LETTER

Will I have to move because of climate change? Perceived likelihood of weather- or climate-related relocation among the US public

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Abstract

As threats from climate change increase across the world, climate-induced migration is receiving more attention, particularly as it affects people in the Global South. However, despite increasing extreme weather events in nations including the United States, limited research has examined public perceptions of the personal likelihood of migration among members of wealthy industrialized countries. We asked a national probability sample of 1,000 U.S. adults about the likelihood that they would have to relocate in the next ten years because of weather or climate-related issues. We found that a majority of respondents (57.0%) reported that these would have a "moderate" or greater influence on their decision to move in the coming decade. Logistic regression analysis with demographic (race, gender, socio-economic status, and political party affiliation) and geographic indicators (regional division and coastal proximity) revealed that Democrats and people with higher education were more likely to indicate that weather or climate-related issues would factor into their decision to relocate. Implications for climate change migration and public opinion research are discussed.

Keywords Climate change · Extreme weather · Migration · Public opinion · Motivated reasoning

1 Introduction

Do Americans believe that weather- or climate-related issues will influence their decision to move in the coming years? While California's 8000 wildfires in 2020 and other extreme weather events in the USA have brought unprecedented media attention to the issue of climate-related migration (Lustgarten 2020), limited research has examined how members of the US public perceive the likelihood that they themselves will have to move because of weather events that have been linked to anthropogenic climate change.

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To date, scholarly and global media attention to climate-related migration has largely focused on the long-term challenges faced in developing regions, including the risk of large-scale migration in Sub-Saharan Africa, South Asia, and Latin America over the next few decades (Rigaud et al. 2018). In the US context, Hauer (2017) takes a long-term modeling approach, projecting that by 2100, under a "no adaptation" 1.8-meter sea level rise scenario, the metropolitan areas of Miami, FL, could lose the most population (2.5 million) while Austin, TX, could gain the most (0.8 million). However, relocation as a means to adapt to short-term weather risks in wealthy industrialized nations has received less attention, despite the increased likelihood of displacement also faced by residents of these nations. For example, in the USA, extreme weather hazards linked to climate change pushed tens of thousands of people to shelters, while causing 247 fatalities and more than $91 billion in damages, in 2018 alone (National Centers for Environmental Information 2019). Coastal areas suffering from frequent floods stemming from sea level rise or increased rainfall—such as Miami Beach, FL, and Atlantic City, NJ—have made substantial investments to raise roads and sidewalks in flood-prone neighborhoods (Milman 2017). In Isle de Jean Charles, LA, nearly $50 million in federal government funding has gone toward relocating the island's tribal communities in the face of significant coastal erosion and sea level rise (Maldonado et al. 2013; Davenport and Robertson 2016). More recently, escalated tensions following an unexpected population surge on the outskirts of New York City during the coronavirus pandemic (Tully and Stowe 2020) warn that weather- or climate-induced migration may also heighten social and economic instability even in one of the most affluent and well-resourced areas of the country (Reuveny 2007; Barnett and Adger 2007; Fan et al. 2018). In light of this, understanding how residents view the influence of weather- or climate-related issues on their relocation decisions is important to identify opportunities and barriers in building policies to minimize potential fatalities, financial losses, and social disruptions in areas that are vulnerable to severe weather impacts.

In the current study, we sought to examine the US public's views regarding the likelihood that weather- or climate-related issues would cause them to move their residence while examining how these views relate to several factors suggested by past research. Importantly, although weather and climate are distinct phenomena, we asked respondents about their perceived likelihood of weather- *or* climate-related migration in light of research suggesting that climate change perceptions are linked to weather patterns, including daily temperature fluctuations (e.g., the local warming effect; Li et al. 2011; see also Druckman 2015), as well as to encompass perceptions of both short-term and long-term risks. In addition, previous research reports that climate change risk perceptions vary by sociodemographic variables (Pearson et al. 2017) as well as by geographic region (Howe et al. 2015). Given that moving decisions are likely the result of multiple factors (Black et al. 2011), we incorporated both demographic (race, gender, socioeconomic status, and political party affiliation) and geographic (regional division and coastal proximity) factors in the present analysis to examine how the perceived likelihood of weather- or climate-related migration varies across segments of the US public.

2 Data and measures

This study analyzes data from the 2016 Cornell National Social Survey (CNSS; fielded September 19 to December 13, 2016), a random digit dial (RDD) telephone survey administered by the Survey Research Institute (SRI) at Cornell University. The CNSS is an annual
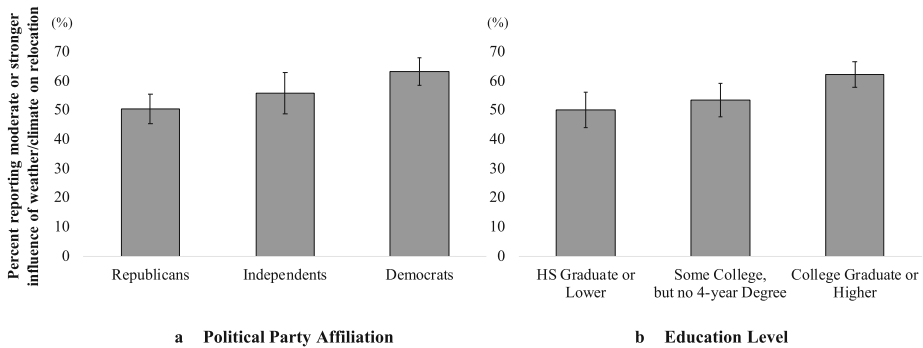
Fig. 1 Percent reporting weather or climate-related issues would have a *moderate influence*, *somewhat strong influence*, or *extremely strong influence* on whether they would move to a new location over the next 10 years, depicted by **a**. Political Party Affiliation and **b**. Education Level

survey that includes questions submitted on a variety of topics by social science researchers at Cornell University. The final sample contained 1000 US adults with 50.9% self-identified as male, 71.6% as white, mean age of 50.1 years, and median household income of US$50,000–$75,000. Forty-five percent reported holding a bachelor's degree or higher.[1] Regarding politics, 37% identified as Republicans (including leaners), 19% as Independents, and 39% as Democrats.[2] All data and materials for the 2016 CNSS are archived at the Roper Center for Public Opinion Research.[3]

As the primary outcome variable, respondents were asked, "What level of influence do you think weather or climate-related issues could have on whether you move to a new location over the next ten years?" (1) *extremely strong influence*, (2) *somewhat strong influence*, (3) *moderate influence*, (4) *minimal influence*, or (5) *no influence at all*. To explore the specific weather- or climate-related factors in respondents' minds, we also asked, "What type of weather or climate-related factors would be the most likely to cause you to move away from your current residence?" (1) *drought*, (2) *large-scale wildfires*, (3) *very strong winds*, (4) *spells of very hot temperatures*, (5) *spells of very cold temperatures*, (6) *very heavy snowfall*, (7) *rising sea levels*, (8) *storm-related flooding*, (9) *others* (the "others" category was accompanied by an open-ended prompt). Near the end of the survey, respondents completed a set of sociodemographic questions used in the models presented below.

3 Analysis and results

3.1 Demographic and social identity predictors

We first examined responses to our primary outcome variable, the perceived likelihood that the respondent would move to a new location during the next 10 years because of weather- or

climate-related issues (Fig. 1). Fifty-seven percent indicated that such issues would have a moderate influence (18.6%), somewhat strong influence (20.1%), or extremely strong influence (18.0%) on whether they would move to a new location in the next 10 years.

For analytic purposes, we re-coded responses into a binary dependent variable, such that moderate influence or higher was coded as 1 and minimal influence or lower was coded as 0. In a logistic regression model, this binary variable was regressed onto gender, race,[4] education level,[5] income level, political party affiliation (base model), plus geographic region and coastal proximity (full model). Table 1 presents the results. In the base model, main effects of political party affiliation and education level emerged, such that Democrats were 1.72 times more likely ($p < .001$), and people with higher levels of education (college graduate or higher) were 1.53 times more likely ($p < .05$), to indicate that weather- or climate-related issues would influence their moving, relative to Republicans and people with lower levels of education (high school or lower), respectively. No other significant predictors emerged.[6]

3.2 Geographic predictors

We also investigated geographic predictors of migration perceptions by adding two additional variables in the full model: US regional divisions and coastal proximity. We used seven regional categories of climate change impacts developed by the Fourth National Climate Assessment (NCA) (i.e., Northwest, Southwest, Northern Great Plains, Southern Great Plains, Midwest, Northeast, Southeast, excluding Alaska and the Islands). For coastal proximity, we coded[7] areas along the coastline at risk from sea level rise and intensified storm surge (Lin et al. 2012; Palm and Bolsen 2020), which might influence residents' migration perceptions. Results of the full model also appear in Table 1. We observed no effects of regional division or coastal proximity. Only political party affiliation and education level emerged as significant predictors in the full model (odd ratios: 1.67, $p < .01$; and 1.55, $p < .05$, respectively), suggesting these relationships remain robust when controlling for the geographic variables.

Given variation in weather and climate stressors across the USA, we further investigated the types of weather or climate respondents had in mind when they answered our survey questions and whether this differed by region. Indeed, the weather- or climate-related cause named by respondents varied depending on respondents' home region, such that *storm-related flooding* was the most-named among those living in the Northwest; *spells of very hot temperatures* was the most-named among those living in the Southwest, Southern Great Plains, and Southeast; and *spells of very cold temperatures* was the most-named among respondents living in the Northern Great Plains, Midwest, and Northeast (see Table 2).

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[4] Here, we analyze race as a binary variable (white vs. non-white) due to the small number of respondents who self-identified as members of racial and ethnic minority groups.

[5] The original educational attainment item was a seven-category measure ranging from "None or grades 1–8" to "Post-graduate or professional schooling." We re-coded this into the three categories that appear in Fig. 1 and Table 1. The category *Some College, but no 4-year Degree* includes those who reporting completing "Technical, trade, or vocational school."

[6] We conducted additional exploratory analysis testing for an education by partisanship interaction effect, given evidence that the association between educational attainment and climate change attitudes varies by political orientation (e.g., Hamilton 2011; Newport and Dugan 2015). We observed no such interaction in the present study.

[7] We used the zip codes of flood-risk areas under a "high sea level rise" scenario by 2100 (Union of Concerned Scientists 2018).

Table 1 Results of logistic regression predicting whether people think weather or climate is influential on their moving

Variables	Model 1 EXP(B)	Model 2 EXP(B)
Step 1: Demographic and social identity indicators		
Gender (male)	1.08	1.07
Race (white)	.95	.94
Education (vs. High School Graduate or Lower)		
College Graduate or Higher	1.53*	1.55*
Some College, but no 4-year Degree	1.15	1.14
Household income (vs. less than $40,000)		
More than $100,000	1.09	1.05
Between $40,000 and $100,000	1.10	1.09
Political party affiliation (vs. Republicans)		
Democrats	1.72***	1.67**
Independents	1.28	1.25
Step 2: Geographic predictors		
Regions by climate change impacts (vs. Northeast[†])		
Northwest		1.19
Southwest		.98
Northern Great Plains		1.75
Southern Great Plains		.79
Midwest		.76
Southeast		.78
Areas at risk of flood by sea level rise (vs. not at risk)		1.50
Chi-square	21.15 (8)**	30.98 (15)**
−2 log likelihood	1178.91	1169.08
Nagelkerke R^2	.032	.046

*$p < .05$

**$p < .01$

***$p < .001$

[†] We found no significant regional differences at other reference categories

Table 2 Descriptive analysis of influential weather- or climate-related factors by region ($n = 670$; 67% of the full sample answered this question)

	% of responses						
	NW	SW	NGP	SGP	MW	NE	SE
Storm-related flooding	20.7	6.9	6.7	8.6	7.3	13.0	18.5
Rising sea levels	6.9	2.9	0.0	1.7	2.2	3.7	6.0
Very heavy snowfall	10.3	2.0	13.3	8.6	16.1	21.1	7.7
Spells of very cold temperatures	17.2	15.7	40.0	12.1	43.8	33.5	18.5
Spells of very hot temperatures	10.3	22.5	26.7	29.3	9.5	8.1	20.2
Very strong winds	3.4	5.9	0.0	12.1	6.6	3.1	8.3
Large-scale wildfires	3.4	2.0	0.0	3.4	0.7	1.9	1.8
Lack of snow or rain (drought)	10.3	17.6	0.0	10.3	2.9	2.5	4.8
Others[†]	17.2	24.5	13.3	13.8	10.9	13.0	14.3

[†] Open-ended responses for "others" (19.6% of total responses) were coded by two independent members of the research team (Cohen's kappa = 0.85). Of these, 23.6% were re-coded into existing categories (and are included in the results reported above) whereas the remainder (49 responses) were coded as true "others" for referencing non-weather- or climate-related factors (e.g., extreme inconsistency, air and water pollution, earthquakes, volcanos)

4 Discussion and conclusion

As climate change disrupts natural and human systems worldwide, millions of people are expected to be displaced, disrupting social and economic systems and leading to instability—particularly in vulnerable areas such as the Global South. Relatively limited scholarship to date has examined how the public perceives internal climate change migration at the national or regional level in developed countries. As extreme weather- and climate-related events occur with increasing frequency in wealthy and industrialized nations, there is a growing need to investigate how their citizens perceive the likelihood that these events might cause them to move their location of residence in the near future.

In the present study, we examined data from a national probability survey of US adults and observed that a majority of respondents in our sample (57%) indicated that weather- or climate-related issues were likely to have a "moderate" or greater influence on their decision to move in the coming decade. In logistic regression models, political party affiliation and education level emerged as significant predictors, such that Democrats and people with higher education were more likely to hold this perception, consistent with a large body of survey research on partisan and education level differences in climate-related risk perceptions more broadly (Capstick et al. 2015; Dunlap et al. 2016; Egan and Mullin 2017; Guber 2013; Pearson et al. 2017).

It is notable that significant political effects emerged despite the fact that our question referenced "weather or climate-related issues" and not "climate change" per se. Our respondents may nevertheless have interpreted the question through a climate change lens, invoking reasoning and decision-making processes rooted in pre-existing partisan schemas (Kunda 1990; Taber and Lodge 2006; see also Druckman and McGrath 2019) and risk perceptions that reflect and reinforce prior beliefs and values (Kahan et al. 2010). However, in interpreting these results, it is important to bear in mind the distinction between weather and climate, which operate on different timescales (short-term vs. long-term). While the present survey question about weather- or climate-related issues allowed us to capture perceptions regarding a broader set of risks related to migration, future research may benefit from measuring concerns about climate and weather separately, to explore their potentially varying relationships with the sociodemographic variables examined here.

Geographically, unlike our anticipation based on unequal climate impacts across the USA, region did not significantly predict beliefs about weather- or climate-induced migration, although the type of weather cited as a reason for moving did vary across regions, as may be expected. These results have implications for climate change migration and public opinion research in that they suggest—as with the issue of climate change more generally—Americans are likely to view personal and community susceptibility to extreme weather events through a partisan lens (see Bolsen et al. 2018), which may hamper efforts to persuade US residents to relocate away from hazard-prone areas.

We note some additional limitations of this research. Although our probability-based sample allows us to generalize the present findings to the broader US public, we recognize that few respondents in our sample are likely to have experienced weather- or climate-related events severe enough to cause them to rethink where they currently live, that only a small fraction of all annual movers list natural disaster or climate change as their "main" reason for moving (Ihrke 2014), and that research of this type would benefit from interviews or focus groups conducted with those for whom such issues are already pressing, such as those living near the wildfires that decimated parts of the Western US in 2020.

In sum, our results suggest that while a majority of the US public reports that weather- or climate-related issues may influence their decision to move in the coming decade, these perceptions also vary significantly by political party and educational attainment, and in a manner suggesting that the perception of personally having to move due to weather- or climate-related events may mirror well-established differences in climate change risk perception, more broadly—especially the partisan divide on climate change concern (e.g., Ballew et al. 2019). As severe weather and climate events increasingly displace populations around the globe, including within wealthy industrialized nations such as the USA, there is a need for ongoing research that tracks these perceptions over time, as nations and their citizens seek to encourage more sustainable and resilient communities.

Author contribution All authors contributed to the study conception and design. All data and materials were prepared by Survey Research Institute at Cornell University. Data analyses were performed by Byungdoo Kim. The first draft of the manuscript was written by Byungdoo Kim and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Data and materials availability All data and materials for the 2016 Cornell National Social Survey are archived at the Roper Center for Public Opinion Research (https://doi.roper.center/?doi=10.2594/ROPER-31115333).

Code availability SPSS dataset and syntax can be provided upon request.

Declarations

Conflict of interest The authors declare no competing interests.

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