Climate Change Beliefs in a Desert City: The case of Phoenix Metropolitan Area

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INTRODUCTION

As one of the fastest growing economies of all metropolitan areas in the US, Phoenix Metropolitan Area is extremely vulnerable to climate change due to its geographical location in the Southwestern US. Critiques have shown that Phoenix Metropolitan Area could witness 42.2 extreme heat days per summer in the periods of 2041 to 2070 compared to 10.6 days for the periods of 1971-2000 (Grossman-Clarke, Schubert, Clarke & Narlan, 2014). Increased heat levels and greater incidence of heat-related illness are observed in the Phoenix Metropolitan Area. This in turn raises concerns about the future wellbeing of the 4,8 million people who live there.

PURPOSE

Given the city's increasing population and drastically changing climate, we aim to understand the locals' perception about climate change considering various factors such as their experience of heat-related illnesses, socio-demographic factors (e.g. gender, income, ethnicity), and other factors including political belief, sense of belonging, and trust in scientists.

METHODOLOGY

The study used the 2011 Phoenix Area Social Survey (PASS-2011) dataset, available at the CAP LTER data portal (Harlan et al., 2017). The PASS-2011 dataset contains records from a total of 806 respondents, drawn from the population of residents in the Phoenix area using a random-probability sampling design.

The dataset contains a wide range of items, which explore several aspects of the experience of living in the Phoenix area. Selected variables from this dataset were analysed using two-level logistic regression models with a random intercept at city level. The analysis for this study was conducted within the R environment for statistical analysis.

THE DATA AND THE ANALYSES

Table 1: Distribution properties of PASS-2011 variables considered by this study

Variable	Distribution description
Respondent's extent of agreement with the statement "the effects of global warming and climate change are already occurring"	Strongly agree: 362 respondents; Somewhat agree, somewhat disagree, strongly disagree: 408 respondents
Respondent had symptoms related to heat or high temperatures	Yes: 203 respondents; No: 535 respondents
Someone else in respondent's household had symptoms related to heat or high temperatures	Yes: 158 respondents; No: 566 respondents
Respondent called 911 or visited the hospital for heat-related illness	Yes: 32 respondents; No: 765 respondents
Survey completion mode	Online: 629 respondents; Telephone: 95 respondents; Face-to-face: 82 respondents
Respondent gender	Female: 453 respondents; Male 345 respondents
Respondent age	18-40 years of age: 269 respondents; 41-56 years of age: 265 respondents; 57 years of age or older: 252 respondents
Respondent employment status	In full-time work: 371 respondents; Other than full-time work: 421 respondents
Respondent highest level of school completed	College, bachelor's degree, graduate, professional school: 371 respondents; Grades 1-11, high school, community, vocational, technical: 424 respondents
Where respondent was born	In the U.S.A: 699 respondents; Outside of the U.S.A.: 97 respondents
Respondent has children under 6 years of age	Yes: 115 respondents; No: 691 respondents
Respondent ethnic background	White: 530 respondents; Other than White: 260 respondents
Respondent political ideology	Very liberal: 60 respondents; Other than very liberal: 648 respondents
Respondent's trust in scientists as a source of information about global warming and climate change	Strongly trust: 198 respondents; Other than strongly trust: 569 respondents
Extent to which respondent feels a sense of belonging to the Valley	Count of responses: 793; Minimum response: 1; Maximum response: 10; Mean response: 7.8; Median response: 8; Standard deviation of responses: 2.212

Table 2: Two-level logistic regression models with random intercept at city level predicting strong agreement with the statement "the effects of global warming and climate change are already occurring" [vs. moderate agreement, moderate disagreement, or strong disagreement]

		Coefficient (standard error)					
Variable	Category [vs. reference category, if predictor is categorical]	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	-	1.59336*** (0.40803)	1.28436 *** (0.43725)	0.4677 (0.3044)	0.5886* (0.3481)	2.0329*** (0.3670)	1.0750**(0.45467)
Respondent had symptoms related to heat or high temperatures	Yes [vs. no]		0.53942** (0.24050)	0.5377** (0.2271)	0.5662** (0.2409)	0.4499* (0.2467)	0.5004**(0.2291)
Someone else in respondent's household had symptoms related to heat or high temperatures	Yes [vs. no]		0.15619 (0.25844)	0.1821 0.2448	0.2660 (0.2583)	0.2450 (0.2648)	0.2163(0.2463)
Respondent called 911 or visited the hospital for heat-related illness	Yes [vs. no]		0.99105** (0.49692)	1.0793** (0.4847)	1.1628** (0.5301)	0.9982** (0.5081)	1.31811**(0.51979)
Survey completion mode	Online [vs. face-to-face]	-1.01864*** (0.31238)	-0.97210*** (0.33458)	-1.0743*** (0.2895)	-1.2954*** (0.3246)	-1.1743*** (0.3039)	-1.0940***(0.2926)
	Telephone [vs. face-to-face]	-0.42350 (0.36529)	-0.47797 (0.38887)	-0.5193 (0.3565)	-0.7311* (0.3861)	-0.6886* (0.3792)	-0.5383(0.3584)
Respondent gender	Male [vs. female]	-0.17563 (0.16174)	-0.16999 (0.17234)				
Respondent age	41 to 56 years of age [vs. 18 to 40]	0.04126 (0.20699)	0.04128 (0.22249)				
	57 years of age or older [vs. 18 to 40]	-0.14688 (0.22618)	-0.03248 (0.24571)				
Respondent employment status	In full-time employment [vs. any other employment status]	-0.11846 (0.17576)	-0.13062 (0.18776)				
Respondent highest level of school completed	College, graduate / professional school [vs. grades 1 to 11, high school, community college, vocational / technical school]	0.39155** (0.17014)	0.32809* (0.18248)				
Where respondent was born	Outside of the U.S [vs. inside the U.S]	0.30578 (0.28045)	0.40142 (0.30627)				
Respondent has children under 6 years of age	Yes [vs. no]	-0.28019 (0.25366)	-0.18627 (0.27806)				
Respondent ethnic background	White [vs. any other ethnic background]	-0.80344*** (0.20086)	-0.72855*** (0.21622)				
Respondent political ideology	Very liberal [vs. moderately liberal, moderately conservative, very conservative]				1.5709*** (0.3381)		
Respondent's trust in scientists as a source of information about global warming and climate change	Strongly trust [vs. moderately trust, moderately distrust, strongly distrust]					1.8196*** (0.2122)	
Extent to which respondent feels a sense of belonging to the Valley	-						-0.0708*(0.0380)
Model metrics							
Sample size		728	646	680	607	661	674
Akaike Information Criterion		963.8	848.6	902.2	784.5	797.3	892.1

RESULTS

Our study for the Phoenix Metropolitan Area indicated that the beliefs in **climate change and global warming is highly positively depended on 1) personal damage to heat-related illnesses, 2) highest level of education, 3) liberal political beliefs, 4) trust in scientists as a source of information**. Also, our analysis indicated that **experiencing personal damage due to symptoms related to heat or high temperatures is a stronger predictor of belief in climate change and global warming** than living in a household where others may have had experienced symptoms similar symptoms.

We have found **negative relationships between climate change and global warming beliefs and sense of belonging to the local area**. The White-male effect has also been observed in our analyses, where **white-male individuals were found less likely believe that climate change and global warming is occurring**.

We haven't found any positive correlation between belief in climate change and global warming, and socio-demographic indicators such as respondents' gender; their age; their employment status; whether they had children under the age of six; and whether they were born in the United States.

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