# Supplementary material for Romero-Canyas et al., "Bringing the Heat Home: Television Spots about Local Impacts Reduce Global Warming Denialism," Environmental Communication, 2018 

Supplementary Materials: Baseline Study

## Method

## Participants

From September 13-17, 2012, we conducted a telephone survey of residents in the area of Sioux Falls, South Dakota in order to gather data on the region's beliefs about global warming. Respondents were acquired through random digit dialing of both cell phones and landlines.

Interviewers recorded the respondents' zip code and county for future reference. Zip codes were selected that were within the Sioux Falls area. In total, 806 individuals from the surrounding Sioux Falls area participated in the poll. The sample was $52.3 \%$ male. The median education-ranging on a scale from 1 ( $8^{\text {th }}$ grade or less) to 8 (Graduate work) - corresponded to junior college graduate ( $M=5.46 ; S D=1.95$ ). The median annual, family income levelranging on a scale from 1 (Less than $\$ 50,000$ ) to 4 ( $\$ 200,000$ or more) - corresponded to $\$ 50,000-\$ 100,000(M=1.8 ; S D=.9)$. Respondents were evenly split by political party with $33.4 \%$ Democrats, $33.4 \%$ Republicans and $33.2 \%$ Independents. In regards to political orientation, $14.8 \%$ of respondents indicated that they were liberal, $31.9 \%$ indicated that they were conservative and $49.7 \%$ said they were "somewhere in between." $66.7 \%$ of respondents were employed full time or part time and $18.3 \%$ were retired. Only respondents older than 18 were surveyed, and the median age of all respondents was $47(M=46.92 ; S D=18.08$; Range $=18-97)$.

## Procedure

Following a household randomization procedure similar to that used by the Pew Research
Center, ${ }^{1}$ when a caller reached a landline respondent, they asked to speak to the youngest male over 18 in the household. If there was no male over 18 in the household, the caller asked to speak with whoever answered the phone. This was to offset the studied effect that women and older adults ( 65 and older) are more likely to answer the phone than men and younger adults respectively (Traugott, 1987). For cell phones, we made the assumption that the person answering was the owner, and the caller began the recruitment effort immediately. Upon successful recruitment, the caller then followed a script. Measures on global warming belief, certainty, scientific consensus, economic implications and demographics were asked and responses were recorded. Respondents were assured that they could refuse to answer any question, and hence there are slight variations in the number of responses per question. Respondents were thanked at the end of the interview.

## Measures

The questions used in the phone survey are included in Appendix A of the paper. Some of the questions are from the Yale Climate Communication polls, as indicated below.

Acceptance that global warming is happening. Respondents were given a brief definition of global warming and asked whether or not they believed that it was happening. The wording for this question and its follow-up were taken from the Yale Climate Communication Survey (Leiserowitz et al., 2012). A follow-up question asked respondents to rate on a four point scale how sure they were about their belief that global warming is/is not happening.

[^0]Concern about global warming. Respondents who thought that global warming is happening and respondents who did not know whether global warming is happening were then asked to rate their level of worry on a four point scale (Leiserowitz et al., 2012).

Causes of global warming. Respondents who believed global warming was happening or who answered "Don't know" were also asked whether or not they believed that global warming was anthropogenic, caused mostly by natural changes in the environment, or both/neither (Leiserowitz et al., 2012).

Perception of scientific consensus. Respondents were presented with a multiple choice question to assess their views on the scientific consensus about global warming, using wording from the Yale Climate Communications surveys (Leiserowitz et al., 2012). Answers to questions on perception of scientific consensus have been shown to express strong predictive power with overall belief in global warming (see Ding, Maibach, Zhao, Roser-Renouf \& Leiserowitz, 2011).

Demographic information. Lastly, respondents were asked for basic demographic information, including age and gender. We asked for employment status, income, and education levels, using brackets of income and education. To capture political beliefs, we asked respondents to self-categorize into a party and political ideology.

## Results

Acceptance that global warming is happening. $70.86 \%$ of respondents said they believed global warming is real, $22.08 \%$ said that they did not believe in global warming, and $7.01 \%$ chose "Don't Know." These numbers are partially in line with national trends as captured by Yale Climate Communications ${ }^{2}$ project for the period of data collection, when $70 \%$ of

[^1]Americans believing that global warming was happening and $12 \%$ thought that it was not (Leiserowitz et al., 2012).

Those respondents who said they believed global warming was happening answered a follow-up question about how sure they felt about their belief. On a scale from 1 to 4 , the average rating was $2.12, S D=.88$, which corresponds to "very sure."

Those respondents who said that they did not believe global warming was happening also rated the certainty of their beliefs. Their mean rating was $2.09, S D=1.04$, suggesting that they, too, were very sure of their position on average.

Concern about global warming. Those respondents who answered "Yes" and "Don't Know" to the question asking if global warming was happening were asked to rate how worried they felt about it. The mean rating was $2.36, S D=.94$, which corresponds to "Somewhat worried." Overall, this pattern is also consistent with national trends at the time of data collection, with the Yale Climate Communications survey showing that $58 \%$ of Americans were "somewhat" or "very" worried about global warming (Leiserowitz et al., 2012).

Causes of global warming. $33.73 \%$ of respondents said they believed global warming was primarily caused by human activity while $21.38 \%$ said global warming was the result of natural environmental changes. $17.78 \%$ attributed global warming to both as primary causes, and $1.74 \%$ said it was neither human activity nor natural processes causing global warming. 25.37\% refused to answer or did not answer because they did not believe global warming was happening.

Perception of scientific consensus. $29.90 \%$ of respondents believed that most scientists agree that global warming is happening, while $35.46 \%$ said that scientists disagree about whether global warming is happening. A small group, just $3.80 \%$, said that most scientists do not believe global warming is happening. $30.63 \%$ said that they did not know if global warming was
happening, and $.02 \%$ did not answer the question. While agreeing that global warming is real, most respondents seemed unaware of the existing scientific consensus.

Ideological and partisan differences. Using multinomial logistic regression models and ANOVAs, we tested for the impact of ideology and partisanship. For each outcome variable described above, we built two models. In one, the self-reported ideology (conservative, moderate or liberal) was entered as a categorical predictor. In the second model, party affiliation was entered (Republican, Independent, Democrat) as the predictor. The results are in line with the well-documented partisan gap. Republicans were less likely to say they believed in climate than independents, and Independents were less likely to say they believed in climate than Democrats. The MLR models are summarized in Supplementary Table 1.

The expected pattern of ideological and partisan differences was also reflected in levels of concern about global warming, with Liberals $(M=3.19, S D=.86)$ more concerned than Moderates $(M=2.67, S D=.93)$, who were more concerned that Conservatives $(M=2.36, S D=$ 85), $F(2,623)=28.36, p=2 \times 10^{-12}$, all paired comparisons $\left.p<.001\right)$. Similarly, Democrats were more concerned $(M=3.00, S D=.89)$ than Independents $(M=2.71, S D=.95)$, who were more concerned than Republicans $(M=2.29, S D=.78), F(2,619)=32.65, p=3 \times 10^{-14}$, all paired comparisons $p \leq .001$ ).

## Discussion

In a sample of 806 residents of the Sioux Falls, South Dakota area, we found levels of acceptance of global warming similar to those captured in national samples. ${ }^{3}$ However, there were some discrepancies between our sample and national samples in regards to levels of acceptance of the scientific consensus about global warming and the anthropogenic causes of
${ }^{3}$ Because our survey included a "Don't Know" option for items assessing global warming belief and certainty, direct comparisons on these measures between our sample and that of the YCC survey are limited.
global warming. For example, Yale Climate Communications September 2012 survey found that $54 \%$ of Americans believe that global warming is mostly caused by human activities (Leiserowitz et al., 2012), while $33.7 \%$ of our sample said that global warming was the result of human activities. Similarly, $44 \%$ of Americans in the same Yale Climate Communications survey reported that most scientists believe that global warming is happening, while in our sample, $29.9 \%$ of respondents expressed believing that most scientists agree that global warming is happening. These differences suggest a politically conservative population.

Consistent with past work, we found ample evidence of a partisan and political ideological divide on global warming issues. As expected, we saw that liberals accepted global warming, were more concerned about it and more willing to embrace solutions compared to moderates, who in turn were higher on these measures than conservatives. A similar pattern of statistically significant differences emerged when we compared Democrats to Independents and Republicans. This is consistent with current national trends.

The responses obtained made us confident that the Sioux Falls area would be well suited for testing the effectiveness of a subtle campaign intended to promote acceptance of global warming. Thus, we moved on to design and run the television campaign in Sioux Falls, South Dakota.

Supplementary Table 1: Percentages of Global Warming Belief, Scientific Consensus, and Causes of Global Warming by Political Ideology and Political Party

|  |  | Baseline |  |
| :---: | :---: | :---: | :---: |
| Variable | Model $\chi^{2}$ | 2012 |  |
|  | Conservative | Moderate | Liberal |


| Do you think that | 39.94, |  |  |  |
| :--- | :---: | :---: | :---: | ---: |
| GW is happening? | $p<.00001$ |  |  |  |
| Yes |  | 59.88 | 82.31 | 16.87 |
| No | 32.80 | 7.82 | 16.11 |  |
| I don't know | 7.32 | 1.01 |  |  |

Scientific Consensus $\quad$| 45.42, |
| :---: |
| $p<.00001$ |

| Most think GW is happening | 20.40 | 30.92 | 48.15 |
| :--- | :---: | :---: | :---: |
| Most think GW is not | 6.42 | 2.04 | 0.21 |
| happening | 43.45 | 34.54 | 22.64 |
| There is disagreement | 29.73 | 32.50 | 29.00 |


| Causes of global warming | 42.01, |  |  |  |
| :--- | :---: | :---: | :---: | :---: |
| Human activity |  | 37.82 | 43.00 | 67.33 |
| Natural changes | 34.43 | 30.83 | 7.67 |  |
| Both | 23.18 | 25.26 | 21.33 |  |
| Don't know or Neither | 4.57 | 0.90 | 3.67 |  |


| Variable | Model $\chi^{2}$ | Republican | Independent | Democratic |
| :--- | :---: | :---: | :---: | :---: |
| Do you think that <br> GW is happening? |  |  |  |  |
| Yes | 51.74, | 64.79 | 63.71 | 86.28 |
| No |  | 26.60 | 28.14 | 11.03 |
| I don't know |  | 8.61 | 8.16 | 2.69 |

## Scientific Consensus

| Most think GW is happening | 19.00 | 27.02 | 46.83 |
| :--- | :---: | :---: | :---: |
| Most think GW is not | 4.53 | 4.90 | .84 |
| happening | 40.91 | 38.98 | 25.47 |
| There is disagreement | 35.56 | 29.10 | 26.86 |
| I don't know |  |  |  |
|  |  |  | 58.09 |
| Causes of global warming | $p<.0005$ | 36.51 | 42.30 |
| Human activity | 38.16 | 29.29 | 16.26 |
| Natural changes | 22.13 | 25.12 | 24.58 |
| Both | 3.19 | 3.29 | 1.07 |
| Don't know or Neither |  |  |  |

## Supplementary Analyses: Political Affiliation Analyses

Supplementary Table 2: Summary of statistical tests for models assessing the main effect of political party affiliation and treatment, and then of the interaction of the two.

| Variable | Test | Main effect Treatment, $p$ | Main effect Party ID, $\boldsymbol{p}$ | Interaction Party ID x Treatment |
| :---: | :---: | :---: | :---: | :---: |
| Belief global warming is happening | MLR | $\begin{gathered} \chi^{2}=18.01 \\ .0001 \end{gathered}$ | $\begin{aligned} & \chi^{2}=76.72, \\ & 9 \times 10^{-16} \end{aligned}$ | $\begin{gathered} \chi^{2}=5.25, \\ .26 \end{gathered}$ |
| Concern about global warming | ANOVA | $F=2.62,$ | $\begin{gathered} F=10.23, \\ .00004 \end{gathered}$ | $\begin{gathered} F=1.67, \\ .19 \end{gathered}$ |
| Causes of global warming (four level) | MLR | $\begin{gathered} x^{2}=3.71 \\ .29 \end{gathered}$ | $\begin{gathered} \chi^{2}=59.62, \\ 5 \times 10^{-11} \end{gathered}$ | $\begin{gathered} \chi^{2}=5.60 \\ .47 \end{gathered}$ |
| Reconsider view about global warming | ANOVA | $\begin{gathered} F=7.75, \\ .006 \end{gathered}$ | $\begin{gathered} F=2.75 \\ .07 \end{gathered}$ | $\begin{gathered} F=1.94, \\ .15 \end{gathered}$ |
| Scientific consensus | MLR | $\begin{gathered} \chi^{2}=15.05, \\ .002 \end{gathered}$ | $\begin{gathered} \chi^{2}=53.06, \\ 1 \times 10^{-9} \end{gathered}$ | $\begin{gathered} \chi^{2}=2.09 \\ .91 \end{gathered}$ |
| Number of Adverts "Recognized" | ANOVA | $\begin{gathered} F=.94, \\ .33 \end{gathered}$ | $\begin{gathered} F=2.92 \\ .05 \end{gathered}$ | $\begin{gathered} F=.32, \\ .73 \end{gathered}$ |
| Messages about impact included in the campaign | ANOVA | $\begin{gathered} F=12.29, \\ .0005 \end{gathered}$ | $\begin{gathered} F=32.40, \\ 1 \times 10^{-14} \end{gathered}$ | $\begin{gathered} F=.005, \\ .99 \end{gathered}$ |
| Messages about mitigation efforts | ANOVA | $\begin{gathered} F=4.02 \\ .05 \end{gathered}$ | $\begin{gathered} F=12.08, \\ 2 \times 10^{-18} \end{gathered}$ | $\begin{gathered} F=.67, \\ .51 \end{gathered}$ |

Supplementary Table 3: means, standard deviations and F-tests from Analyses of Variance from Table 3 and 4.

| Variable | Republican | Party Affiliation Independent | Democrat |
| :---: | :---: | :---: | :---: |
| Concern about GW | $\begin{gathered} 2.59 \\ (.06) \\ n=265 \end{gathered}$ | $\begin{gathered} 2.42 \\ (.05) \\ n=375 \end{gathered}$ | $\begin{gathered} 2.24 \\ (.051) \\ n=326 \end{gathered}$ |
| Openness to changing mind | $\begin{gathered} 2.36 \\ (.07) \\ n=211 \end{gathered}$ | $\begin{gathered} 2.49 \\ (.07) \\ n=255 \end{gathered}$ | $\begin{gathered} 2.63 \\ (.09) \\ n=132 \end{gathered}$ |
| Number of ads recognized | $\begin{gathered} 1.64 \\ (.08) \\ n=376 \end{gathered}$ | $\begin{gathered} 1.61 \\ (.07) \\ n=482 \end{gathered}$ | $\begin{gathered} 1.84 \\ (.07) \\ n=356 \end{gathered}$ |
| Messages about economic impact included in the campaign | $\begin{gathered} 3.04 \\ (.033) \\ n=385 \end{gathered}$ | $\begin{gathered} 3.19 \\ (.03) \\ n=481 \end{gathered}$ | $\begin{gathered} 3.42 \\ (.03) \\ n=354 \end{gathered}$ |
| Messages about mitigation efforts | $\begin{gathered} 2.70 \\ (.04) \\ n=384 \end{gathered}$ | $\begin{gathered} 2.91 \\ (.04) \\ n=487 \end{gathered}$ | $\begin{gathered} 3.23 \\ (.04) \\ n=359 \end{gathered}$ |
| Number of networks watched at time when adverts were broadcast | $\begin{gathered} 1.68 \\ (.08) \\ n=388 \\ \hline \end{gathered}$ | $\begin{gathered} 1.60 \\ (.08) \\ n=490 \\ \hline \end{gathered}$ | $\begin{gathered} 1.80 \\ (.08) \\ n=360 \\ \hline \end{gathered}$ |

[^2]Supplementary Table 4: Percentages of Global Warming Belief and Scientific Consensus by Political Party

| Variable | Overall |  |  | Study Control |  |  | Study <br> Treatment |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Republican | Independent | Democratic | Republican | Independent | Democratic | Republican | Independent | Democratic |
| Do you think that GW is happening? |  |  |  |  |  |  |  |  |  |
| Yes | 57.36 | 72.10 | 86.22 | 54.19 | 68.68 | 80.71 | 63.16 | 79.39 | 92.72 |
| No | 31.71 | 22.10 | 9.19 | 34.48 | 24.03 | 12.21 | 26.62 | 17.89 | 5.63 |
| I don't know | 10.94 | 5.8 | 4.59 | 11.33 | 7.30 | 7.08 | 10.22 | 2.72 | 1.65 |
| Scientific <br> Consensus |  |  |  |  |  |  |  |  |  |
| Consensus <br> Most think GW is happening | 22.99 | 29.46 | 45.05 | 18.58 | 26.35 | 40.67 | 30.97 | 36.04 | 50.18 |
| Most think GW is not happening | 7.10 | 4.51 | 1.14 | 7.60 | 5.12 | 1.19 | 6.14 | 3.22 | 1.08 |
| There is disagreement | 39.54 | 37.81 | 26.11 | 41.70 | 40.55 | 27.53 | 35.62 | 32.00 | 24.44 |
| I don't know | 30.39 | 28.22 | 27.71 | 32.12 | 27.98 | 30.61 | 27.26 | 28.74 | 24.30 |


[^0]:    ${ }^{1}$ http://www.pewresearch.org/methodology/u-s-survey-research/sampling/

[^1]:    ${ }^{2}$ The Yale Climate Communications survey words in terms of "global warming" instead of "climate change," and research suggests that referring to it as such will reduce Republicans" belief that the phenomena is happening (Schuldt, Konrath \& Schwarz, 2011; Schuldt, Roh \& Schwarz, 2015).

[^2]:    Notes: each cell reports the estimated mean from the model, the standard error of that estimate in parentheses, and the n of participants in that cell in that model.

