UCLA School of Law Williams Institute

RESEARCH THAT MATTERS

CLIMATE CHANGE RISK FOR LGBT PEOPLE IN THE UNITED STATES

April 2024

Lindsay Mahowald
Ari Shaw

EXECUTIVE SUMMARY

Climate change represents a global challenge, but it also exacerbates existing disparities among individuals and communities. LGBT people face discrimination and exclusion, creating unique vulnerabilities that compound and heighten their exposure to climate-related harms. This report provides some of the first empirical documentation as to how LGBT people differentially experience the negative effects of climate change compared to non-LGBT people. Using U.S. Census data and climate risk assessment data from NASA and the Federal Emergency Management Agency (FEMA), we conducted a geographic analysis to assess the climate risk impacting same-sex couples.

KEY FINDINGS

LGBT people in same-sex couples are at greater risk of exposure to the negative effects of climate change compared to straight couples.

- LGBT people in same-sex couples are disproportionately located in coastal areas and cities. Among the 15 counties with the highest proportions of same-sex couples, all are coastal or urban.
- In the United States, same-sex couples disproportionately live in counties with greater risks due to climate change.
    - A 1 percentage point increase in the proportion of same-sex couples by county is associated with a 17.17 percentile increase in the NASA composite risk score, which focuses on meteorological changes such as extreme cold, heat waves, excessive precipitation, and dry conditions.
    - A 1 percentage point increase in the proportion of same-sex couples by county is associated with a 6.13 percentile increase in the FEMA risk projection score, which focuses on natural hazards and disasters such as flooding, tornadoes, wildfires, hail, and lightning.
- Same-sex couples are more likely to reside in communities with poorer infrastructure and less access to resources. They are, therefore, less prepared to respond and adapt to natural hazards and other climate disruptions.
    - A 1 percentage point increase in the county-level proportion of same-sex couples relative to opposite-sex couples is associated with a 15.27 percentile increase in the NASA exposure risk projections.
    - This indicates that LGBT people in same-sex couples are more likely to be located in places with large impervious surface areas, high housing density, and low-lying infrastructure.
- Washington, D.C., a county equivalent, has the highest proportion of same-sex couples of any county in the United States. It scores high for a variety of climate risks, including heat waves (97th percentile), flooding (95th percentile), and dangerously strong winds (98th percentile).

RECOMMENDATIONS

- Given the disproportionate impact of climate change on LGBT populations and the degree to which LGBT populations face additional disparities in housing, health care, income, and access to food, climate change action plans at federal, state, and local levels, including disaster preparedness, response, and recovery plans, must be inclusive and address the specific needs and vulnerabilities facing LGBT people.
- Policymakers and service providers must ensure that disaster relief is accessible and administered without discrimination on the basis of sexual orientation, gender identity, or gender expression, including safe shelters, access to medication such as HIV treatment, and financial support for displaced LGBT individuals and families.
- Given that LGBT populations are more likely to live in areas with poor infrastructure, worse-built environments, and fewer resources to respond to climate change, development plans, and zoning policies, particularly in urban areas, should prioritize expanding green space and enhancing structural resilience. Policies that mitigate discriminatory housing practices and provide economic relief to LGBT people will bolster the resilience of these communities to climate events.
- Future research should examine how disparities across housing, employment, and healthcare among LGBT people, particularly transgender individuals and LGBT people of color, compound the geographic vulnerabilities to the effects of climate change.
- Federal and state surveys, including the U.S. Census, should include measures of sexual orientation and gender identity to increase the scope and granularity of information available on LGBT people, including assessments of climate risk.
- NASA and FEMA risk assessments, as well as other measures of climate risk, should include LGBT people among social groups with elevated vulnerability to climate change when assigning social vulnerability scores.

INTRODUCTION

At the end of 2023, Dubai hosted the 28th Conference of the Parties (COP28) to the United Nations Framework Convention on Climate Change. COP28 brought together heads of state, business leaders, scientists, activists, and other stakeholders to track progress on country commitments to the Paris Climate Change Agreement. This came in the wake of an alarming climate milestone, as global temperatures for the first time rose more than two degrees Celsius above pre-industrial levels—a threshold that climate scientists agree has severe implications for the well-being of humanity and the natural environment.[1]

While COP28 concluded with an ambitious global commitment to "[transition] away from fossil fuels," the largest contributor of carbon dioxide and greenhouse gas emissions,[2] less attention was paid to mitigating the existing and anticipated effects of climate change on infrastructure, health, and well-being that are disproportionately faced by marginalized communities. This includes lesbian, gay, bisexual, and transgender (LGBT) people, who face many forms of social and economic exclusion and experience inequalities that likely increase their vulnerability to climate disasters.[3]

This report provides some of the first empirical documentation showing how LGBT people are at greater risk to the negative effects of climate change compared to non-LGBT people. While previous studies have examined the disparate effects of climate change on particular groups, including racial and ethnic minorities, none have quantitatively assessed the risk of LGBT people to the multitude of meteorological and disaster events that result from climate change.[4] Using U.S. Census data and climate risk assessment data from NASA and the Federal Emergency Management Agency (FEMA), we conduct a geospatial analysis using statistical modeling to assess the climate risk impacting same-sex couples. These results have meaningful implications for our understanding of the geographic and environmental vulnerabilities of LGBT people that compound and exacerbate their exposure to the negative effects of climate change.

---

[1] Scott Dance, "Earth passed a feared global warming milestone Friday, at least briefly," *The Washington Post*, Nov 19, 2023, https://www.washingtonpost.com/climate-environment/2023/11/19/climate-change-2c-temperature-heat-record/

[2] Brad Plumer and Max Bearak, "In a First, Nations at Climate Summit Agree to Move Away From Fossil Fuels," *The New York Times*, Dec 13, 2023, https://www.nytimes.com/2023/12/13/climate/cop28-climate-agreement.html

[3] Leo Goldsmith and Michelle L. Bell, "Queering Environmental Justice: Unequal Environmental Health Burden on the LGBTQ+ Community," *American Journal of Public Health* 112 (2022): 79-87, https://doi.org/10.2105/AJPH.2021.306406; See also Samuel Mann, Tara McKay, and Gilbert Gonzales, "Climate Change-Related Disasters & the Health of LGBTQ+ Populations," *The Journal of Climate Change and Health*, February 2024, 100304, https://doi.org/10.1016/j.joclim.2024.100304.

[4] See e.g., Alique G. Berberian, David J. X. Gonzalez, and Lara J. Cushing, "Racial Disparities in Climate Change-Related Health Effects in the United States," *Current Environmental Health Reports* 9, no. 3 (May 28, 2022): 451–64, https://doi.org/10.1007/s40572-022-00360-w.; Chuyuan Wang et al., "Spatial Modeling and Analysis of Heat-Related Morbidity in Maricopa County, Arizona," *Journal of Urban Health* 98, no. 3 (June 2021): 344–61, https://doi.org/10.1007/s11524-021-00520-7.; Arbor J.L. Quist et al., "Hurricane Flooding and Acute Gastrointestinal Illness in North Carolina," *Science of The Total Environment* 809 (February 2022): 151108, https://doi.org/10.1016/j.scitotenv.2021.151108.

LGBT INEQUALITIES, GEOGRAPHY, AND CLIMATE CHANGE

In November 2023, the U.S. Global Climate Research Program—a federal interagency program tasked with coordinating research and investments related to the impacts of climate change—released its Fifth National Climate Assessment (NCA).[5] For the first time, the NCA included a brief section on how social, economic, and health disparities among LGBT people, and especially those experiencing multiple and intersecting forms of marginalization, likely create unique risks to and challenges mitigating the harms of climate change. For example, LGBT people face persistent discrimination in areas including housing, employment, education, and accessing services.[6] LGBT people of color are three times more likely than white straight cisgender people to live below the federal poverty line,[7] and transgender immigrants are more likely than non-LGBT people to report negative health outcomes and experience barriers to accessing healthcare.[8] As the NAC concludes from existing evidence, LGBT people may face "heightened health disparities" as the effects of climate change negatively impact economies, and discrimination excludes LGBT people from disaster preparedness and response plans.[9]

The limited research on LGBT people and climate change suggests that geography may compound these existing vulnerabilities to environmental hazards compared to non-LGBT populations. Historical exclusion of LGBT people through "heteronormative NIMBYism" that restricted zoning for gay-owned establishments, as well as Federal Housing Administration policies that promoted loans for straight married couples, often pushed LGBT people into low-income and under-resourced areas.[10] Today, while some LGBT people are able to afford living in affluent "Gayborhoods," employment discrimination and wage disparities leave many unable to afford quality housing, or they face discrimination given the absence of federal antidiscrimination protections in housing.[11] Indeed, a review conducted by the Williams Institute shows that LGBT persons are more likely than non-LGBT persons to experience discrimination from mortgage lenders, housing providers, and shelters; consequently, they are less likely to own homes and more likely to experience homelessness.[12]

---

[5] A.R Crimmins, C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds., "Fifth National Climate Assessment," *U.S. Global Change Research Program*, 2023, https://doi.org/10.7930/NCA5.2023

[6] Ilan H. Meyer, Bianca Wilson, and Kathryn O'Neil, "LGBTQ People in the US: Select Findings from the Generations and TransPop Studies," *The Williams Institute*, June 2021, https://williamsinstitute.law.ucla.edu/publications/generations-transpop-toplines/; Caroline Medina and Lindsay Mahowald, "Discrimination and Barriers to Well-Being: The State of the LGBTQI+ Community in 2022," *The Center for American Progress*, Jan 2023, https://www.americanprogress.org/article/discrimination-and-barriers-to-well-being-the-state-of-the-lgbtqi-community-in-2022/

[7] Bianca Wilson, Lauren Bouton, M.V. Lee Badgett, and Moriah Macklin, "LGBT Poverty in the United States: Trends at the Onset of COVID-19," *The Williams Institute*, Feb 2023, https://williamsinstitute.law.ucla.edu/wp-content/uploads/LGBT-Poverty-COVID-Feb-2023.pdf

[8] Elana Redfield, Rubeen Guardado, and Kerith Conron, "Transgender Immigrants in California," *The Williams Institute*, Jan 2024, https://williamsinstitute.law.ucla.edu/wp-content/uploads/Trans-Immigrants-CA-Jan-2024.pdf

[9] Crimmins et al., 15.2.

[10] Goldsmith and Bell

[11] Goldsmith and Bell

[12] A.P Romero, S.K. Goldberg and L.A.Vasquez, "LGBT People and Housing Affordability, Discrimination, and Homelessness," *The Williams Institute*, April 2020, https://williamsinstitute.law.ucla.edu/wp-content/uploads/LGBT-Housing-Apr-2020.pdf

These differences have a meaningful impact on both how LGBT communities experience climate change and their ability to respond to it. Notably, poor infrastructure and a lack of necessary resources can leave certain areas more vulnerable to climate hazards.[13] LGBT people are often concentrated in urban areas with a relatively high degree of impervious surfaces (e.g., human-made, durable constructs such as roads or buildings) that are more susceptible to flooding.[14] Studies have also shown that low-income urban areas, where many LGBT people reside, have less urban forest cover and green space that could increase vulnerability to extreme temperatures and poor air quality, among other hazards.[15]

Scholars have attempted to quantify the impact of geographic differences on health risks among LGBT people. One study, using national Census data on same-sex households by census tract combined with data on hazardous air pollutants (HAPs) from the National Air Toxics Assessment, models the relationship between same-sex households and risk of cancer and respiratory illness. The results indicate that higher prevalence of same-sex households is associated with higher risks for these diseases.[16] Previously, the same researchers used a similar methodological approach to establish a relationship between same-sex households and cancer and respiratory illnesses in Greater Houston.[17] Unfortunately, to our knowledge, these studies are the only available quantitative assessments of the difference in geographic environmental risk between LGBT and non-LGBT communities. This leaves large gaps in our understanding of disparities in the geographic impact of climate change.

---

[13] Goldsmith, Raditz, and Méndez

[14] Kerith Conron, Winston Luhur, and Shoshana Goldberg, "LGBT Adults in Large U.S. Metropolitan Areas," *The Williams Institute*, Mar 2021, https://williamsinstitute.law.ucla.edu/wp-content/uploads/MSA-LGBT-Ranking-Mar-2021.pdf; P.T. Greiner, D. A Shtob and J.F. Besek, "Is Urbanization Good for the Climate? A Cross-County Analysis of Impervious Surface, Affluence, and the Carbon Intensity of Well-Being," *Socius* 6 (2020), https://doi.org/10.1177/2378023119896896

[15] Jochem Klompmaker et. al., "Racial, Ethnic, and Socioeconomic Disparities in Multiple Measures of Blue and Green Spaces in the United States," *Environmental Health Perspectives* 131(1) (2023), https://doi.org/10.1289/EHP11164

[16] Timothy W. Collins, Sara E. Grineski, Danielle X. Morales, "Environmental injustice and sexual minority health disparities: A national study of inequitable health risks from air pollution among same-sex partners," *Social Science & Medicine* 191, 38-47 (2017), https://doi.org/10.1016/j.socscimed.2017.08.040.

[17] Timothy W. Collins, Sara E. Grineski & Danielle X. Morales, "Sexual Orientation, Gender, and Environmental Injustice: Unequal Carcinogenic Air Pollution Risks in Greater Houston," *Annals of the American Association of Geographers* 107(1), 72-92 (2016), https://doi.org/10.1080/24694452.2016.1218270.

LGBT COMMUNITIES AND NATURAL DISASTERS

A limited number of studies have examined how natural disasters impact LGBT communities.[18] One study examined how existing disparities between LGBT and non-LGBT people across homelessness, incarceration, and rates of disability make LGBT communities uniquely vulnerable in disaster situations.[19] Another study elaborates on these themes in the context of disaster relief following Hurricane Katrina. Discrimination in employment, housing, and health care all compounded health and safety issues for LGBT communities in areas hit by the storm.[20] Indeed, disasters can pose particular difficulties for individuals with chronic health conditions such as respiratory illnesses or HIV—among which LGBT people are overrepresented—because they are often unable to receive necessary care and medication.[21]

Furthermore, LGBT people are vulnerable to discrimination during disaster response and recovery. For example, following Hurricane Katrina, LGBT people were often overlooked in local and national relief efforts that did not recognize households comprised of same-sex couples as "families."[22] As a result, many LGBT families faced separation during resettlement and had difficulty applying for relief aid. Barriers to accessing government assistance can be compounded by the significant amount of private relief aid that comes from churches and religiously affiliated organizations that historically have been unwilling to serve LGBT people, especially in states with exemptions that allow organizations to deny services on religious grounds.[23] Concerns are particularly amplified for transgender individuals, who may be denied housing or experience difficulty accessing services without identification documents that match their gender identity. In one prominent incident, two transgender women of color were arrested and jailed for using the women's restroom at a shelter while fleeing Hurricane Katrina.[24]

---

[18] See A Rushton, L. Gray, J. Canty and K. Blanchard, "Beyond Binary: (Re)Defining "Gender" for 21st Century Disaster Risk Reduction Research, Policy, and Practice," *International Journal of Environmental Research and Public Health* 16(20) (2019): Article 20, https://doi.org/10.3390/ijerph16203984. One recent study became the first to utilize data from the U.S. Household Pulse Survey (HPS) to assess the disparate impact of natural disasters on LGBT individuals. Researchers found that LGBT individuals were twice as likely to be displaced by natural disasters as non-LGBT individuals, and that LGBT individuals generally face worse displacement conditions. However, many respondents appear incorrectly classified as LGBT in this assessment, which could have meaningful implications for survey results. The HPS utilizes the two-step approach when assessing gender identity, which relies on a question about current gender as well as a question about sex assigned at birth, and most analyses of HPS data (including LGBT estimates by the Census Bureau) do not classify "I don't know," "something else," or "none of these" responses as LGBT. An analysis of the data used by this study indicates that, based on these criteria, thousands of respondents had been incorrectly classified as LGBT. Further analysis of HPS data is necessary. See Jessica Geiger, Michael Mendez and Leo Goldsmith, *Amplified Harm: LGBTQ+ Disaster Displacement*, University of California Irvine (2023), https://socialecology.uci.edu/sites/default/files/users/mkcruz/amplified_harm-_lgbtq_disaster_displacement_12.7.23.pdf.

[19] Goldsmith, Raditz, and Méndez

[20] Dale Dominey-Howes, Andrew Gorman-Murray and Scott McKinnon, "Queering disasters: on the need to account for LGBTI experiences in natural disaster contexts," *Gender, Place & Culture* 21(7) (2014): 905-918.

[21] Goldsmith and Bell

[22] Dominey-Howes, Gorman-Murray, and McKinnon; Hurricane Katrina occurred in 2005, prior to the national legalization of same-sex marriage in 2015.

[23] Leo Goldsmith, Vanessa Raditz, Michael Méndez

[24] Haskell; Dominey-Howes, Gorman-Murray and McKinnon

These experiences of discrimination during natural disasters underscore the importance of knowing whether and to what extent LGBT people are likely to experience these climate events. This report attempts to address that knowledge gap by examining the relationship between the geography of same-sex couples and their risk of exposure to various climate change effects.

GEOSPATIAL ANALYSIS OF CLIMATE RISK FOR SAME-SEX COUPLES

Data and Methods

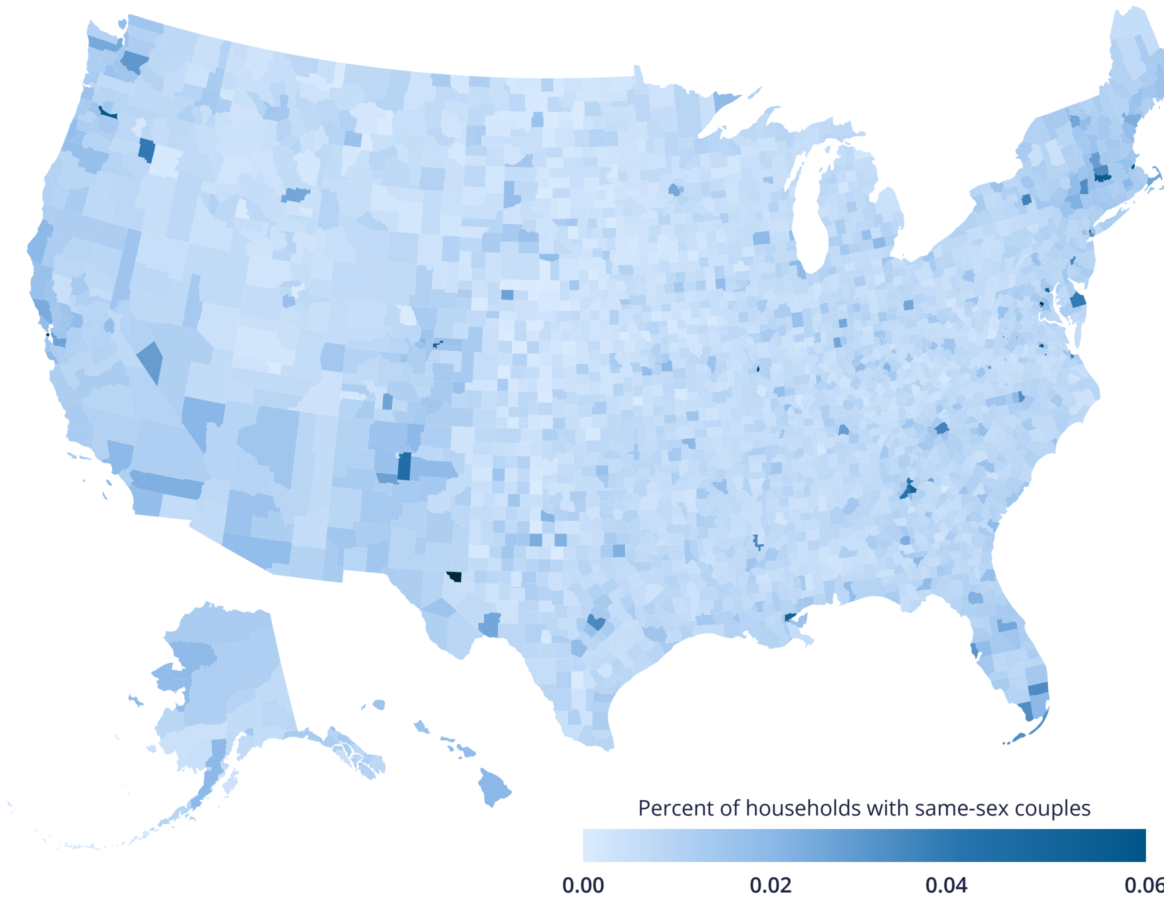
This study analyzed data on same-sex couples taken from the 2020 U.S. Decennial Census. No national surveys that collect data on the LGBT status of individuals have sufficient data at the county level.[25] This lack of data on LGBT persons makes it difficult to capture the true population size and geographic distribution of LGBT individuals. To be sure, the use of same-sex couples as a proxy for LGBT individuals does not capture LGBT persons who are not living in same-sex couple households. It also likely reflects a sample that is less racially, economically, and gender diverse than the LGBT population as a whole, given that it includes only those who are able to cohabitate or marry.[26] Nevertheless, same-sex couples are the best available measure for geographically specific data on this population and are commonly used in research addressing LGBT people.

This data was collected at the county level to match the geographies represented in available climate risk projection data and to create more robust sample sizes. Counties with 500 or fewer coupled households were removed from the models. Below is a map of proportions of same-sex couples by U.S. county (this map includes counties with 500 or fewer coupled households). See Appendix 1 for more details on the U.S. Census data.

[25] Caroline Medina and Lindsay Mahowald, "Collecting Data About LGBTQI+ and Other Sexual and Gender-Diverse Communities," *Center for American Progress*, May 24, 2022, https://www.americanprogress.org/article/collecting-data-about-lgbtqi-and-other-sexual-and-gender-diverse-communities/

[26] Lindsay Mahowald, "LGBTQI+ Nondiscrimination Laws Improve Economic, Physical, and Mental Well-Being," *Center for American Progress*, March 24, 2022, https://www.americanprogress.org/article/lgbtqi-nondiscrimination-laws-improve-economic-physical-and-mental-well-being/

Figure 1. Percent of coupled households by US county that are same-sex



For data on climate risk projections, we relied on two separate sources—one from NASA, which focuses primarily on changes to meteorological patterns, and another from FEMA, which mainly focuses on changes in the occurrence of severe weather events (i.e., natural disasters).

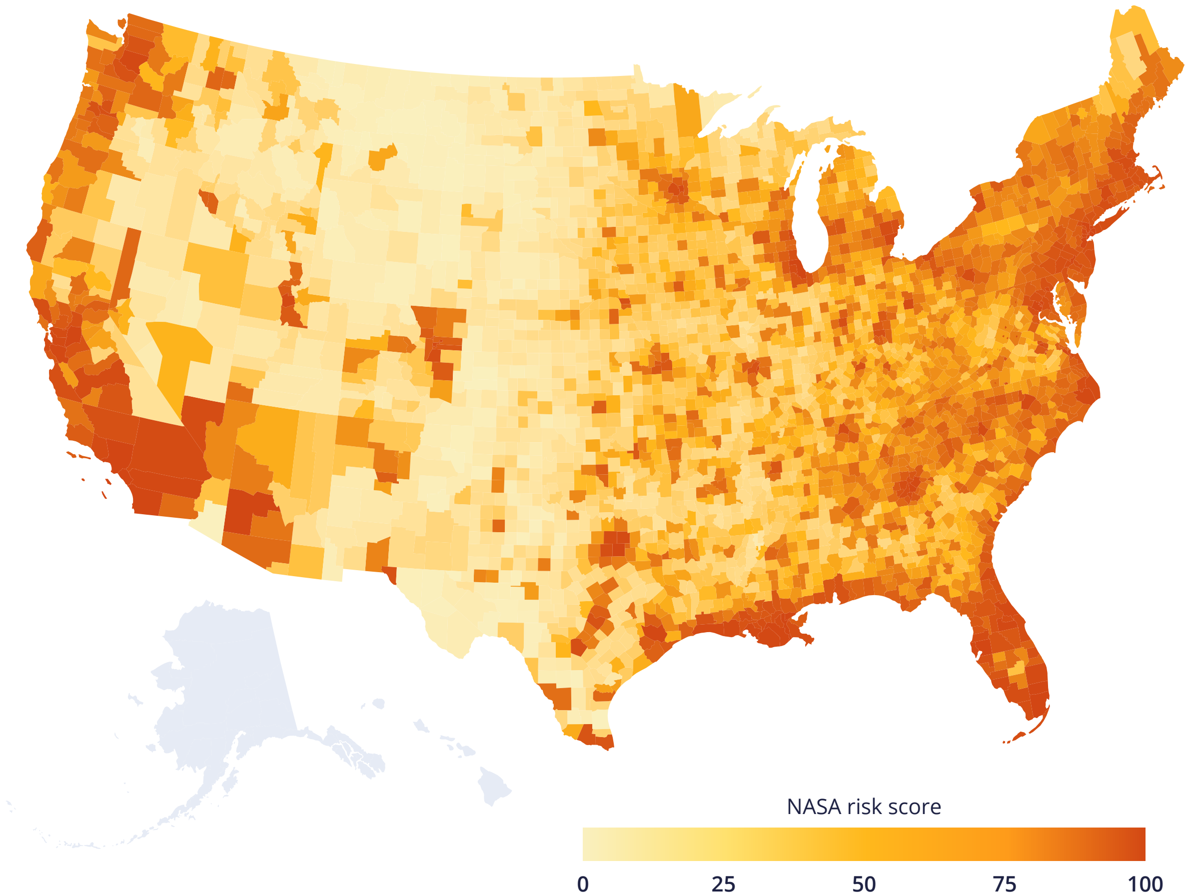
U.S. Climate Risk Projections data, compiled by the NASA Socioeconomic Data and Applications Center, provides climate risk projections for 2040-2049 based on predicted changes in temperature, precipitation, dry conditions, heat waves, and cold spells by county.[27] A composite score is generated based on meteorological assessments, existing built environments (i.e., infrastructure quality), and the presence of at-risk populations in each area (LGBT status was not considered in the NASA composite score, but LGBT people in these counties are more likely to share the demographic characteristics that indicate vulnerability). These scores were adjusted to a 0-100 scale, creating percentiles of risk by U.S. county where a higher score indicates a greater level of climate risk relative to other counties.

The exposure index is one of the three major components of NASA's composite risk score. This combines factors related to a county's impervious surfaces, population and housing density, and low-lying infrastructure (i.e., roads or houses that are likely to be adversely affected by sea level

[27] "U.S. Climate Risk Projections by County, v1 (2040–2049)," NASA Socioeconomic Data and Applications Center, https://sedac.ciesin.columbia.edu/data/set/crv-us-climate-risk-proj-county-2040-2049

rise) to create a score measuring the degree to which hazards will likely impact an area based on its infrastructure and built environment. Its sole focus on built environments and their climate vulnerability makes it useful for understanding whether same-sex couples face greater climate risks due to the infrastructure around them. See Appendix 1 for more details on NASA Risk Projections.

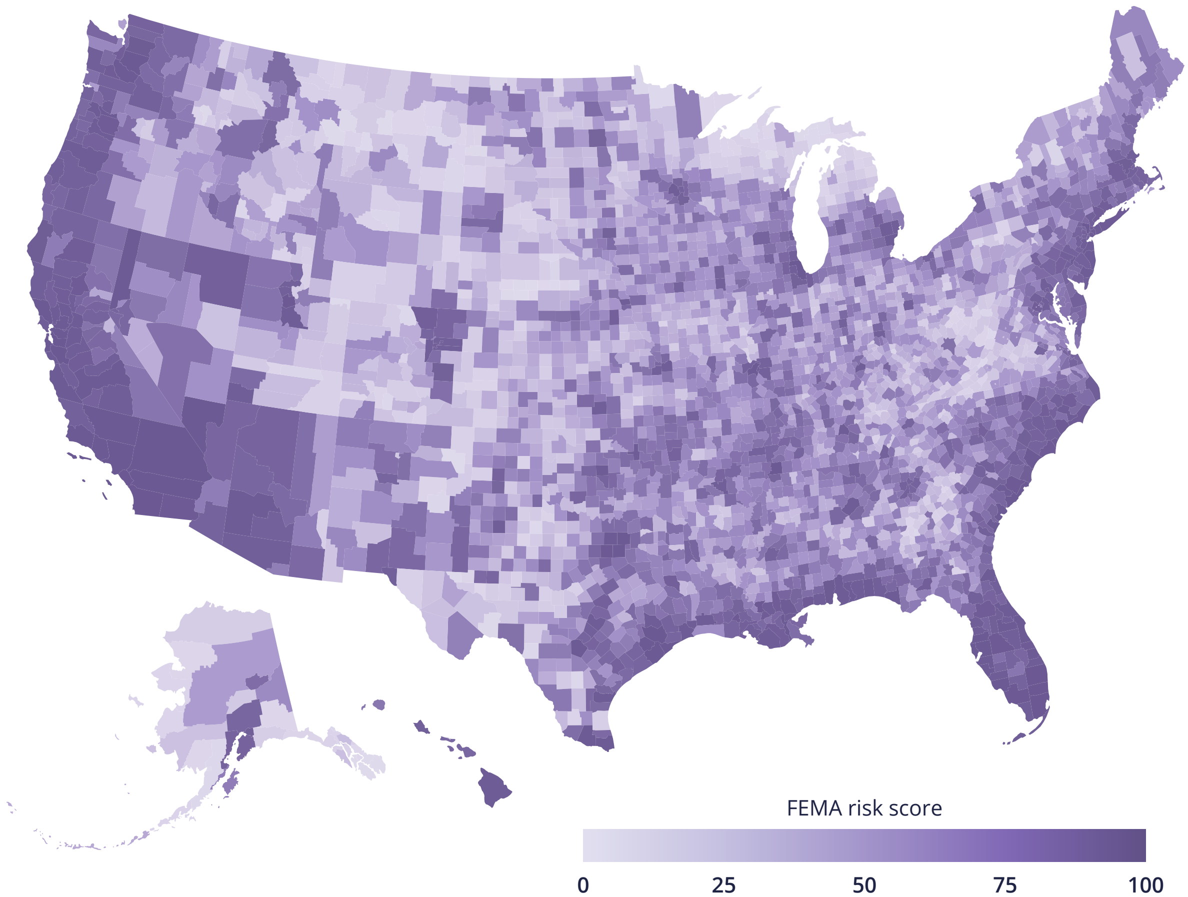
Figure 2. NASA Climate Risk Projections by US county



The second source of climate change risk measures was the FEMA National Risk Index. FEMA provides a detailed risk assessment for U.S. counties based on a wide array of weather phenomena, including cold and heat waves, hail, earthquakes, lightning, and volcanoes.[28] A composite risk score of 0-100 is generated that includes the average economic loss in dollars resulting from natural hazards (Expected Annual Loss); a score for the prevalence of groups likely to be disproportionately impacted by severe weather events and conditions that elevate risk (Social Vulnerability); and a score for the ability of different communities to prepare for, adapt to, and recover from such events based on infrastructure, availability of services, and access to resources (Community Resilience). LGBT status was not considered by FEMA when assigning social vulnerability scores. See Appendix 1 for more details on FEMA National Risk Index scores.

[28] "National Risk Index," *Federal Emergency Management Agency*, https://hazards.fema.gov/nri/learn-more

Figure 3. FEMA Climate Risk Index by US county



Using the above data, we created statistical models that analyze the relationship between the proportion of same-sex couples in each U.S. county and the composite risk scores provided by NASA and FEMA while controlling for factors such as race, income, housing, and population density. Where a composite risk score included one or more of these control variables in its calculations, they were excluded from that model's set of controls. This resulted in two separate risk assessment models, each using one of the composite measures, as well as six additional models that compared proportions of same-sex couples with individual risk scores provided by each agency (i.e., for temperature changes, hurricanes, or flooding). To understand the specific impact of built environments on same-sex couples experiencing climate change, we created a separate model using NASA's exposure score with these controls included. See Appendix 1 for a more detailed discussion of data sources and the methodological approaches.

Findings

A strong and statistically significant positive relationship exists between the proportion of same-sex couples in a county and its climate risk. Simply put, we find that the greater the share of same-sex couples in a county, the greater the climate risk, even after controlling for other factors that might contribute to climate risk. Our model of NASA's composite risk projections, which highlight meteorological changes, indicates that a one percentage point increase in the county-level proportion of same-sex couples relative to opposite-sex couples is associated with a 17.17 percentile increase in risk ($p < 0.01$). Meanwhile, our model of FEMA's composite risk projections, which focus on natural hazards and disasters, indicates that a one percentage point increase in the county-level proportion of same-sex couples is associated with a 6.13 percentile increase in risk projections ($p < 0.01$). In other words, LGBT people in same-sex couples are at greater risk of exposure to the negative effects of climate change compared to straight couples. This is due not only to their greater geographic risk of exposure to weather hazards but also because they are more likely to reside in communities with poorer infrastructure and less access to resources and are, therefore, less prepared to withstand and respond to natural hazards and other climate change disruptions. The NASA Exposure Projections model supports these conclusions, showing that a one percentage point increase in the county-level proportion of same-sex couples relative to opposite-sex couples is associated with a 15.27 percentile increase in exposure risk projections. This indicates that LGBT people in same-sex couples are more likely to be located in places with large impervious surface areas, high housing density, and low-lying infrastructure.

Table 1. Same-sex couples and risk projections: OLS models

	NASA COMPOSITE PROJECTIONS	FEMA COMPOSITE PROJECTIONS	NASA EXPOSURE PROJECTIONS
Constant	41.280 (8.152)***	-18.473 (11.225)	17.735 (6.570)***
Proportion same-sex couples	17.170 (2.251)***	6.133 (1.782)***	15.274 (0.796)***
Urban location	-17.282 (1.752)***	-19.903 (1.873)***	-17.151 (0.910)***
Population density	-0.001 (0.001)	-0.002 (0.001)**	-0.001 (0.001)**
Renters pct	-29.441 (13.431)**	52.202 (21.402)**	-8.486 (6.714)
GINI index	11.171 (18.904)	89.161 (20.295)***	22.279 (12.145)*
Multirace pct	88.600 (102.764)		22.879 (40.312)
Pacific Islander pct	-631.253 (273.031)**		-391.731 (184.045)**
Asian pct	192.807 (46.261)***		107.381 (19.538)***
Native American pct	-73.093 (11.386)***		-60.407 (7.095)***
Hispanic pct			-37.382 (2.869)***
Black pct			24.566 (3.080)***
Median household income		0.0004 (0.0001)***	0.004 (0.00004)***
Observations	2,991	3,014	2,991
R^2	0.410	0.363	0.488
Adjusted R^2	0.408	0.362	0.486
Residual Std. error	22.164 (df = 2981)	22.466 (df = 3007)	20.085 (df = 2978)

Note: *p<0.1; **p<0.05; ***p<0.01

In addition to these composite models, which aggregated a number of risk factors, and the NASA Exposure Projection model, we assessed the impact of individual climate risk factors for same-sex couples. These findings are more mixed (See Appendix 3 for the detailed results of the six individual component risk models). A significant positive relationship exists between the proportion of same-sex couples and increased temperatures; a one percentage point increase is associated with a 4.40 percentile increase in temperature change risk ($p < 0.05$). Likewise, a one percentage point increase in the proportion of same-sex couples is positively associated with an increase in riverine flood risks (7.29 percentile increase, $p < 0.01$) as well as hurricane risks (10.93 percentile increase, $p < 0.01$). However, models assessing increased rainfall, increased cold waves, and increased wildfire risks did not yield any statistically significant results.

The trends determined by these models are shown clearly in counties with high proportions of same-sex couples (see below), each of which has very high climate risk scores relative to other counties. Washington, D.C., a county equivalent, has the highest proportion of same-sex couples of any county in the United States. It scores high for a variety of climate risks, including heat waves (97^{th} percentile), flooding (95^{th} percentile), and dangerously strong winds (98^{th} percentile). Orleans Parish, which comprises New Orleans, also has one of the largest proportions of same-sex couples and is an extremely high-risk area for heat waves (risk score in the 97^{th} percentile) and hurricanes (risk score in the 98^{th} percentile). Most of these counties also score in the 90^{th} percentile or above on NASA's exposure scale, indicating built environments that are poorly equipped to handle climate change and natural disasters.

Table 2. Proportion of same-sex couples and Composite Risk Score percentile by county

COUNTY NAME	PROPORTION OF SAME-SEX COUPLES	FEMA RISK SCORE (PERCENTILE)	NASA RISK SCORE (PERCENTILE)
District of Columbia	7.96%	91.57	99.10
San Francisco County, California	7.81%	98.92	90.34
New York County, New York	7.12%	96.18	99.70
St. Louis City, Missouri	5.66%	95.35	98.37
Suffolk County, Massachusetts	5.48%	92.71	98.87
Multnomah County, Oregon	5.19%	98.60	96.10
Richmond City, Virginia	5.17%	73.24	98.30
Hampshire County, Massachusetts	5.04%	63.38	84.44
Baltimore City, Maryland	4.79%	93.67	98.43
Denver County, Colorado	4.78%	93.60	98.23
Orleans Parish, Louisiana	4.78%	96.98	99.43
DeKalb County, Georgia	4.72%	89.63	98.70
Santa Fe County, New Mexico	4.23%	81.20	67.62
Fulton County, Georgia	4.04%	92.30	96.50
Sussex County, Delaware	3.85%	92.94	89.81

DISCUSSION AND RECOMMENDATIONS

Our analysis provides evidence that geographic differences between LGBT and non-LGBT populations have a meaningful effect on their risk of experiencing the negative effects of climate change. Findings indicate that areas with a higher proportion of same-sex couples are, on average, at increased risk from environmental, infrastructure, and social vulnerabilities to climate change.

These findings have important implications for our understanding of both LGBT populations and the impact of climate change. Given the disparate impact of climate change on LGBT populations, climate change policies, including disaster preparedness, response, and recovery plans, must be inclusive and address the specific needs and vulnerabilities facing LGBT people. This includes state and local climate change action plans, which often seek to specifically address the needs of marginalized communities. These recommendations could focus on establishing shelters that are safer spaces for LGBT persons, providing medication such as HIV treatment during natural disasters, and ensuring that relief aid is targeted toward displaced LGBT individuals and families.

Evidence from this study indicates that LGBT populations are more likely to live in areas with poor infrastructure, worse-built environments, and fewer resources to respond to climate change. Development plans and zoning policies should prioritize expanding green space (tree planting, green roofs) and enhancing structural resilience, particularly in urban areas. More broadly, policies that mitigate discriminatory housing practices and provide economic relief to LGBT communities will impact the degree to which these communities are affected by climate crises.

While this study provides evidence that the geographic distribution of LGBT persons makes them more vulnerable to climate hazards, it does not touch on many other factors that are crucial to understanding the vulnerabilities of these communities. LGBT people, particularly transgender individuals, are more likely to be homeless than non-LGBT people and, on average, have lower incomes and less access to health care.[29] LGBT people also experience higher rates of medical conditions with social and environmental determinants, such as heart disease, respiratory illnesses, HIV, and mental illness.[30] These factors compound the geographic vulnerabilities found in this study to create a greater risk of harm from climate change and should be studied in greater detail.

Lastly, additional data is critical to research on LGBT communities. Existing federal surveys provide quality estimates of LGBT populations by state.[31] However, there are currently no publicly available

---

[29] Bianca Wilson et. al, "Homelessness Among LGBT Adults in the US," *The Williams Institute*, May 2020, https://williamsinstitute.law.ucla.edu/publications/lgbt-homelessness-us/; M. V. Lee Badgett, Soon Kyu Choi, and Bianca D.M. Wilson, "LGBT Poverty in the United States," *The Williams Institute*, Oct 2019, https://williamsinstitute.law.ucla.edu/wp-content/uploads/National-LGBT-Poverty-Oct-2019.pdf; Caroline Medina, Lindsay Mahowald, Thee Santos and Sharita Gruberg, "Protecting and Advancing Health Care for Transgender Adult Communities," *Center for American Progress*, Aug 18, 2021, https://www.americanprogress.org/article/protecting-advancing-health-care-transgender-adult-communities/; Caroline Medina and Lindsay Mahowald, "Advancing Health Care Nondiscrimination Protections for LGBTQI+ Communities, *Center for American Progress*, Sep 8, 2022, https://www.americanprogress.org/article/advancing-health-care-nondiscrimination-protections-for-lgbtqi-communities/

[30] Goldsmith and Bell

[31] LGBT Data and Demographics," *The Williams Institute*, https://williamsinstitute.law.ucla.edu/visualization/lgbt-stats/?topic=LGBT

estimates of the number of LGBT persons in geographic areas more granular than the state level, hampering the ability of researchers to engage in socio-spatial analyses. This study uses the best available proxy measure—data on same-sex couples from the U.S. Census—but estimates indicate that this proxy captures, at best, 1 in 6 LGBT persons.[32] Individual measures of sexual orientation and gender identity should be included in Census data in order to increase the scope and granularity of information available on LGBT people.[33] One key benefit of increased data is that it would allow LGBT status to be more easily used as a factor in assessing climate risk. As described above, neither the NASA nor FEMA projections considered LGBT status when assigning social vulnerability scores despite the demonstrated risk posed to these communities. It is critical for these and similar measures of climate risk to include LGBT persons among groups with elevated vulnerability to climate change.

[32] Medina and Mahowald, "Collecting Data"; Thom File and Jason-Harold Lee, "Household Pulse Survey Updates Sex Question, Now Asks About Sexual Orientation and Gender Identity," Census Bureau, Aug 2021, https://www.census.gov/library/stories/2021/08/household-pulse-survey-updates-sex-question-now-asks-sexual-orientation-and-gender-identity.html

[33] Currently, the Bureau includes questions regarding sexual orientation and gender identity (SOGI) on their Household Pulse Survey, which does not include geographic indicators beyond state; however, in September, the Bureau publicly requested permission from the Biden Administration to test questions on SOGI for future iterations of the American Community Survey; Mike Schneider, "Census Bureau wants to test asking about sexual orientation and gender identity on biggest survey," *AP News*, Sep 19, 2023, https://apnews.com/article/lgbtq-census-bureau-survey-gender-5af1926e2cee7d2b7007ac03a767e811

AUTHORS

Lindsay Mahowald, M.Q.E., is a Research Data Analyst at the Williams Institute.

Ari Shaw, Ph.D., is a Senior Fellow and Director of International Programs at the Williams Institute.

ACKNOWLEDGMENTS

The authors thank Andrew Flores, Assistant Professor at American University and Visiting Scholar at the Williams Institute, Nathan Cisneros, HIV Criminalization Project Director at the Williams Institute, and Elena Grossman, GTI Energy, for their valuable feedback on earlier drafts of this report. We also thank Brad Sears, Founding Executive Director at the Williams Institute, for his review.

SUGGESTED CITATION

Mahowald, L. & Shaw, A. (2024). Climate Change Risk for LGBT People in the United States. The Williams Institute, UCLA School of Law, Los Angeles, California.

ABOUT THE WILLIAMS INSTITUTE

The Williams Institute is dedicated to conducting rigorous, independent research on sexual orientation and gender identity law and public policy. A think tank at UCLA Law, the Williams Institute produces high-quality research with real-world relevance and disseminates it to judges, legislators, policymakers, media, and the public. These studies can be accessed at the Williams Institute website.

FOR MORE INFORMATION

The Williams Institute, UCLA School of Law
(310) 267-4382
williamsinstitute@law.ucla.edu
williamsinstitute.law.ucla.edu

RESEARCH THAT MATTERS

APPENDIX I. DATA SOURCES AND METHODS

SAME-SEX COUPLES: 2020 CENSUS DATA

We calculated proportions by county of same-sex couples from the 2020 Decennial Census, for which household demographic files were released in May 2023. To match the geographies represented in available climate risk projection data and to create more robust sample sizes, we collected this data at the county level. The proportion of same-sex couples was calculated by adding the number of same-sex married couples and same-sex cohabitating couples in each county and dividing by the number of coupled households overall. We removed counties with 500 or fewer coupled households to ensure that the included same-sex couple proportions would be as accurate as possible.

CLIMATE CHANGE DATA

NASA Climate Projections. This data comes from a study conducted by researchers at the NASA Socioeconomic Data and Applications Center, which provides climate risk projections for 2040-2049 based on predicted changes in temperature, precipitation, dry conditions, heat waves, and cold spells by county.[34] A composite score for "hazard risk" (*H*) is created based on each of these factors. To ensure that risk factors take built environment factors into consideration, an "exposure risk" (*E*) score is created based on existing infrastructure—such as population density and scope of impervious surfaces—to assess how such factors will impact hazard risk. Additionally, "vulnerability risk" (*V*) scores relating to the presence of populations likely to be adversely impacted by hazards and conditions that elevate risk are separately calculated. LGBT status was not considered in assigning vulnerability scores. Each of these scores is multiplied together (*H*E*V*) to make a holistic risk assessment score based on meteorological assessments, existing built environments, and the presence of at-risk populations in each area. There are separate scores for a number of factors that are used in the "hazard risk" composite score, including temperature change and precipitation change. Each of these scores, along with individual risk factor projections, was transformed into county-level percentiles to place them on a 0-100 scale comparable to FEMA NRI projections. Alaska and Hawaii are not included in these projections.

FEMA National Risk Index. FEMA provides a detailed risk assessment for U.S. counties based on a wide array of weather phenomena—including cold and heat waves, hail and earthquakes, and even lightning and volcanoes.[35] A composite risk score is provided that includes a grouped score for each of these risks (Expected Annual Loss); along with a score for the prevalence of groups likely to be disproportionately impacted by severe weather events (Social Vulnerability); and a score for the ability of different communities to prepare for, adapt to, and recover from such events based on infrastructure, availability of services, and access to resources (Community Resilience). LGBT status was not considered by FEMA when assigning social vulnerability scores. The equation for composite risk value is as follows:

There are separate scores for individual hazards, including hurricanes, wildfires, heat and cold waves, and various types of flooding. Risk scores represent the national percentile ranking of the risk value of each county; as a result, all risk scores, including composite risks and individual hazard risks, are on a scale from 0-100.

[34] "U.S. Climate Risk Projections by County, v1 (2040–2049)"

[35] "National Risk Index"

NASA COMPOSITE RISK SCORE	FEMA COMPOSITE RISK SCORE
Hazard: Predictions of temperature change, precipitation change, extreme precipitation, extreme cold, heat waves, and dry conditions in 2040 **Exposure:** Estimates of impervious surfaces, population, housing density, and low-lying infrastructure **Vulnerability:** Accounts for elderly population, infant population, farming jobs, forestry and fishery jobs, personal income per capita, African American (non-Hispanic) population, and Hispanic population	**Expected Annual Loss:** Involves 18 individual natural hazards (avalanche, coastal flood, cold wave, drought, earthquake, hail, heat wave, hurricane, ice storm, landslide, lightning, riverine flooding, strong wind, tornado, tsunami, volcanic activity, wildfire, and winter weather) **Community Resilience:** Combines physical attributes of populations, their values and belief systems, their economic conditions, the infrastructure, the access to resources, the social networks and connectivity, and the natural resource base and environmental conditions **Social Vulnerability:** Accounts for populations that are in poverty, unemployed, experiencing housing cost burden, have no high school diploma, have no health insurance, are aged 65 and older, are aged 17 and younger, are civilians with a disability, and are racial or ethnic minorities, as well as the amount of multi-unit structures, mobile homes, crowding, and group quarters

CONTROL VARIABLES

In selecting model controls, it was important to account for location-variant factors representing both social vulnerabilities and built environments. The controls collected were the same as those utilized by Collins, Grineskia, and Morales (2017) in their study assessing the relative impact of air pollution on areas with high proportions of same-sex couples, as this work required similar considerations in control inclusion.[36] The Boruta Algorithm was used for variable selection.[37] These variables include the following estimates by county:

- Proportion Hispanic (any race)
- Proportion Black (non-Hispanic)
- Proportion American Indian (non-Hispanic)
- Proportion Asian (non-Hispanic)
- Proportion Pacific Islander/Native Hawaiian (non-Hispanic)
- Proportion multi-/other race (non-Hispanic)
- Median household income
- Income inequality (as measured by the GINI index)
- Proportion renter-occupied homes
- Population density (per square mile)

[36] Collins, Grineski, and Morales (2016).

[37] Miron B. Kursa and Witold R. Rudnicki, "Feature Selection with the Boruta Package," *Journal of Statistical Software* 36(11) (2010), https://core.ac.uk/download/pdf/6340269.pdf?repositoryId=153

- Urban location (percent of housing in urban areas, placed into groups of urban or not urban using k-means clustering)

Some variables were excluded from NASA and FEMA composite risk models in situations where the risk assessment included one or more of these variables in its calculations. For example, the NASA risk assessment model does not include Proportion Hispanic, Proportion Black (non-Hispanic), or Median household income because these (or similar measures) were used in the calculations of NASA's composite risk assessment.

MODELING APPROACH

A series of ordinary least squares (OLS) regression models using the above controls were created to assess the relationship between proportion of same-sex couples by county and a variety of climate change risk factors. Initial models measure climate risk using NASA and FEMA's composite climate risk scores as the endogenous variable of interest, with a third utilizing NASA's exposure index to assess the impacts of infrastructure/built environment. There are several additional models utilizing specific risk factors as the endogenous variable of interest; two individual risk factor variables used in these models come from NASA climate projection data (temperature change, precipitation change), while four individual risk factor variables used in models come from FEMA climate projection data (wildfire risk, cold wave risk, riverine flood risk, and hurricane risk). See Appendix 2 for two-way scatterplots of proportions of same-sex couples and composite risk measurements.

Cook's Distance measure of influence found several meaningful outliers from the resultant models, but these instances were counties with relatively high proportions of same-sex couples, and the results are robust to including these outliers. Breusch-Pagan tests showed some evidence of heteroskedasticity; for this reason, models include standard errors clustered by state to account for potential non-independence due to state-level differences. Additional diagnostic tests indicate that these models were not adversely impacted by multicollinearity or non-normality of error distributions.

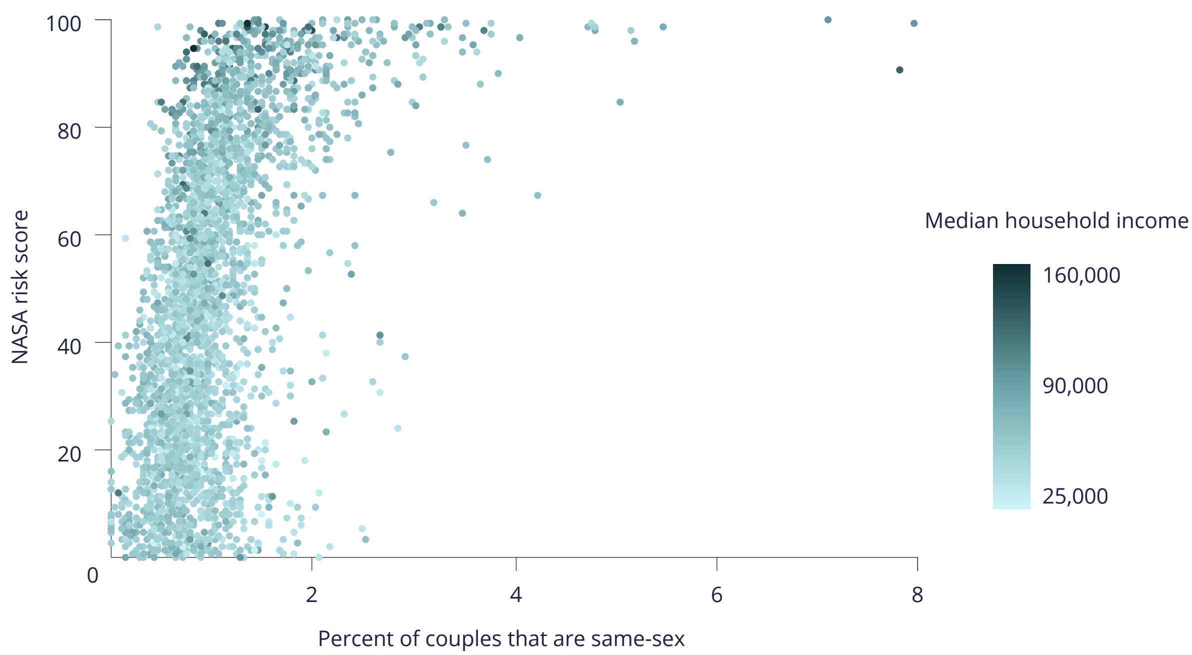
ROBUSTNESS CHECKS

To alleviate any concerns that non-independence remains an issue in the OLS estimates, a set of generalized estimating equations (GEEs)—built to accommodate clustered data—were constructed. The GEEs used closely match the methodological approach taken by Collins, Grineskia, and Morales (2017). In keeping with assessing groupings based on built environments, they define clusters by breaking down geographic regions by the median year of housing construction, organized by decade ("2000 or later", "1990 to 1999", "1980 to 1989", "1970 to 1979", "1960 to 1969", "1950 to 1959", "1940 to 1949", and "1939 or earlier"). Results from these models are shown in Appendix 4; the coefficients of interest closely match those of the above OLS models, indicating that issues of non-independence did not significantly impact the original estimates.

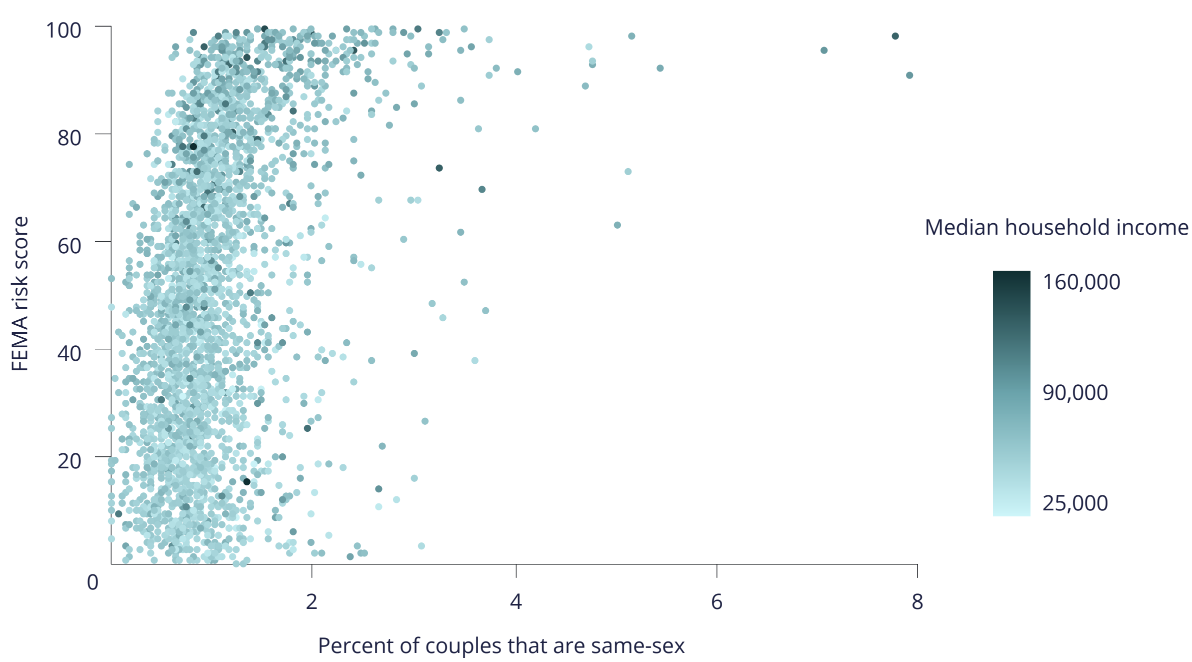
Additionally, because the Boruta Algorithm follows an all-relevant feature selection method, it is possible that some included controls—while relevant to the endogenous variables of interest—would have been excluded using other feature selection methods, potentially altering the model results. To test this hypothesis, all models were re-created using a stepwise selection method, which progressively adds model controls from the baseline while at each stage removing controls that no longer improve model fit (in this case, using AIC as the criterion). Results from this process are shown in Appendix 4. While all models did include smaller sets of control variables, the coefficients of interest remained largely unchanged, indicating that the existing control selection did not adversely affect model results.

APPENDIX II. SCATTERPLOTS OF SAME-SEX COUPLES AND CLIMATE RISK

Same-sex couples and NASA composite risk score: points by county



Same-sex couples and FEMA composite risk score: points by county



APPENDIX III. EXTENDED MODEL RESULTS

Same-sex couples and specific risk projections: OLS Estimates

	TEMPERATURE CHANGE	PRECIPITATION CHANGE	WILDFIRE RISK	COLD WAVE RISK	RIVERINE FLOOD RISK	HURRICANE RISK
Constant	85.032 (12.479)***	25.431 (12.271)**	-14.156 -16.136	88.194 (17.732)***	23.647 -14.523	-35.784 (17.320)**
Proportion same-sex couples	4.395 (2.183)**	-0.471 -1.799	0.813 -1.947	-0.93 -2.375	7.285 (1.543)***	10.934 (3.166)***
Urban location	-2.821 -1.777	1.671 -1.638	-5.186 (1.894)***	-9.312 (2.087)***	-16.086 (2.185)***	-2.71 -2.271
Population density	0.002 (0.001)*	-0.002 (0.001)**	-0.005 (0.002)***	0.000 -0.002	-0.001 -0.001	-0.001 (0.001)**
Renters pct	26.182 -17.401	2.772 -11.278	-8.598 -16.932	14.217 -20.98	8.247 -19.104	-32.103 -22.933
GINI Index	-80.956 (21.291)***	42.819 (19.733)**	97.19 (22.094)***	-63.715 (25.255)**	71.819 (19.998)***	118.584 (25.339)***
Multirace pct	-282.623 (149.643)*	245.817 (56.355)***	509.607 (126.741)***	-110.004 -214.583	-133.541 -112.385	-36.115 -150.599
Pacific Islander pct	-113.639 -323.034	190.621 -292.73	-316.487 -299.997	-203.722 -379.239	222.476 -179.34	-51.509 -243.407
Asian pct	-31.795 -42.82	7.742 -23.17	-26.558 -37.184	-94.345 -63.822	84.077 (33.101)**	83.995 (35.086)**
Native American pct	29.832 (15.991)*	-44.606 (10.435)***	30.684 (17.146)*	37.846 (17.270)**	-10.744 -12.147	-33.447 -30.883
Hispanic pct	-18.981 -17.421	-17.808 (6.406)***	73.047 (8.678)***	4.905 -15.225	4.26 -6.156	19.707 (9.805)*
Black pct	-85.054 (10.902)***	51.069 (5.271)***	-26.49 (9.294)***	-116.823 (11.971)***	-12.934 -12.416	86.901 (12.129)***
Median household income	0.0001 -0.0001	-0.00005 -0.0001	0.0002 -0.0001	0.00004 -0.0001	-0.0001 -0.0001	0.0003 (0.0001)***
Observations	2,991	2,991	3,014	3,014	3,014	2,189
R^2	0.203	0.105	0.246	0.292	0.193	0.401
Adjusted R^2	0.2	0.102	0.243	0.29	0.19	0.397
Residual std. error	25.849 (df = 2978)	27.350 (df = 2978)	25.201 (df = 3001)	28.426 (df = 3001)	25.415 (df = 3001)	22.236 (df = 2176)

Note: *p<0.1; **p<0.05; **p<0.01

APPENDIX IV. ROBUSTNESS CHECK RESULTS

Same-sex couples and risk projections: GEE Models

	NASA COMPOSITE	FEMA COMPOSITE	NASA EXPOSURE	TEMPERATURE CHANGE	PRECIPITATION CHANGE	WILDFIRE RISK	COLD WAVE RISK	RIVERINE FLOOD RISK	HURRICANE RISK
Constant	45.753 (5.092)***	-14.486 (7.486)*	13.162 (6.524)**	79.932 (8.245)***	26.506 (8.833)***	-7.009 -8.008	81.4 (8.826)***	23.706 (8.790)***	-18.374 (7.590)**
Proportion same-sex couples	15.526 (1.226)***	5.9 (0.966)***	13.652 (1.180)***	3.519 (1.101)***	-0.438 -1.138	1.106 -0.907	0.186 -1.211	6.875 (1.092)***	5.591 (1.154)***
Urban location	-17.675 (0.984)***	-19.459 (1.078)***	-16.862 (0.915)***	-2.924 (1.140)**	1.67 -1.24	-4.774 (1.057)***	-9.025 (1.179)***	-16.076 (1.163)***	-4.662 (1.028)***
Population density	-0.001 -0.001	-0.002 (0.0005)***	-0.001 -0.001	0.002 (0.001)**	-0.001 (0.0005)***	-0.004 (0.001)***	-0.001 -0.001	-0.001 -0.001	-0.001 -0.0005
Renters pct	-23.693 (6.621)***	53.981 (8.574)***	0.982 -7.399	23.128 (8.643)***	2.931 -9.116	-5.607 -8.166	14.434 -9.191	9.273 -9.276	-8.953 -8.9
GINI Index	0.8 -11.95	76.044 (14.477)***	24.31 (11.747)**	-67.084 (15.258)***	40.512 (16.062)**	80.505 (15.001)***	-53.837 (15.431)***	67.161 (16.063)***	92.987 (13.821)***
Multirace pct	82.111 (46.468)*		15.466 -39.993	-252.324 (68.539)***	248.163 (53.212)***	475.132 (63.348)***	-144.61 (56.276)**	-120.13 (54.232)**	-25.005 -48.019
Pacific Islander pct	-319.257 (184.097)*		-201.045 -157.262	-136.297 -214.775	137.657 -247.391	-259.599 -158.755	-128.371 -141.43	208.637 -136.396	-66.853 -107.569
Asian pct	180.547 (26.331)***		90.373 (27.138)***	-37.997 -31.683	7.1 -26.303	-15.651 -21.444	-70.488 (29.435)**	84.74 (25.381)***	83.415 (20.234)***
Native American pct	-46.081 (8.382)***		-43.003 (6.835)***	27.047 (8.930)***	-41.829 (8.698)***	30.822 (6.533)***	41.536 (7.400)***	-7.056 -9.531	-33.039 (13.829)**
Hispanic pct			-30.903 (3.849)***	-17.499 (4.587)***	-17.697 (4.451)***	63.549 (3.711)***	8.086 (4.361)*	4.363 -4.241	15.05 (4.837)***
Black pct			18.357 (3.905)***	-74.898 (4.090)***	47.49 (3.702)***	-24.198 (3.656)***	-109.45 (4.820)***	-10.468 (3.937)***	66.373 (4.618)***
Median household income		0.0004 (0.00004)***	0.0004 (0.00004)***	0.0001 (0.00005)**	-0.00005 -0.00005	0.0002 (0.00005)***	0.0001 -0.0001	-0.00003 -0.00005	0.0003 (0.00004)***
Observations	2,991	3,014	2,991	2,991	2,991	3,014	3,014	3,014	2,189

Note: *p<0.1; **p<0.05; **p<0.01

Same-sex couples and risk projections: Stepwise Selection Models

	NASA COMPOSITE	FEMA COMPOSITE	NASA EXPOSURE	TEMPERATURE CHANGE	PRECIPITATION CHANGE	WILDFIRE RISK	COLD WAVE RISK	RIVERINE FLOOD RISK	HURRICANE RISK
Constant	45.678 (1.862)***	-18.473 (6.786)***	16.207 (6.292)**	88.647 (7.960)***	19.606 (6.658)***	-13.027 (7.590)*	94.197 (6.840)***	27.661 (7.959)***	-37.597 (8.647)***
Proportion SS Couples	17.295 (0.857)***	6.133 (0.865)***	15.091 (0.760)***	4.284 (1.020)***	-0.516 -1.027	0.386 -0.951	-0.53 -1.06	7.44 (0.918)***	10.833 (1.060)***
Urban Location	-17.194 (0.943)***	-19.903 (0.996)***	-16.798 (0.855)***	-2.825 (1.171)**	1.84 (1.116)*	-4.699 (1.068)***	-9.823 (1.209)***	-16.942 (1.053)***	-2.701 (1.181)**
Population Density	-0.001 (0.001)*	-0.002 (0.001)***	-0.001 (0.001)**	0.002 (0.001)**	-0.002 (0.001)**	-0.005 (0.001)***			-0.001 (0.001)*
Renters Pct	-27.512 (6.057)***	52.202 (6.623)***		23.375 (8.403)***			14.106 (8.430)*		-32.762 (8.917)***
Multirace Pct	84.943 (43.238)**			-296.87 (50.532)***	257.954 (52.585)***	493.953 (46.793)***	-160.027 (45.010)***	-163.232 (42.526)***	
Pacific Islander Pct	-645.525 (201.150)***		-401.737 (179.691)**			-363.22 (137.450)***		277.605 (140.005)**	
Asian Pct	192.2 (18.211)***		103.807 (18.946)***				-85.964 (21.501)***	90.201 (22.777)***	69.272 (24.856)***
Native American Pct	-72.828 (7.730)***		-60.596 (6.417)***	31.153 (9.070)***	-43.808 (9.461)***	29.931 (7.481)***	40.152 (8.396)***		-41.198 (15.150)***
Hispanic Pct			-38.421 (2.745)***	-19.444 (3.677)***	-16.912 (3.759)***	71.664 (3.479)***			20.277 (3.620)***
Black Pct			23.337 (2.937)***	-85.012 (3.949)***	52.39 (3.899)***	-28.104 (3.670)***	-118.309 (4.183)***	-12.275 (3.636)***	87.376 (3.614)***
GINI Index		89.161 (13.116)***	20.558 (12.070)*	-83.684 (15.419)***	50.662 (15.130)***	92.288 (14.888)***	-68.971 (16.082)***	71.869 (15.207)***	120.828 (15.791)***
Median HH Inc		0.0004 (0.00003)***	0.0004 (0.00003)***	0.0001 (0.00004)**		0.0002 (0.00004)***		-0.0001 (0.00004)*	0.0003 (0.00005)***
Observations	2,991	3,014	2,991	2,991	2,991	3,014	3,014	3,014	2,189
R2	0.41	0.363	0.488	0.203	0.105	0.245	0.292	0.192	0.4
Adjusted R2	0.408	0.362	0.486	0.2	0.102	0.243	0.29	0.19	0.397
Residual Std. Error	22.163 (df = 2982)	22.466 (df = 3007)	20.084 (df = 2980)	25.848 (df = 2980)	27.342 (df = 2982)	25.205 (df = 3003)	28.426 (df = 3005)	25.419 (df = 3005)	22.232 (df = 2178)

Note: *p<0.1; **p<0.05; **p<0.01