on climate change (see Nisbet & Kotcher, 2009).

Models of trust and the concept of epistemic authority

Normatively defined, climate change and its impacts are subjects of scientific inquiry. Unsurprisingly, existing models of trust in the climate domain have often focused on public trust in scientists. Gauchat (2011), for example, analyzed data from the National Science Foundation's 2006 Science Indicators Survey and found that the public authority of science on the subjects of global warming and stem cell research depends on the level of knowledge citizens have about scientific issues, the felt degree of alienation from public institutions, and the perceived cultural meaning of science (e.g. having a systematic method, being conducted at universities, and supporting common knowledge). Those who lack scientific knowledge feel alienated from public institutions, or do not share in a common definition of science tend to place less trust in scientists, compared to citizens on the opposite ends of these spectra. Research by Hmielowski, Feldman, Myers, Leiserowitz, and Maibach (2014) also revealed that trust in scientists serves as an intervening variable between media-use and belief in climate change, explaining why conservative news media actively seed distrust in scientists, compared to more liberal media sources. Work by Brewer and Ley (2013) further showed that trust in scientists strongly predicts trust in environmental organizations, the Environmental Protection Agency, and scientific media sources, indicating that trust in scientists may serve as a general gateway of support for climate-related action.

Implicit in this discussion is that trust in scientists (or science) is a central requirement for effective climate engagement, placing a limiting frame around possibilities for broader climate engagement in the USA. Specifically, people tend to socially trust others with whom they share important values (Earle & Siegrist, 2006)—raising the important question of how to reach Americans who do not share the values of scientists. Similarly, Boykoff (2011) has persuasively argued

that climate change representations in the media and in public opinion polls have transformed the subject of climate change from a matter of serious scientific inquiry to one of personal belief, ultimately trivializing the subject for many Americans. One could also argue the opposite, namely that the media's treatment of climate change and the use of opinion polls to measure climate engagement simply reflect the fact that many Americans naturally construe climate change as a matter of personal belief, because they do not rely on scientific definitions of climate change (Gauchat, 2011).

The notion that scientists do not necessarily hold a privileged position of authority in people's minds has seen extensive coverage in Kruglanski's (1989) lay epistemic theory (LET), a cognitive theory explaining the everyday acquisition of knowledge. LET posits that scientific and non-scientific knowledge, for example, are acquired in similar ways and are differentially relevant to people as a function of various informational, cognitive, and motivational parameters. Most applicable to the current discussion is the concept of epistemic authority, developed by Kruglanski et al. (2005) to explain the special role of communicators in knowledge acquisition. Specifically, according to Kruglanski et al. (2005), people may assign epistemic authority—general credibility to communicators—based on subjective syllogisms, or “if-then” linkages involving major premises (rules) and minor premises (evidence), resulting in conclusions that a person either is, or is not, an authority. For example, a person may subscribe to a similarity-based rule “If a person is a member of my church, then he is trustworthy and has my best interest in mind”. Upon encountering a specific member of the church (the minor premise or evidence), the person concludes that the person can be trusted. With a trust relationship established, the individual is more likely to respond positively to an invitation from the communicator to learn more about solutions to climate change, attend to the message, and ultimately, follow the behavioral recommendations made by the communicator (e.g. to support the church's planned investment in solar panels). Interestingly, epistemic authorities affect information processing at the first level of exposure to a communication attempt. For example, an epistemic authority in a person's life may be so highly valued that his or her opinion on a matter may override all other available sources of information (Kruglanski et al., 2005). Conversely, a communicator might be rejected as a credible source of information, because he or she possesses a characteristic that a recipient dislikes so strongly that anything the communicator might say would be perceived as untrustworthy (see also Kruglanski & Sleeth-Keppler, 2007 for a review of similar social judgment processes).

The characteristics of epistemic authorities in people's lives may be very diverse and extend beyond those outlined by Nisbet and Kotcher (2009), who primarily focus on variables to identify opinion leaders, such as self-confidence or willingness to share information. Similarly, communicators may enjoy epistemic authority based on many forms of evidence, including shared values and interests, perceived proximity between a communicator and a recipient, and any number of subjective rules that govern social trust between people. We adopt Kruglanski et al.'s (2005) framework for the current purpose primarily because of its relative flexibility and generality,

compared to other models of trust or credibility, particularly those explaining trust in scientists.

Demographic and social dynamics of trust

Both groups (social networks) and individuals appear intimately intertwined in the ongoing process of assigning epistemic authority. As Vähämaa (2013) recently argued, epistemology—the process of coming to know what one knows—is inseparable from the groups one is a member of. We operationalized this reasoning in the present study by using climate-relevant demographic and social variables to predict trust in various informal communicators. Specifically, we conceptualize these variables as elements of the subjective rules people may employ to consider whether someone is an authority on climate change in their lives (Kruglanski et al., 2005). This reasoning is supported by the fact that demographic variables, including gender, age, education, income, and race, often predict climate change concern. For example, work by McCright (2010) has shown that US women versus men, non-whites versus whites, and more versus less educated citizens show greater climate change concern. Increases in income and age, on the other hand, are associated with decreasing concern (McCright, 2010). Beyond their relationships with climate change attitudes, demographics may systematically relate to trust in various climate communicators. For example, less educated individuals may place less trust in scientists (due to lack of scientific knowledge), but may place more trust in neighbors, with whom they may share more values. Similarly, social variables, including political party affiliation, political ideology, level of religiosity, and religious affiliation have been shown to relate consistently to climate change attitudes and behaviors and are expected to show strong predictive effects on trust in different informal climate communicators as well. We examine these possibilities next.

Identifying informal communicators on climate change solutions

The foregoing discussion leads to the following research question:

Research Question 1: Beyond the share of epistemic authority assigned to formal communicators (e.g. scientists), to what extent do demographic and social variables predict trust in informal communicators on solutions to climate change?

Based on Kruglanski et al.'s notion of epistemic authority, we took a broad approach to the identification of informal climate communicators. Specifically, we sought to identify potential informal climate communicators on the basis of available literature to cover a range of domains of social life. For practical considerations, the goal was not to cover an exhaustive list of potential communicators. We follow each discussion of a class of communicators with a specific hypothesis, where applicable. The nature of this research is partly exploratory due to the paucity of existing research examining trust in informal climate communicators. Informal communicators under investigation include the following.

Close family

Developmentally, individuals come to rely on close family members (e.g. parents and siblings) as their earliest and most general epistemic authorities (Raviv, Bar-Tal, Raviv, & Houminer, 1990), including questions of science. In a study by Palmer (1999) using adult samples, over 20% of the respondents cited close family as an important source in the development of pro-environmental attitudes and behaviors (the second most important factor in her study). Based on Raviv et al.'s (1990) work, which showed a decreased reliance on family members in older children, we hypothesize that older adults may rely less on close family members on matters related to climate change, compared to younger adults, who are still experiencing a greater direct influence of close family members during their formative adult years (see Flaherty & Brown, 2010 for empirical support of this notion). This reasoning leads to our first hypothesis:

Hypothesis 1: Trust in close family members on solutions to climate change will be negatively related with age.

Neighbors

Community psychologists and sociologists traditionally define reliance on neighbors in terms of “sense of community” or “neighborhood cohesion” variables. Work by Buckner (1988) examined predictors of sense of community and found a significant negative relationship between education and sense of community. Furthermore, religious involvement has been shown to relate positively to number of social ties in a community and support received from community members (Ellison & George, 1994). Work by Flaherty and Brown (2010), in addition to showing a negative relation between age and family ties, showed a negative relationship between age and friendship ties. Thus, neighbors appear to be general sources of authority for certain social and demographic groups, which may extend to the topic of climate change solutions:

Hypothesis 2a: Trust in neighbors on solutions to climate change will be negatively related with age and education.

Hypothesis 2b: Trust in neighbors on solutions to climate change will be positively related with religiosity.

Religious communities

Researchers are increasingly investigating the involvement of faith communities in the climate change discourse in the USA. For example, Smith and Leiserowitz (2013) found that evangelical Christians were less likely than non-evangelicals to believe climate change is happening. However, a majority of evangelicals nonetheless supported various climate and energy policies. Similarly, work by Clements, McCright, and Xiao (2014) recently revealed that Christians are less likely than non-Christians to hold pro-environmental attitudes and beliefs, but also found that the level of religiosity among Christians predicted pro-environmental behaviors. These findings suggest countervailing effects of religious identification (Christian versus non-Christian) and religiosity (reflecting intensity) on environmental attitudes. Thus, we predict:

Hypothesis 3a: Trust in religious leaders and congregants on solutions to climate change will be positively related with religiosity.

Hypothesis 3b: Trust in religious leaders and congregants on solutions to climate change will be negatively related with Christian religious identification.

Similarly, a substantial body of work has examined and supported the overall value congruence between political conservatism and religiosity (e.g. Feather, 1979; Jost, Glaser, Kruglanski, & Sulloway, 2003), leading to:

Hypothesis 3c: Trust in religious leaders and congregants on solutions to climate change will be positively related with political conservatism.

Other community sources

In addition to the community messengers described above, we examined trust in farmers and emergency first responders on the topic of climate change. Farmers, by virtue of living close to the land and being sensitive to changes in climate and associated growing cycles (including loss of biodiversity), could serve as primary climate advocates in rural communities. In support of this notion, work by Weber (1997) showed a significant correlation between 48 American farmers' belief in climate change and their willingness to take adaptive measures to reduce the negative impacts of climate change. Similarly, emergency first responders enjoy a great deal of public trust (Donahue & Miller, 2006) and could, under certain conditions, serve as specific epistemic authorities regarding community preparation for the negative effects of climate change. For example, public health researchers have called for the specific training and mobilization of emergency first responders in connection with climate-related extreme heat events (Luber & McGeehin, 2008).

Similarly to the subjective rules governing trust in neighbors (e.g. proximity), and religious leaders/congregants (e.g. value alignment; Earle & Siegrist, 2006), we hypothesize that residents of rural (versus urban) areas will show higher levels of trust in farmers, and that less versus more educated citizens will show higher levels of trust in farmers and emergency first responders. Specifically, farming and firefighting are practical training professions, requiring less education as defined in terms of postsecondary degree-completion. Formally,

Hypothesis 4a: Trust in farmers on solutions to climate change will be positively related with residing in a rural area.

Hypothesis 4b: Trust in farmers and emergency first responders on solutions to climate change will be negatively related with education.

Health professionals

One of the most rapidly emerging topics in climate change research concerns the various health implications of climate change, including mental health effects such as increases in stress, anxiety, and depression (Clayton, Manning, & Hodge, 2014). Pascal, Viso, Medina, Delmas, and Beaudeau (2012) have argued that integration of

climate change surveillance into the daily practices of health professionals would be necessary to effectively adapt to climate change and communicate information to various stakeholders. Given the increasing importance of health professionals in the dissemination of climate change information and health interventions (including the option of leading by example), we decided to test the amount of trust Americans place in health professionals on climate solutions directly.

Recent work by Guffey and Yang (2012), employing nationally representative data from the General Social Survey, found a positive relation between identification as Christian and trust in doctors in two out of the three study years, a positive relation between Democratic Party identification and trust in one out of the three study years, and a negative relationship between race (African-American) and trust in doctors in one out of the three study years. Guffey and Yang (2012), in light of this inconsistent pattern of results, concluded that more research is needed to better understand demographic and social effects on trust in doctors. We therefore approach the question of who may trust doctors on solutions to climate change purely empirically.

Workplace communicators

Relatively little work has examined the effectiveness of informal climate communicators in the workplace. Around 58% of Americans are currently employed (Pew Research Center for the People & the Press, 2013), providing vast opportunities for workplace education programs on climate change. In the UK, Lockton et al. (2011) have described the development of a software-based program called Empower to encourage energy-efficient behavior focused primarily on heating, ventilation, air conditioning and lighting in the workplace. In a related vein, Unsworth, Dmitrieva, and Adriasola (2013) outlined various characteristics of effective pro-environmental workplace interventions focused on employees, including making the intervention attractive, free from conflict with other goals, and ultimately attainable. Applied to the current discussion, climate-related workplace interventions require organizational champions in the form of managers or co-workers to promote new initiatives and provide information. More knowledge about the amount of trust Americans place in workplace epistemic authorities on climate solutions could shed valuable light on which demographics could be more readily influenced by workplace climate communicators, than others. Due to the paucity of existing research on this subject, we treat the examination of trust in co-workers and bosses empirically.

Formal communicators

Finally, even though the primary focus of this study is on informal communicators, we included measures of trust in scientists and US President Obama as comparison standards. Recently, Obama has very publicly reaffirmed his commitment to combating climate change (The White House, 2014). Given Obama's continued role in advancing solar deployment and energy-efficiency from a regulatory level, it is important to assess the level of trust different types of Americans place in him as an epistemic

authority on climate. As with most formal communicators on the subject (including the mainstream media and scientists), his influence in the country is likely going to be limited to his supporters, namely Democrats and non-Whites (see Hehman, Gaertner, & Dovidio, 2011 for a study examining lower levels of support for Obama among whites). Thus, we predict:

Hypothesis 5a: Trust in President Obama on solutions to climate change will be positively related with non-white racial identification and Democratic Party affiliation.

Replicating earlier work, we predicted a positive relationship between education and trust in scientists (Gauchat, 2011) and between trust in scientists and trust in other climate communicators, in line with Brewer and Ley's findings (2013). Whereas Brewer and Ley found a relationship between trust in scientists and trust in closely related sources (environmental organizations and scientific media), we examined the possibility of a general diffusion of trust across formal and informal communicators, including President Obama, health professionals, farmers, and emergency first responders. In particular, Americans who trust scientists on the basic question of climate change may be more open to additional perspectives on climate-related solutions from informal communicators, in line with the notion that solutions to climate change require extensive collaboration between stakeholders (Ostrom, 2012). Formally,

Hypothesis 5b: Trust in scientists on solutions to climate change will be positively related with education.

Hypothesis 5c: Trust in scientists on solutions to climate change will be positively related with trust in all other communicators.

Judgments of trust and effectiveness of climate solutions

Implicit in the foregoing discussion is the general question of which solutions to mitigate climate change might see effective advocacy by various communicators. This basic question is complicated by the presence of much controversy; little agreement exists about which solutions would be the most effective or equitable on a global scale (Matthews & Caldeira, 2008). The overarching goal of reductions in greenhouse gases in the atmosphere unites the most frequently cited solutions. Such reductions may be achieved through regulatory initiatives, for example, by placing quotas on greenhouse gas emissions, or through carbon taxation schemes (e.g. Karp & Zhang, 2012). Another major path toward stabilization of the global climate comes from technological solutions, including the development of alternative energy sources that do not emit carbon (e.g. moving away from coal and oil to wind and solar energy), and carbon sequestration technologies (see Hoffert et al., 2002 for a review). Specific solutions to climate change often see criticisms on the grounds that they cannot be implemented equitably, placing undue burdens on countries that are not necessarily the most responsible for carbon pollution (Posner & Sunstein, 2008). Nonetheless, many analysts agree that building large-scale support for climate solutions is a necessary requirement to

stabilize the climate (e.g. Ostrom, 2012). In addition to measuring and predicting trust in informal climate communicators, we therefore examined the perceived effectiveness of various solutions to climate change with the goal of providing a baseline for future communication efforts to build upon:

Research Question 2: To what extent does trust in various climate communicators predict perceived effectiveness of solutions to climate change?

Because the majority of current solutions to climate change either have a regulatory or technological flavor, we expect to see a pattern of results that shows a stronger connection between trusting scientists and President Obama—formal communicators—and belief in the effectiveness of various solutions, including moving away from using coal and oil as sources of energy, modernizing the electrical grid, regulating carbon emissions, and finding natural solutions to dealing with climate change:

Hypothesis 6: Judgments of the effectiveness of solutions to climate change will be positively related with trust in scientists and President Obama.

The study

To put American judgments of informal climate communicators and solutions to the test, we analyzed data collected from 1737 members of GfK's KnowledgePanel (KN), a nationally representative online panel providing coverage of over 97% of the US population via address-based sampling. The data were collected as part of a larger effort known as the American Climate Values Survey (ecoAmerica, 2014). In addition to recruiting members using probability sampling, KN provides internet service and laptops to non-internet households, ensuring representation of all eligible households in the panel. Thus, even though the present study relied on the internet to collect responses, GfK KN's underlying sampling method ensures projectability of the results to the US population, on par with the most rigorous government surveys (Yeager et al., 2011).

Method

Sample

2946 non-institutionalized adult (18+) panelists were sampled between 1 October and 23 October 2013. 1737 individuals responded, resulting in a response rate of 59%. Participants received a cash equivalent of \$5 in return for their participation. We employed post-stratification weighting to adjust distributions for minor over and underrepresentation of certain demographics, and for a study-specific design effect involving African-American, Hispanic, and Asian oversamples. We used demographic and geographic benchmarks from the most recently available Census Population Survey (CPS) to make these adjustments. Apart from the influence of the ethnic oversamples, post-survey adjustments were small. The actual weighting variables and CPS benchmarks are available from the authors upon request.

Predictors of trust

As described earlier, we employed a series of relevant social and demographic variables as a lens to examine trust-relationships with potential climate communicators. These include, age, gender, education, income, political party affiliation, political ideology, level of religiosity, religious affiliation, employment status, race, and self-reported population density. Table 1 lists these variables, their coding, means and standard deviations.

Effectiveness of climate solutions

To measure perceived effectiveness of climate solutions, we asked respondents to indicate “How effective will the following solutions to climate change be in the next 20 years?” We included the following, representative list of solutions: “Move away from using coal and oil”, “Increase use of renewable energy (e.g. solar and wind power)”, “Regulate and limit carbon emissions from coal-fired power plants”, “Require companies that produce or import fossil fuels to pay a price for carbon released from burning coal, oil, or natural gas”, “Invest in natural solutions to reduce carbon pollution (e.g. plant more trees)”, “Invest in technology to capture and store carbon”, “Invest in technology to reflect the heat of the sun away from earth”, “Modernize electrical grid to make it more energy-efficient”, and “Raise energy-efficiency standards for appliances”. Answer categories included 1 = “Definitely not effective to stop climate change”, 2 = “Probably not effective to stop climate change”, 3 = “Neither effective nor ineffective (included as a “have no idea” category)”, 4 = “Probably effective to stop climate change”, and 5 = “Definitely effective to stop climate change”.

Table 1. Coding, mean, and standard deviation for social and demographic variables.

Variable	Coding	Mean	SD
Political party Affiliation	1 (Strong Republican) to 7 (Strong Democrat)	4.3	2.08
Political ideology	1 (Extremely Liberal) to 7 (Extremely Conservative)	4.05	1.51
Age	18–93 (in actual years)	46.4	17.1
Gender	0 (female) to 1 (male)	0.48	0.5
Annual income	1 (less than \$25,000) to 4 (more than \$75,000)	2.8	1.15
Education	1 (less than high school) to 4 (Bachelor’s degree or higher)	2.75	0.99
Religiosity	1 (not at all important) to 4 (most important part of my life)	2.65	0.97
Religious affiliation	0 (any non-Christian denomination) to 1 (any Christian denomination)	0.92	0.26
Full-time employment	0 (no) to 1 (yes)	0.57	0.49
Race	0 (non-White) to 1 (White)	0.66	0.47
Self-reported population density	1 (rural) to 4 (urban)	2.69	1.01

Trust measure

Following the solutions question, we measured the degree of trust Americans place in the communicators discussed above by asking respondents to indicate “Which of the following people or groups of people would you trust for guidance about solutions to climate change?” Pre-testing of the entire instrument, and analysis of cognitive responses, revealed that a further definition of “solutions to climate change” in this question was not necessary, because respondents made several judgments about climate solutions prior to this measure. We included the following list of communicators: “my close family (spouse/partner, siblings, and parents)”, “scientists”, “health professionals”, “my boss/supervisor”, “my co-workers”, “my religious leader”, “members of my religious organization”, “farmers”, “first emergency responders, such as firefighters”, “The President of the United States”, and “my neighbors”. The list was completely randomized for each respondent. Answer categories included 1 = “Would definitely not trust”, 2 = “Would probably not trust”, 3 = “Would neither trust or distrust (collected using a separate “I’m not sure” answer category)”, 4 = “Would probably trust”, and 5 = “Would definitely trust”. We also included a “Does not apply” category (e.g. if a respondent does not have co-workers), and a “Would trust, but not on the topic of climate change” category to avoid response distortions (Gal & Rucker, 2011) from respondents who may strongly trust a communicator (e.g. a priest), but may not believe in climate change. We recoded “Would trust but not on the topic of climate change” into category 1 (“would definitely not trust”) for our analyses. Table 2 lists the means and standard deviations for the trust and solutions items for respondents who did not opt out of the questions.

Analytic approach

In order to test our hypotheses, we employed multiple regression modeling as our primary analytic method. To answer Research Question 1, we ran 11 separate multiple regression models, one for each climate communicator. The full set of predictor variables for these models included scientists, President Obama, political affiliation, political ideology, age, gender, income, education, religiosity, religious affiliation, employment status, race, and self-reported population density. In addition to examining trust in scientists and President Obama, we chose to include these communicator variables as *predictors* of trust in informal communicators. This model-design allows us to test variability in trust after trust in scientists and Obama are statistically accounted for, reflecting our primary theoretical aim to understand trust dynamics on climate change *beyond* those afforded to formal communicators. This design also allows us to statistically account for the natural correlation between trust in formal communicators and various social and demographic variables (including political ideology, party affiliation, income, and education).

To address Research Question 2, we conducted nine separate multiple regression models, one for each climate solution. Predictors included the full set of communicators under investigation, with the exception of religious

Table 2. Coding, mean, and standard deviation for trust and solutions variables in the analyses.

Trust ratings	Coding	N	Mean	SD	Does not apply (%)
Scientists	1 = Would definitely not trust; 2 =	1634	3.74	1.23	5.90
Close family	Would probably not trust; 3 =	1583	3.39	1.45	8.90
Farmers	Neither trust nor distrust; 4 =	1588	3.26	1.34	8.60
Emergency first responders	Would probably trust; 5 = Would definitely trust	1612	3.21	1.45	7.20
Health professionals		1582	3.1	1.45	8.90
President of the USA		1629	2.74	1.45	6.20
Religious leader		1291	2.69	1.46	25.70
Members of religious congregation		1327	2.67	1.43	23.60
Co-workers		1361	2.58	1.3	21.60
Neighbors		1593	2.56	1.28	8.30
Boss/supervisor		1264	2.34	1.28	27.30
Solutions Ratings	Coding	N	Mean	SD	
Increase use of renewable energy	1 = Definitely not effective to stop climate change; 2 = Probably not effective to stop climate change; 3 =	1737	3.76	1.16	
Invest in natural solutions	Neither effective nor ineffective; 4 =	1737	3.65	1.12	
Move away from coal and oil	Probably effective to stop climate change; 5 = Definitely effective to stop climate change	1737	3.61	1.16	
Regulate carbon pollution		1737	3.6	1.14	
Modernize electrical grid		1737	3.58	1.11	
Raise energy-efficiency standards		1737	3.49	1.14	
Technology to capture and store carbon pollution		1737	3.39	1.1	
Pay a price for carbon		1737	3.32	1.17	
Reflect the heat of the sun away from earth		1737	3.09	1.09	

congregants, which correlated too strongly with religious leaders ($r = .817$), reducing model fit.

Results

Research question 1

We eliminated from further analysis respondents who selected “Does not apply” (see Table 2). We subjected all 11 multiple regression models covering Research Question 1 to collinearity diagnostics. High correlations between predictors in multiple regression models can inflate the standard errors associated with the regression coefficients, reducing model fit. None of the variance inflation factors in the models

exceeded a value of 2, indicating acceptable levels of collinearity. Thus, we included all predictors in the models. The omnibus *F*-tests for each model reached conventional levels of significance ($p < .05$ or less). Table 3 lists the results of the regression models for each of the communicators (Adjusted R^2 values, standardized coefficients, and significance levels).

Hypothesis 1

Trust in close family members on solutions to climate change shows a significant negative relationship with age, supporting Hypothesis 1 ($b = -.087, p < .01$). Additionally, Democratic Party affiliation ($b = -.036$), and residing in a rural area ($b = -.062$) show significant negative relationships with trust in close family.

Hypotheses 2a and 2b

Trust in neighbors on solutions to climate change shows a significant negative relationship with education ($b = -.095, p < .01$), a significant positive relationship with religiosity ($b = .170, p < .001$), and a significant negative relationship with age ($b = -.065, p < .01$), supporting Hypotheses 2a and b. Additionally, Christians are significantly less likely than non-Christians to trust neighbors on solutions to climate change ($b = -.87, p < .01$), conceptually replicating the different effects of religiosity and religious affiliation on environmental issues observed in prior research (Clements et al., 2014).

Hypotheses 3a, 3b, and 3c

Judgments of trust in religious leaders and congregants on solutions to climate change show significant positive relationships with religiosity ($b = .246, p < .001$ and $b = .250, p < .001$, respectively), supporting Hypothesis 3a. We observed a significant negative relationship between Christian religious affiliation and trust in congregants ($b = -.064, p < .05$), but no significant relationship between religious affiliation and trust in religious leaders, providing partial support for Hypothesis 3b. It is possible, therefore, that religious leaders may encounter marginally less resistance from Christians on solutions to climate change in future outreach, compared to congregants. Results also show significant positive relationships between political conservatism and trust in religious leaders ($b = .129, p < .001$), but not congregants, partially supporting Hypothesis 3c. The observed distinctions between the authorities of religious leaders and congregants could be further examined in future research efforts.

Hypotheses 4a and 4b

Residing in rural area is associated with increased trust in farmers ($b = -.058, p < .05$), supporting for Hypothesis 4a. Level of education shows significant negative relationships with trust in farmers ($b = -.130, p < .001$) and trust in first responders

Table 3. Multiple regression models explaining trust in climate communicators.

Independent variables	Scientists	Close family	Farmers	First responders	Health professionals	Obama	Religious leader	Congregation	Co-workers	Neighbors	Boss
Scientists	–	.174***	.208***	.194***	.154***	.292***	.063	.106**	.087**	.108***	.009
Obama	.343***	.145***	.152***	.183***	.227***	–	.189***	.171***	.256***	.230***	.337***
Political party affiliation	–.004	–.036*	–.068	–.061	–.055	.333***	.038	–.013	–.07	–.034	–.145**
Political ideology	–.121***	–.007	–.027	–.037	.037	–.062*	.129**	.059	.015	.018	.005
Age	–.005	–.087**	.041	.028	–.034	.006	–.127***	–.123***	–.074**	–.065*	–.089**
Gender	.019	.022	–.008	.025	.031	–.018	–.007	–.022	.087	.028	.071*
Annual income	.045	.005	–.028	–.042	–.041	.031	–.053	–.011	.014	.013	–.004
Education	.087**	–.028	–.130***	–.106***	–.04	–.003	–.087	–.068	–.051	–.095**	–.086*
Religiosity	–.085**	.041	.097**	.122**	.144***	.012	.246***	.250***	.079*	.170***	.093*
Religious affiliation	–.024	–.017	–.021	.01	–.033	–.028	–.05	–.064*	–.061*	–.087**	–.067
Full-time employment	–.033	–.01	.033	.037	.032	–.011	.049	–.026	.018	–.023	.051
Race	.067	.052	.018	–.070*	.01	–.113***	.015	–.03	.002	.014	.053
Self-reported population density	.077**	–.062*	–.058*	–.014	.019	.032	.038	.008	–.001	–.016	–.019
Adjusted R ²	.203	.059	.085	.106	.089	.321	.114	.108	.081	.092	.111

Note: Entries are standardized coefficients.

* $p < .05$ (two-tailed tests).

** $p < .01$ (two-tailed tests).

*** $p < .001$ (two-tailed tests).

($b = -.106, p < .001$), supporting Hypothesis 4b. Trust in farmers and first responders also relates positively with religiosity.

Health professionals

Religiosity positively predicts trust in health professionals, whereas party affiliation and religious affiliation show no significant relationships with trust in health professionals (see Table 3). These findings are potentially inconsistent with Guffey and Yang's (2012) recent work on general trust in doctors, which showed higher levels of trust among Democrats versus Republicans. The present study and Guffey and Yang's (2012) work are based on similar methodologies (national probability samples), suggesting that the epistemic authority of doctors on the topic of climate change may be distinct from their medical authority. We revisit this issue in the general discussion.

Co-workers and bosses

Religiosity positively predicts trust in co-workers ($b = .079, p < .05$) and bosses ($b = .093, p < .05$) in the current study. Democratic Party affiliation and higher levels of education, on the other hand, are associated with decreased trust in bosses on climate solutions (detailed results in Table 3). These results point to value-similarity as a driver of trust in co-workers or bosses on solutions to climate change.

Hypotheses 5a, 5b, and 5c

Non-white racial identification ($b = -.113, p < .001$) and Democratic Party affiliation ($b = .333, p < .001$) predict increased trust in President Obama on solutions to climate change, supporting Hypothesis 5a. Education positively predicts trust in scientists ($b = .087, p < .01$), supporting Hypothesis 5b. Furthermore, trust in scientists is positively related with trust in the remaining communicators, with the exception of bosses (see Table 3 for full results), generally supporting Hypothesis 5c. Trust in President Obama shows a similar pattern of associations, even after statistically accounting for trust in scientists and demographic and social predictors in the model. Thus, as a general finding, trust in formal communicators (scientists and Obama) is not at odds with trust in informal communicators and may reflect the notion that various stakeholders need to work together to solve climate change. This explanation could be fruitfully examined in future research.

Research Question 2

Collinearity diagnostics resulted in removal of religious congregants from the regression models.

As hypothesized, trust in scientists and President Obama significantly predicts the perceived effectiveness of all the climate solutions included in the present study,

supporting Hypothesis 6 (see Table 4 for full results). Surprisingly, trust in health professionals positively predicts the judged effectiveness of most climate solutions in our study, with the exception of carbon capture and storage. This interesting and unanticipated finding could be further investigated in future research efforts.

Additionally, our findings show that trust in formal communicators spills over to perceived effectiveness of climate solutions, likely because most of the solutions featured in our study either had a regulatory flavor (e.g. putting a price on carbon) or techno-scientific flavor (e.g. investing in heat-deflecting technology). We also found additional relationships between trust and solutions that emerged purely empirically. For example, Americans who view first responders as an authority on solutions are more likely to rate increasing use of renewable energy and reflecting heat from the sun as effective. Trust in co-workers relates positively to the perceived effectiveness of renewable energy, regulation of carbon emissions, grid modernization, and the raising of energy-efficiency standards. Future research could investigate whether other informal communicators, for example, farmers, could readily adopt regulatory or scientific solutions to climate change in their messages, perhaps by reframing them to fit audience requirements. Similarly, informal communicators could also deliver messages around specific solutions appropriate for their area of expertise. For example, farmers could message effectively around agricultural solutions (Howden et al., 2007), and doctors and first responders could message around solutions to deal with negative health effects of climate change, as opposed to mitigating the problem.

General discussion

The present study represents a systematic and generalizable investigation of the potential for informal communicators to affect the climate change discourse. Climate advocacy from scientists and other formal communicators (e.g. politicians) typically fails to reach citizens who distrust these groups, largely due to value differences. The trust various social and demographic groups place in informal communicators on solutions to climate change theoretically supports Kruglanski et al.'s (2005) notion of flexible rules that govern authority assignments among different groups of people. Our study suggests avenues for further inquiry into the question of how individuals come to trust and rely on others for knowledge, and possibilities for broader climate outreach and policy advocacy.

General versus specific authority

As discussed briefly above, our finding that political party affiliation does not efficiently predict trust in health professionals on solutions to climate change is apparently at odds with work showing that Democrats tend to place more trust in doctors in general, relative to Republicans (Guffey & Yang, 2012). These observed differences in trust in health professionals between certain groups suggest that people may value the same person's authority differently, depending on the epistemic context. For example, some

Table 4. Multiple regression models explaining perceived effectiveness of climate solutions.

Independent variables	Increase use of renewable energy	Invest in natural carbon solutions	Move away from coal/oil	Regulate carbon pollution	Modernize electrical grid	Raise energy-efficiency	Capture and store carbon	Put a price on carbon	Reflect heat from the sun
Close family	.021	.016	-.012	-.003	.018	.034	-.004	-.037	-.071*
Scientists	.332***	.288***	.345***	.331***	.306***	.263***	.280***	.236***	.173***
Health professionals	.118**	.106**	.098**	.072*	.073*	.090*	.059	.173***	.138***
Boss/supervisor	-.108**	-.079*	-.104**	-.048	-.067	-.003	.045	-.032	.029
Co-workers	.134**	.060	.123**	.151***	.080*	.122**	.012	.092*	.00
Religious leader	-.104**	-.043	-.087*	-.099**	-.065	-.096	-.055	-.055	.003
Farmers	-.027	-.040	-.043	-.059	-.007	.023	-.024	-.017	-.092**
First responders	.073*	.091*	.062	.119**	.054	.046	.128***	.046	.136***
President of the USA	.123***	.149***	.216***	.177***	.146***	.156***	.124***	.203***	.099**
Neighbors	-.006	-.021	-.032	-.053	.003	-.088	.003	-.044	.058
Adjusted R ²	.223	.180	.263	.246	.185	.177	.171	.192	.129

Note: Entries are standardized coefficients.

* $p < .05$ (two-tailed tests).

** $p < .01$ (two-tailed tests).

*** $p < .001$ (two-tailed tests).

assignments of authority may be very specific, and only involve certain types of knowledge, such as medical knowledge, in the case of Democrats' trust in doctors. On the other hand, a person may be a general source of authority in a person's life, giving advice in various domains of life, which may explain why religiosity predicts trust in health professionals on climate solutions. Additionally, our analysis reveals many connections between social and demographic groups and priests, bosses, and co-workers on solutions to climate change. A plausible explanation for these results is that many people may first judge who they can trust in general, based on various subjective rules, involving value congruence, proximity, similarity, joint group-membership, and so forth, and then accept guidance on all kinds of different topics from authorities under this general umbrella of trust. Future research could investigate the distinction between general and specific authority assignments more directly, by distinguishing between how much people trust various communicators in general, versus just on the topic of climate change. Future research could also address if trust on matters of climate change extends to all informal communicators in a category (e.g. all priests), or just specific individuals (e.g. a particular priest).

Issues of causal direction

Prior research has shown that trust in scientists explains belief in climate change (Hmielowski et al., 2014). In the domain of extra-scientific climate communications, such as those involving priests, firefighters, farmers, and health professionals, a question involves whether beliefs and attitudes toward climate change pre-dispose individuals to place more trust in certain communicators, or whether certain communicators influence climate change beliefs and attitudes. To address a similar question, work by Krosnick, Holbrook and Visser (2000) measured global warming beliefs and attitudes prior to fall 1997, when US President Bill Clinton launched a major campaign to build support for the Kyoto treaty, and after the debate that ensued. Results showed that overall beliefs and attitudes toward global warming remained stable for the whole population. However, Democrats and Republicans began to diverge on the issue, resulting in the frequently cited partisan divide on concern over climate change (Krosnick et al., 2000). Thus, Bill Clinton's advocacy had a polarizing effect on subgroups of people, supporting the path from communicator to attitudes. The communication process is inherently dynamic and subject to multi-directional influences, and future research could investigate whether some informal communicators play more of a formative role early in the climate change communication sequence, and others at a later stage, after positive climate change attitudes have been formed.

Implications for outreach

Environmental communicators wishing to implement these findings in their efforts may take the general route suggested by Nisbet and Kotcher (2009), who recommend that opinion leaders could be mobilized through initial identification using various available measurement instruments (e.g. assessing willingness to share information

with others), development and coordination of appropriate messages and frames (Hart, 2010), and through training programs designed to encourage opinion leaders to deliver messages to stakeholders over time. A campaign focused on the promotion of health-related behaviors with climate mitigation benefits, such as walking or biking to work, could involve the identification and training of health professionals and religious leaders, who are trusted authorities among citizens who consider religion an important part of their lives. Similarly, the social marketing organization Green-Faith.org provides a host of resources aimed at bridging the gap between theology and environment and guidelines for members of religious congregations to implement to become green, which could also profitably target political conservatives, based on our study.

The distinctions in epistemic authorities between religiously involved Americans and those with a Christian vs. non-Christian affiliation (see regression model for “neighbors”, “congregation”, and “co-workers”) shed important light on the dynamics of religion and climate change in America. The positive environmental effect of religion in a person’s life could override the negative effects of religious affiliation as Christian in many instances, opening up avenues for communicators or other policy actors to more effectively involve Christian religious communities on climate change.

Implications for policy

Policies require public support, and the increasing distrust in public institutions poses difficult challenges for policy actors (Twenge et al., 2014). The failure of a comprehensive carbon trading policy in the US Congress further reflects the partisan divide on climate solutions and widespread uncertainty about how to implement effective solutions to mitigate climate change, or adapt to its ongoing effects. Our current study suggests the benefit of engaging more informal sources to build policy support on climate issues. Clearly, engaging grassroots communicators to address different constituents more effectively with messages about climate solution is only part of a successful policy effort. However, our general finding that many Americans trust informal groups on climate solutions is in natural alignment with examples of recent grassroots movements designed to affect societal change or policies, including the 2008 Obama campaign, the Tea Party and Occupy Wall Street populist movements, and the battle over internet neutrality (SOPA). Thus, policy actors could use the present findings to begin conversations about how to build support for climate policies through social media channels, using a range of communicators and organizations. The recent successful implementation of the People’s Climate March can serve as a useful guiding framework for future policy-related efforts.

Limits of the current study

As is the case with any single empirical effort, the current study suffers from several weaknesses. The results of the present study only generalize to the US adult

population, and do not reliably inform epistemic authority assignments among citizens younger than 18, or citizens in other countries. Secondly, the present study relies on the methodology of survey self-reports, which could introduce distortions. For example, Goldstein, Cialdini, and Griskevicius (2008) discuss that respondents on surveys tend to underreport how much they trust neighbors, largely because this type of informal social influence may exist outside of conscious awareness. A person may indicate on a survey that they would not trust a neighbor on solutions to climate change, when in fact they would if a communication attempt actually occurred. One aspect that mitigates this concern is the nature of the analysis, which primarily features cross-sectional demographic analyses, rather than absolute statements about the potential effectiveness of different communicators. This differentiated view on epistemic authority assignments by social and demographic groups reveals theoretically and practically useful relationships for communicators and policy actors to build upon in their campaign efforts, even though the absolute size of these effects may be smaller than would be observed in practice, due to underreporting.

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