LETTER • OPEN ACCESS

The generational divide over climate change among American evangelicals

ENVIRONMENTAL RESEARCH
LETTERS

OPEN ACCESS

RECEIVED
26 May 2022

REVISED
27 September 2022

ACCEPTED FOR PUBLICATION
14 October 2022

PUBLISHED
25 October 2022

LETTER

The generational divide over climate change among American evangelicals

Benjamin S Lowe[1,2,*], **Susan K Jacobson**[3], **Glenn D Israel**[4], **John E Kotcher**[5], **Seth A Rosenthal**[6], **Edward W Maibach**[5] and **Anthony Leiserowitz**[6]

[1] School of Natural Resources and Environment, University of Florida, PO Box 116455, Gainesville, FL 32611, United States of America
[2] A Rocha International, 180 Piccadilly, London W1J9HF, United Kingdom
[3] Department of Wildlife Ecology and Conservation, University of Florida, PO Box 110430, Gainesville, FL 32611-0430, United States of America
[4] Department of Agricultural Education and Communication, University of Florida, PO Box 110540, Gainesville, FL 32611, United States of America
[5] Center for Climate Change Communication, George Mason University, 4400 University Drive, Fairfax, VA 22030, United States of America
[6] Yale Program on Climate Change Communication, Yale University, 195 Prospect Street, New Haven, CT 06511, United States of America
[*] Author to whom any correspondence should be addressed.

E-mail: benlowe@ufl.edu

Keywords: Christianity, Generation Z, global warming, post-Millennial, survey, religion

Supplementary material for this article is available online

Abstract

As urgency grows to address global warming, younger generations can play a strategic role in mobilizing communities that have generally been more opposed to climate action and policy, such as political and religious conservatives in the United States. American evangelical Protestants—and white evangelicals in particular—are the largest religious group in the U.S. and also the most skeptical of climate science. There is growing interest, however, around whether evangelicals are becoming 'greener,' and whether climate attitudes among younger generations are diverging from their elders. We analyze empirical evidence for such generational divides by comparing data from two Climate Change in the American Mind surveys ($n = 2332$) with a national survey of Generation Z evangelicals ($n = 1063$). Our results show that young evangelicals are highly likely to say that global warming is happening (89%) and anthropogenic (75%), with approximately a third of young evangelicals doing so despite perceptions that their parents disagree. They are also consistently more likely than older evangelicals to express pro-climate positions on a range of belief and attitudinal measures. The results are more mixed when young evangelicals are compared more broadly with the general American public as well as with Generation Z Americans. Notably, however, young evangelicals are more supportive of climate policies, such as funding renewable energy research, than Americans overall, even though they are also more politically conservative and Republican. These results suggest that a generational 'greening' of American evangelicals may indeed be taking place, potentially along with some decoupling of climate attitudes from political identity. This may have major implications for the future of climate action and policy in the United States and beyond.

1. Introduction

As negative impacts from climate change continue to intensify, public awareness and support for policy solutions are also rising. This trend is even happening in the U.S., which has consistently been among the most polarized countries on global warming issues (Dunlap *et al* 2016, Arbuckle 2017, Pew Research Center 2020, Leiserowitz *et al* 2021). Younger generations are recognized as particularly instrumental in galvanizing attention and action on the climate crisis at multiple levels of influence, from engaging with family and peers to organizing social and political demonstrations (Lawson *et al* 2018, 2019, O'Brien *et al* 2018, Han and Ahn 2020). Numerous surveys have found younger generations

hold significantly higher levels of awareness, concern, and willingness to act around climate change than older generations (Reinhart 2018, Hamilton *et al* 2019, Ballew *et al* 2020, Pew Research Center 2021). This generational divide is particularly pronounced among typically more skeptical groups such as political conservatives and Republicans in the U.S. (Ballew *et al* 2019, Funk and Tyson 2020, Pew Research Center 2021).

Previous studies suggest that the most skeptical major religious group in the U.S. is white evangelical Protestants (Jones *et al* 2014, Climate Nexus 2020, Veldman *et al* 2021). Evangelicals are the largest major religious group in the U.S. (Pew Research Center 2019), and have a reputation for being highly politically engaged and disproportionately opposed to climate and environmental policies (Smith and Leiserowitz 2013, Veldman *et al* 2021), even when controlling for partisan affiliation (Lowe *et al* 2022a). White evangelicals in particular—most recently estimated at 14%–16% of the U.S. population (Pew Research Center 2019, PRRI 2021)—have become prominently associated in the media and public discourse with the Republican party, Christian Nationalism, and right-wing politics (Hempel and Smith 2020, Whitehead and Perry 2020).

At the same time, however, American evangelicalism is far from monolithic and evidence indicates that it is neither inherently nor inevitably anti-environment or against climate action (Smith and Veldman 2020). Indeed, evangelical Christianity can offer rich motivations and resources for caring about climate and environmental issues (Hitzhusen 2007, Haluza-DeLay 2014, Stover 2019). The last few decades have seen a growing number of evangelical leaders and institutions promoting greater climate concern (Danielsen 2013). There are also multiple evangelical-aligned initiatives and organizations—including Young Evangelicals for Climate Action/Evangelical Environmental Network, A Rocha, the Au Sable Institute, and more—devoted to championing greater environmental awareness and action, including advocating for climate and clean energy policies (Wilkinson 2012, Lamb *et al* 2019, Stover 2019).

Thus, as Smith and Veldman (2020) argue, the complex dynamics around evangelical skepticism in the U.S. may be driven more by the particular sociocultural and political context than by normative evangelical beliefs and doctrine. This suggests that current U.S. evangelical climate attitudes and engagement are not set in stone and could shift under different conditions. Given that recent data on potential changes in climate beliefs and attitudes among evangelicals are mixed (e.g. Danielsen 2013, Clements *et al* 2014, Taylor *et al* 2016, Konisky 2018)—perhaps itself notable given the considerable efforts to sow scientific doubt and political controversy among evangelicals and conservatives (Bean and Teles 2015, Veldman 2019)—there is a growing narrative that younger evangelicals may be diverging from their elders when it comes to concern about global warming (Stover 2019, Veldman *et al* 2021). If a generational shift really is underway, it could portend a long anticipated 'greening' of evangelicalism, with major implications for both decreasing opposition to and increasing support for climate solutions and policies in the U.S. and beyond.

The purpose of this study is to examine whether there are indeed generational divides on climate change among American evangelicals. We do this by comparing the youngest current generation of rising evangelical adults (those in Generation Z aged 18–23) with their parents' generations (Generation X and the Baby Boomers; ages 40–74) and the broader evangelical and general publics (figure 1). Utilizing data from two national surveys, we ask: (a) how do the climate beliefs of young evangelicals compare with their perceptions of their own parents/guardians? (b) how do the climate beliefs and attitudes of young evangelicals compare with evangelicals in general and older evangelicals in particular; and (c) how do the climate beliefs and attitudes of young evangelicals compare with the American public in general and young Americans in particular? The results offer an effective view of this important population along with implications for climate change action and policy.

2. Data and methods

This study uses data from two national surveys (Total $n = 3395$) that were conducted online during the same time period, and which utilize identically worded questions and response categories on variables of interest. The first dataset is a nationally representative sample comprising two waves of the *Climate Change in the American Mind* (CCAM) project, which is a collaboration between the Yale Program on Climate Change Communication and the George Mason University Center for Climate Change Communication (Mason 4C). These probability-based samples were drawn from the Ipsos KnowledgePanel®, which uses random digit dial and address-based sampling techniques to recruit panel members who are then loaned computers and given internet access if needed in order to participate. The first sampling wave used here was conducted in November 2019 and the second wave was conducted in April 2020. These consecutive waves were combined in order to increase subsample sizes across categories of interest, which result in a sample size of $n = 2332$ for the CCAM survey. While conducted approximately five months apart, climate views remained relatively stable during this period, and we did not identify any major events likely to have shifted responses between the waves. This combined dataset will be referred to as the 'CCAM dataset.'

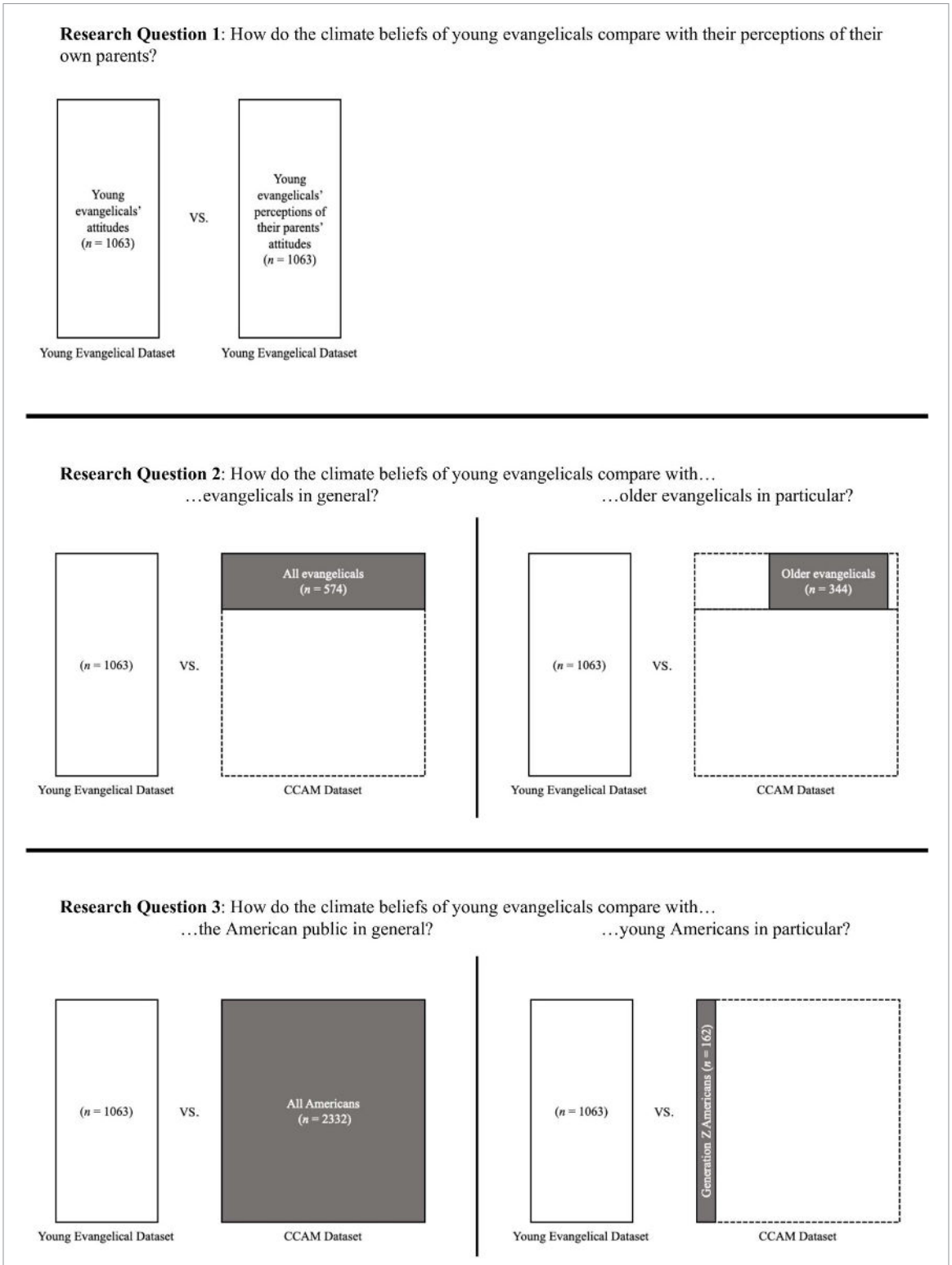

Figure 1. Conceptual overview of the respective comparisons by research question.

A main challenge to examining generational differences among evangelicals is that general population surveys do not contain large enough subsets of evangelical respondents to conduct rigorous comparisons within and between generations (e.g. combining the two CCAM waves resulted in a subsample of only 26 evangelical Generation Z respondents, or 1% of the total sample). To address this limitation, we conducted an additional survey of undergraduate students (ages 18–23) at 35 evangelically aligned Christian universities across 19 states (see supplemental information for a list of the institutions; overall response rate is 58%). Approval for this survey was obtained from the Institutional Review Boards of each institution involved in the study.

Surveying students in undergraduate courses is a widely used approach for data collection in the environmental social sciences (e.g. Schultz *et al* 2000,

Table 1. Generational boundaries used in this study (based on Dimock 2019).

Generational label	Birth years
Generation Z	1997–2012
Millennials	1981–1996
Generation X	1965–1980
Baby boomers	1946–1964
Silent generation	1928–1945
Greatest generation	1901–1927

Markowitz 2012, Carlton and Jacobson 2013), as well as across social-scientific research more broadly (Hanel and Vione 2016). It is considered particularly appropriate and useful when the resulting samples match the research questions (Henry 2008), as is the case given our focus on college-aged evangelicals. Recent research has also found college student datasets to outperform professional panel data and be comparable in quality to Amazon's MTurk (Kees *et al* 2017). Given that the young evangelical dataset is not a probability-based sample, however, caution should be taken in generalizing our results without further replication (Peterson 2001, Peterson and Merunka 2014). Nonetheless, this design does offer particular insight into those students (and parents) who prioritize religious-based higher education, and thus are also likely to be highly religiously engaged.

Data from this population were collected in February–April 2020 through an online Qualtrics survey delivered to select general education and introductory science courses. These courses comprised students from a wide range of academic majors, and surveys were conducted before related topics were addressed in class. Only respondents from Generation Z (i.e. those born after 1996) who self-identified as 'evangelical or born-again' (66% of the full sample) were retained for this analysis, which results in a sample size of $n = 1063$. Focusing on Generation Z, which includes the age range of traditional undergraduate students at the time of sampling, enabled us to expand beyond studies focused on the preceding Millennial generation. This dataset will be referred to throughout this paper as the 'young evangelical dataset.'

2.1. Instrumentation and variables

The questions and response categories (supplemental information; table S1) used by both surveys in this study were drawn verbatim from the broader CCAM project, which has been surveying the U.S. population biannually since 2008. The young evangelical survey also includes additional questions about students' perceptions of their parents' climate beliefs and political views. Generational definitions and age divisions used in this study are based on those used by Pew Research Center (Dimock 2019; table 1).

There is some debate over whether the term 'climate change' or 'global warming' is more polarizing, and which one is best to use in research, education, and communication (Leiserowitz *et al* 2014). At the same time, recent research suggests that there may not currently be significant differences between them (Soutter and Mõttus 2020). As the CCAM project uses the term global warming, this verbiage was maintained in the young evangelical survey for consistency.

2.2. Data processing and analysis

Data were analyzed using International Business Machines Corporation's (IBM) Statistical Program for the Social Sciences (SPSS Version 27). The CCAM dataset was weighted according to U.S. Census parameters. The young evangelical dataset was not weighted because precise parameters for this population are not known. Responses of 'unknown' were treated as missing, and missing values analysis of the young evangelical dataset ($n = 1063$) showed an arbitrary pattern with an overall missing value rate of 5.79%. To maximize the sample size and minimize sampling bias, missing values were estimated through multiple imputation (ten imputations) using the Markov Chain Monte Carlo (MCMC) algorithm with fully conditional specification (Schafer and Graham 2002, Yuan 2010).

Following multiple imputation, both datasets were combined, and a 'risk perception index' was created using the five questions around perceived harm from global warming. This index was tested using Cronbach's alpha ($\alpha = 0.90$) and common factor analysis using principal axis factoring. Additionally, 'Six Americas' audience segments were calculated for both datasets using the validated 'Six Americas Short Survey' tool (Chryst *et al* 2018).

McNemar tests (for dichotomous variables) and McNemar-Bowker tests (for nominal variables with more than two levels) were used to analyze paired data comparing young evangelical respondents with the perceptions they have of their parents' opinions about identical questions. We conducted additional analyses (using Two-Sample McNemar tests) of the paired student/students'-perceptions-of-parents data that controlled for sex and race. Chi-square tests for independence were used to compare CCAM and young evangelical respondents with each other across generational, evangelical, race, and gender categories. For research question 2 (comparing young evangelicals to evangelicals in general), we defined 'older evangelicals' in the CCAM dataset as those who fell into the Generation X and Baby Boomer generations, as these two generations most closely match the parents of those in Generation Z (i.e. our 'young evangelicals'). Since the focus of this study is on comparing Generation Z with their parents' generations, our analyses do not include Millennials as they fall in between.

As SPSS does not currently offer pooled results for Chi-square tests on multiple imputations, we pooled each of the outputs into a single result using the

'miceadds' package in R. This package offers a function (micombine.chisquare) that pools Chi-square results across multiple imputations into an F-statistic using formulas based on the D2 statistic (Marshall *et al* 2009, Enders 2010, Heymans and Eekhout 2019). Based on recommendations for pooling Chi-square results developed and tested by Eekhout *et al* (2017), effects sizes are given using the median values of either Phi (for two-by-two comparisons) or Cramer's V (for comparisons greater than two-by-two). Due to the number of comparisons being made, the Šidák correction was used to control for the family-wise error rate (Abdi 2007). The corrected significance threshold for comparisons between variables used in all three research questions (i.e. 'global warming happening', 'global warming cause', 'partisan identification', and 'political ideology') is $p < 0.010$ while the corrected significance threshold for comparisons between variables used only in research questions two and three is $p < 0.013$.

3. Results

Details of all descriptive statistics and comparisons are provided in the Supplementary Material (tables S2–S15). In general, respondents in the young evangelical dataset report attending religious services significantly more often than evangelicals in the broader American public (i.e. from the CCAM dataset). This suggests that the type of young evangelical who opts to attend a religious university may, on average, be more religiously engaged than their counterparts who choose other universities (or no university at all). Respondents in the young evangelical dataset are also more likely than broader evangelicals to identify as politically conservative and Republican and perceive their parents to be even more conservative and Republican than themselves. They are also disproportionately female and white compared with Americans more broadly. This is unsurprising, however, as American evangelicals in general are disproportionately white and female (Pew Research Center 2014) and current undergraduate students in the U.S. are also disproportionately white and female (National Center for Education Statistics 2021). This is reflected in other climate studies using college student samples that obtained similar proportions of white and female respondents (e.g. Markowitz 2012, Harrod and Rolland 2020). Sociodemographic variables are included in each of the results tables below to help facilitate comparisons by research question.

3.1. Research question 1: how do the climate beliefs of young evangelicals compare with their perceptions of their own parents?

By a highly significant margin, young evangelicals are more likely to say that global warming is happening (89%) and anthropogenic (75%) compared with what they perceive their own parents believe (57% and 49% respectively; figure 2). While a slim majority of young evangelicals say that their parents agree with them that global warming is happening, approximately a third (34%) affirm that global warming is happening while reporting that their parents disagree. About three in ten (29%) young evangelicals also report having parents who disagree with them that global warming is caused by humans. Politically, young evangelicals are significantly less likely than their parents to identify as Republican or conservative, with more identifying as 'other' and 'middle of the road' (table 2). Based on their perceptions, their parents also appear to be significantly more conservative and Republican, and less accepting that global warming is happening, than results in the CCAM dataset from evangelicals in those comparable generations—Generation X and Baby Boomers—more broadly (table S3).

Female and male young evangelicals are not significantly different from each other in terms of how much they diverged from their parents (tables S4 and S5). White respondents are significantly more likely than respondents of color to differ from their perceptions of their parents' opinions on whether global warming is happening (table S6) and whether it is caused by humans (table S7). Notably, this is not because white respondents and respondents of color differ significantly from each other in their own climate beliefs, but because white students are less likely than students of color to perceive that their parent think global warming is happening and human caused. White students and their parents are also significantly more likely to be conservative (table S8) and Republican (table S9) than students of color and their parents.

3.2. Research question 2: how do the climate beliefs of young evangelicals compare with evangelicals in general and older evangelicals in particular?

Young evangelicals are consistently more likely than older evangelicals—and also more likely than average evangelicals across all generations—to hold pro-climate beliefs and attitudes (figure 3; detailed results in tables S10 and S13). An exception is on whether there is a scientific consensus about climate change, for which there was no significant difference between young and older evangelicals once the Sidak correction was applied. Notably, these relationships hold even when controlling for education level (tables S11 and S12). In terms of political variables, young evangelicals in our dataset are just as likely to identify as Republican (but less likely to identify as Democrat and more likely to identify as other/none) and even more likely to identify as conservative than evangelicals more broadly (figure 4). They also report attending religious services more regularly than both older evangelicals and evangelicals in general.

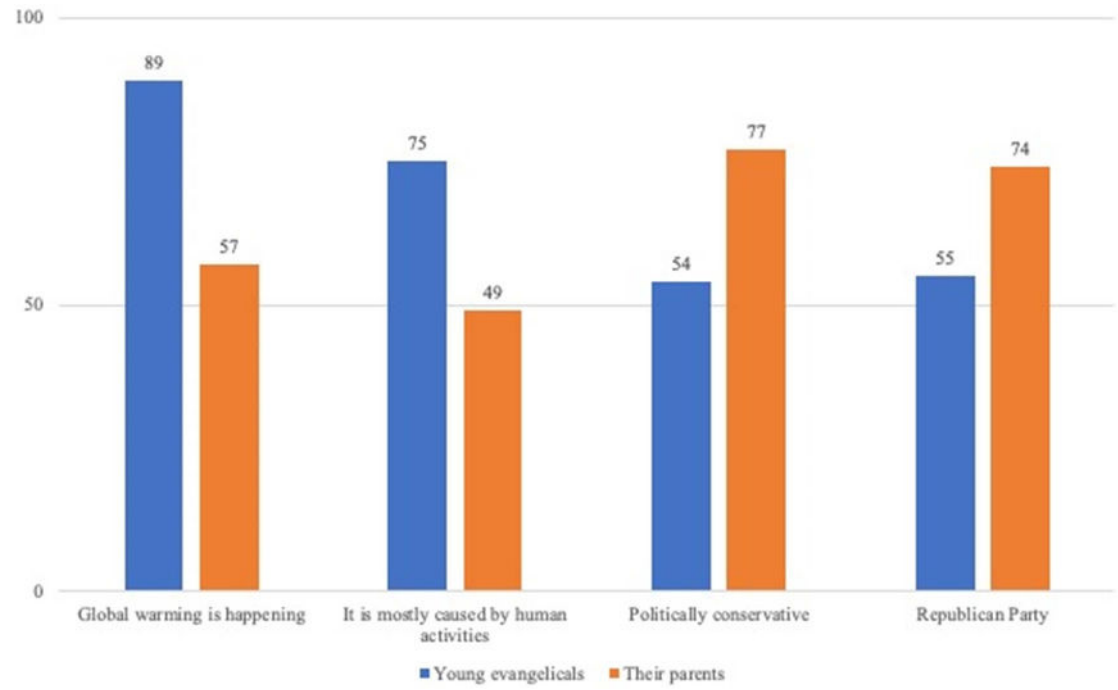

Figure 2. Comparing young evangelicals with their perceptions of their parents ($n = 1063$).

Table 2. Paired comparison of young evangelicals with their perceptions of their parents about climate change ($n = 1063$).

Variable	Response	Young evangelicals	Agreement w/parents	
			Agree	Disagree
Happening[a]	Yes	89%	55% (parents—yes)	34% (parents—no)
	No	11%	10% (parents—no)	1% (parents—yes)
Cause[a]	Human	75%	45% (parents—human)	29% (parents—not human)
	Not human	25%	21% (parents—not human)	4% (parents—human)
Ideology[a]	Conservative	54%	50% (parents—conservative)	3% (parents—middle of the road) 2% (parents—liberal)
	Middle of the road	33%	11% (parents—middle of the road)	21% (parents—conservative) 2% (parents—liberal)
	Liberal	12%	3% (parents—liberal)	6% (parents—conservative) 3% (parents—middle of the road)
Party[a]	Republican	55%	51% (parents—Republican)	2% (parents—Democrat) 3% (parents—other)
	Democrat	12%	5% (parents—Democrat)	5% (parents—Republican) 2% (parents—other)
	Other	33%	12% (parents—other)	18% (parents—Republican) 2% (parents—Democrat)

aMcNemar test (for dichotomous variables) and McNemar-Bowker results (for variables with >2 categories) significant at $p < 0.001$ (corrected significance threshold $p = 0.01$).

3.3. Research question 3: how do the climate beliefs of young evangelicals compare with the American public in general and young Americans in particular?

While young evangelicals are more likely than the general public to say that global warming is happening and caused by humans, they are less likely to say there is a scientific consensus (figure 3; detailed results in tables S14 and S15). They also tend to perceive greater risk from global warming and yet be less worried. Their higher levels of perceived risk are focused more on distant subjects including future generations and non-human plant/animal species (table S14). When compared with the broader Generation Z, they do not differ significantly on whether global warming is happening, whether it is caused by humans, whether there is a scientific consensus, or their risk perception, but they are significantly less likely to be as worried or perceive global warming to be important.

While not significantly different in their support for regulating carbon dioxide, young evangelicals are

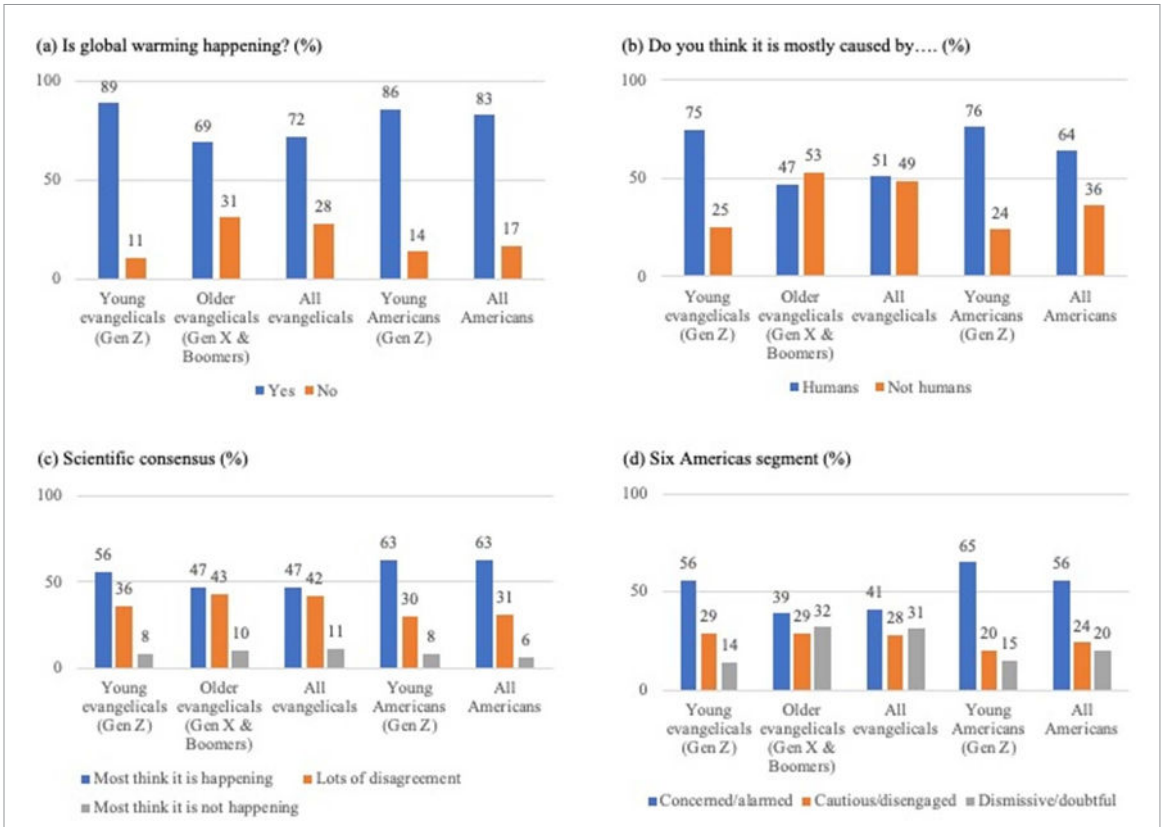

Figure 3. Comparing young evangelicals ($n = 1063$) with older evangelicals ($n = 344$), all evangelicals ($n = 574$), young Americans ($n = 162$), and all Americans ($n = 2332$) across key climate variables.

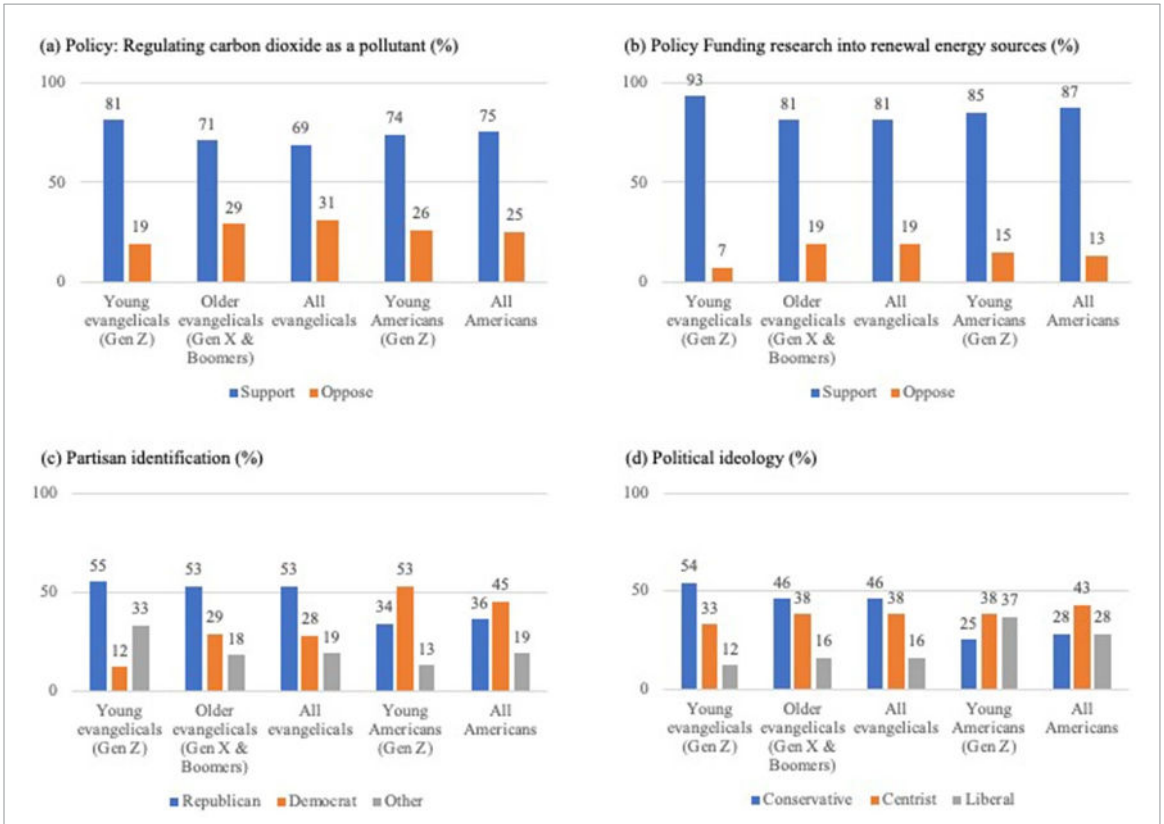

Figure 4. Comparing young evangelicals ($n = 1063$) with older evangelicals ($n = 344$), all evangelicals ($n = 574$), young Americans ($n = 162$), and all Americans ($n = 2332$) across policy and political variables.

more likely than both other Generation Z Americans and the general public to support funding for renewable energy research (figures 4(a) and (b)). At the same time, young evangelicals are more likely than other Generation Z Americans and the general public to identify as Republican or conservative and less likely to identify as Democrat or middle of the road/liberal (figures 4(c) and (d)).

4. Discussion

Our results consistently demonstrate a generational divide in climate beliefs and attitudes among American evangelicals, with the exception of views about the scientific consensus on climate change. Young evangelicals hold more pro-climate positions than their own parents, older evangelicals more broadly, and the evangelical community in general. These findings align with a popular narrative in the news media that young adults are changing the social and political culture around global warming among American evangelicals (e.g. Subramanian 2018, Krantz 2019, Goering 2021, Morris 2021). The divergence in attitudes between young evangelicals and their parents is particularly notable because studies on adolescents have found that family and parental influence can be a significant predictor of climate change concern (Mead *et al* 2012, Stevenson *et al* 2019).

The generational gaps identified here appear especially pronounced among white evangelicals, because white parents are perceived as more skeptical about global warming than parents of color. This suggests that racial divides in climate beliefs among evangelicals are more pronounced among older generations but may be waning in younger generations. We concur with other studies calling for greater attention to such differences between white evangelicals and evangelicals of color when it comes to climate and environmental concerns (Peifer *et al* 2014, Veldman *et al* 2021).

Our results also show that, while young evangelical respondents perceive themselves as more pro-climate and less politically conservative than they perceive their parents, they are more pro-climate but also *more* politically conservative than older evangelicals more broadly. With a few exceptions, young evangelicals' climate beliefs and attitudes largely do not differ from Generation Z Americans more broadly, even though they remain significantly more Republican and politically conservative than their peers. These nuanced findings suggest the possibility that some level of decoupling may be taking place among young evangelicals between their climate beliefs and political views. Similar to trends being observed among young Republicans (Funk and Tyson 2020, Pew Research Center 2020), young evangelicals may be growing more pro-climate without necessarily becoming politically progressive. This could make bipartisan collaboration more critical for passing climate policies, but it could also make it more likely.

Young evangelicals are more likely than average Americans to say that global warming is happening, yet, as with other evangelicals, are less likely to agree that there is a scientific consensus. Given how much scientific skepticism and climate doubt has been promoted within evangelical and conservative communities over the years, it is unsurprising that there are lower levels of awareness about the scientific consensus on anthropogenic global warming (Veldman 2019). Such efforts to sow scientific uncertainty can be particularly effective in shaping negative attitudes toward climate action (Rode *et al* 2021). Thus, what is more notable is that our findings suggest young evangelicals may think global warming is happening without necessarily having an accurate understanding of the scientific consensus. This ties in with findings in the climate change literature that younger generations may have high levels of concern about global warming while also having inaccurate knowledge about the scientific basis or solutions (Corner *et al* 2015, Huxster *et al* 2015). There are multiple potential explanations for these apparent contradictions, including that beliefs about climate change are shaped more by the confidence of one's understanding of the issue (i.e. meta-knowledge) rather than the actual accuracy (i.e. objective knowledge) of one's understanding (Fischer and Said 2021). In the case of American evangelicals, the prominent climate deniers in this community tend to have older audiences and be from older generations themselves (Lowe *et al* 2022b). Young evangelicals are likely exposed to these skeptical voices that may reflect general partisan views about science issues in civic life (Pew Research Center 2020)—especially if their parents or churches promote them—yet, nonetheless believe that climate change is a real and anthropogenic problem.

Compared with the general public, young evangelicals also tend to perceive greater risk from global warming overall and yet be less worried about. This apparent inconsistency could be due to their view that harm from global warming would be greater for more distant subjects such as developing countries, future generations, and other species, than for themselves. Another possible explanation has to do with how evangelicals tend to view God's role in relation to human agency and world events. If they believe that God is in control of what happens then this could lead to lower levels of worry about risks such as global warming.

Young evangelicals also rate global warming as somewhat less important than the general public, which suggests that they may care more about other higher priority issues. At the same time, however, a national survey conducted by a major evangelical-aligned campus ministry, InterVarsity

Christian Fellowship, found their students identified climate change as the second most important social issue, just behind racial justice and ahead of reducing abortion and promoting religious tolerance/-freedom (Gryboski 2021). Whatever the case may be, just because evangelicals may be growing more accepting and less skeptical about global warming does not *necessarily* mean that it is a high priority to address relative to other concerns. Instead of trying to persuade evangelicals to elevate global warming on their list of priorities, an alternative strategy would be to show how global warming connects with what people already care about (Hayhoe 2018). For example, given the connections between climate/environmental issues and human health/life, the Evangelical Environmental Network has often framed these as 'pro-life' concerns, which is an issue many evangelicals are already passionate about (Bloomfield 2020).

In terms of support for climate policies, although young evangelicals report being less worried about global warming and view it as less personally important than young Americans more broadly, they do not differ significantly in their support for regulating carbon dioxide and are even *more* supportive of funding for renewable energy research. This is surprising because evangelicals (and political conservatives) have been known to be more skeptical about the role of collective and policy solutions in addressing environmental concerns (Smith *et al* 2018). In fact, some of the most prominent opponents of climate action and policies have been self-identified evangelicals who interpret certain biblical passages in ways that support their skepticism (Lowe *et al* 2022b). Yet, we found young evangelicals to be just as or even more likely to support government intervention on this issue, even though they are also more likely to identify as conservative. This suggests that one of the major constituencies previously in the way of passing climate change legislation in the U.S. may be wanning in their opposition.

Interestingly, young evangelicals' climate beliefs and attitudes appear more closely aligned with fellow young Americans than with fellow evangelicals. This makes sense as Generation Z has only known the reality of a warmer-than-average world where climate impacts have continued to intensify (NOAA 2022). Unlike their parents' generation, they are less likely to be influenced by the older religious right leaders who aggressively opposed climate and environmental concerns; or by earlier controversies like whether the earth was cooling and the partisan polarization surrounding former U.S. Vice President Al Gore's film, *An Inconvenient Truth*. Instead, they have experienced rising climate and environmental concern across much of society—including prominent examples of youth climate activism worldwide—and often are heavily involved in social media, where they can be exposed to a wide range of voices and ideas from both across and beyond their faith community. Thus, their subjective norms around climate change likely differ considerably from their parents and older generations.

While examining such potential drivers behind this generational gap in climate attitudes is beyond the scope of this paper, our findings support the argument that being an evangelical is not in itself a barrier to being pro-climate action. They also indicate that, although the evangelical institutions surveyed in this study tend to be more conservative overall, these campuses are still places where young evangelicals can be aware and concerned about global warming. A study testing the impacts of a recorded climate lecture at three evangelical colleges found lasting attitudinal gains among students (Hayhoe *et al* 2019). Investing in climate and environmental mobilization efforts at Christian colleges and universities may be a strategic way to reach rising generations of evangelicals and thus shape Christian communities more broadly (Lamb *et al* 2019).

A limitation of this study is that the young evangelical dataset relies on students' perceptions of their parents' views for the paired comparisons. Using student perceptions as proxy reports of parental characteristics is common in the social sciences, though the reliability and validity of such data can vary (Kayser and Summers 1973, Looker 1989, Lien *et al* 2001, Taber 2010, Hou *et al* 2020). The accuracy of proxy data tends to be higher for older over younger students, females over males, majority over minority races, and questions focused on objective items over abstract concepts, which aligns well with our young evangelical dataset (Kerckoff *et al* 1973, Looker 1989, Taber 2010, Ridolfo and Maitland 2011, Hou *et al* 2020). Additionally, children's perceptions of their parents' beliefs have been found to be influential regardless of whether the perceptions are accurate (Šimunović *et al* 2018). A related limitation is that, to keep the survey within time constraints, we did not ask respondents to specify whether they were reporting on one or more parent/guardian, or their genders. This could elide any differences in views some respondents may perceive between their parents/guardians, and studies have also shown that there can be gender differences in knowledge and attitudes about climate change (e.g. McCright 2010, McCright and Dunlap 2011).

Additionally, the young evangelical dataset is not necessarily representative of all young evangelicals. Respondents were enrolled in university and thus may tend to have higher socio-economic status and potentially more interest in science, which has been shown to predict trust in climate scientists (Motta 2018). We sought to minimize these potential biases by controlling for education and sampling in general education courses that cater to students with a wide range of majors. Nevertheless, further research is needed before generalizing our findings, and the

results from comparing across the two datasets in particular should be viewed as exploratory.

Future research can also examine the drivers behind this generational gap, as well as how the climate attitudes of young evangelicals may change over time. While intensifying impacts from global warming will continue to strengthen the case for greater mitigation and adaptation, it remains to be seen how the concerns and perceived interests of Generation Z may evolve as they grow into new life stages. Furthermore, beliefs and attitudes on their own do not necessarily result in change; they must also be translated into behaviors and actions that are sustained over time.

5. Conclusion

Given the critical role of the United States in global climate action, and the influential role of evangelicals in American society and politics, there is considerable interest in whether evangelicals can become less skeptical of anthropogenic global warming and more supportive of climate and clean energy policies. This study offers initial evidence that such changes may indeed be taking place across generations, with young evangelicals holding more pro-climate beliefs and attitudes than their parents and older generations more broadly. Interestingly, young evangelicals seem closer in their climate views to their generation than to their evangelical faith community, including in their support for policies regulating carbon dioxide and funding renewable energy research. This suggests that a 'greening' of evangelicals' beliefs and attitudes about global warming may be taking place across generations, even among more politically conservative (and majority white) evangelicals. If this trend continues, it could change the political calculus around climate policies and also bring bi-partisan action within greater reach. Groups working to tackle global warming, especially those focused on building broader and more diverse coalitions, should pursue opportunities to build relationships, support, and collaborations with the growing majorities of young evangelicals who share these pressing concerns.

Data availability statement

The data that support the findings of this study are available upon request from the authors.

Acknowledgments

Partial support for this research was awarded to B S Lowe by the National Science Foundation Graduate Research Fellowship (Grant No. DGE-1842473) and the Religious Research Association's Constant H Jacquet Research Award. We are grateful to the Au Sable Institute and supporting faculty at each of the participating institutions for their valuable assistance in this study, to J Colee and S Lamb for input on the analysis, and to R Lamb and the anonymous reviewers for helpful feedback that improved the article.

Author contributions

B L, S J, G I, J K, E M, S R, and A L conceived and designed the study. B L, J K, E M, S R, and A L collected the data. B L, S J, and G I conducted the analyses. B L, S J, G I, J K, S R, E M, and A L wrote the manuscript.

Declaration of interest statement

The authors declare that they have no conflicts of interest.

Ethics statement

This study meets the ethical standards of the University of Florida's Institutional Review Board, including procedures for the informed consent of human participants (Approved as Exempt on 12/6/2019 under IRB#201903125)

ORCID iDs

Benjamin S Lowe https://orcid.org/0000-0002-1879-254X
Susan K Jacobson https://orcid.org/0000-0001-5992-939X
Glenn D Israel https://orcid.org/0000-0002-1328-0262
John E Kotcher https://orcid.org/0000-0003-4789-1384
Seth A Rosenthal https://orcid.org/0000-0003-0950-2261
Edward W Maibach https://orcid.org/0000-0003-3409-9187
Anthony Leiserowitz https://orcid.org/0000-0001-5349-409X

References

Abdi H 2007 *Encyclopedia Meas. Stat.* (available at: www.ressources-actuarielles.net/ext/isfa/1226.nsf/d512ad5b22d73cc1c1257052003f1aed/e9ae0885fb4f7e17c125787300722b5b/$FILE/Abdi_2007.pdf)

Arbuckle M B 2017 The interaction of religion, political ideology, and concern about climate change in the United States *Soc. Nat. Resour.* **30** 177–94

Ballew M, Marlon J, Kotcher J, Maibach E, Rosenthal S, Bergquist P, Gustafson A, Goldberg M and Leiserowitz A 2020 Young adults, across party lines, are more willing to take climate action (New Haven, CT: Yale University and George Mason University, Yale University and George Mason University, Yale Program on Climate Change Communication) (available at: https://climatecommunication.yale.edu/publications/young-adults-climate-activism/)

Ballew M, Marlon J, Rosenthal S, Gustafson A, Kotcher J, Maibach E and Leiserowitz A 2019 Do younger generations care more about global warming? (New Haven, CT: Yale University and George Mason University, Yale Program on

Climate Change Communication) (available at: https://climatecommunication.yale.edu/publications/do-younger-generations-care-more-about-global-warming)
Bean L and Teles S 2015 Spreading the gospel of climate change: an evangelical battleground (Washington, DC: New America) (available at: https://static.newamerica.org/attachments/11649-spreading-the-gospel-of-climate-change/climate_care11.9.4f0142a50aa24a2ba65020f7929f6fd7.pdf)
Bloomfield E F 2020 The reworking of evangelical Christian ecocultural identity in the creation care movement *Routledge Handbook of Ecocultural Identity* (London: Routledge) pp 195–207
Carlton S J and Jacobson S K 2013 Climate change and coastal environmental risk perceptions in Florida *J. Environ. Manage.* **130** 32–39
Chryst B, Marlon J, van der Linden S, Leiserowitz A, Maibach E and Roser-Renouf C 2018 Global warming's "six Americas short survey": audience segmentation of climate change views using a four question instrument *Environ. Commun.* **12** 1109–22
Clements J M, Xiao C and McCright A M 2014 An examination of the "greening of Christianity" thesis among Americans, 1993–2010 *J. Sci. Study Relig.* **53** 373–91
Climate Nexus 2020 Interfaith power and light national climate change poll (available at: https://climatenexus.org/wp-content/uploads/2015/09/IPL-National-Climate-Change-Poll.pdf)
Corner A, Roberts O, Chiari S, Völler S, Mayrhuber E S, Mandl S and Monson K 2015 How do young people engage with climate change? The role of knowledge, values, message framing, and trusted communicators *Wiley Interdiscip. Rev. Clim. Change* **6** 523–34
Danielsen S 2013 Fracturing over creation care? Shifting environmental beliefs among evangelicals, 1984–2010 *J. Sci. Study Relig.* **52** 198–215
Dimock M 2019 Defining generations: where Millennials end and Generation Z begins *FactTank* (Pew Research Center) (available at: https://pewrsr.ch/2szqtJz) (Accessed 17 January 2019)
Dunlap R E, McCright A M and Yarosh J H 2016 The political divide on climate change: partisan polarization widens in the US *Environment* **58** 4–23
Eekhout I, Van De Wiel M A and Heymans M W 2017 Methods for significance testing of categorical covariates in logistic regression models after multiple imputation: power and applicability analysis *BMC Med. Res. Methodol.* **17** 1–12
Enders C K 2010 *Applied Missing Data Analysis* (New York: Guilford Press)
Fischer H and Said N 2021 Importance of domain-specific metacognition for explaining beliefs about politicized science: the case of climate change *Cognition* **208** 104545
Funk C and Tyson A 2020 Millennial and Gen Z Republicans stand out from their elders on climate and energy issues (Pew Research Center) (available at: www.pewresearch.org/fact-tank/2020/06/24/millennial-and-gen-z-republicans-stand-out-from-their-elders-on-climate-and-energy-issues)
Goering L 2021 Young evangelicals push to 'build a bigger choir loft' for U.S. climate action *(Reuters)* (available at: www.reuters.com/article/us-climate-change-usa-religion-idUSKBN2CT1PK)
Gryboski M 2021 Racial justice top social issue among InterVarsity Christian students: poll *The Christian Post* (available at: www.christianpost.com/news/racial-justice-top-social-issue-among-intervarsity-members-poll.html)
Haluza-DeLay R 2014 Religion and climate change: varieties in viewpoints and practices *Wiley Interdiscip. Rev. Clim. Change* **5** 261–79
Hamilton L C, Hartter J and Bell E 2019 Generation gaps in US public opinion on renewable energy and climate change *PLoS One* **14** e0217608
Han H and Ahn S W 2020 Youth mobilization to stop global climate change: narratives and impact *Sustainability* **12** 4127
Hanel P H and Vione K C 2016 Do student samples provide an accurate estimate of the general public? *PLoS One* **11** e0168354
Harrod S E and Rolland V 2020 Factors associated with attitudes and knowledge of first-semester college students toward climate change *BioScience* **71** 415–25
Hayhoe D, Bloom M A and Webb B S 2019 Changing evangelical minds on climate change *Environ. Res. Lett.* **14** 024016
Hayhoe K 2018 When facts are not enough *Science* **360** 943
Hempel L and Smith E K 2020 Evangelical protestantism, politics, and the environment: when and how do biblical beliefs matter? *Soc. Nat. Resour.* **33** 594–611
Henry P J 2008 Student sampling as a theoretical problem *Psychol. Inq.* **19** 114–26
Heymans M W and Eekhout I 2019 Applied missing data analysis with SPSS and (R) Studio (Amsterdam) (available at: bookdown.org/mwheymans/bookmi)
Hitzhusen G E 2007 Judeo-Christian theology and the environment: moving beyond scepticism to new sources for environmental education in the United States *Environ. Educ. Res.* **13** 55–74
Hou Y, Benner A D, Kim S Y, Chen S, Spitz S, Shi Y and Beretvas T 2020 Discordance in parents' and adolescents' reports of parenting: a meta-analysis and qualitative review *Am. Psychol.* **75** 329
Huxster J K, Uribe-Zarain X and Kempton W 2015 Undergraduate understanding of climate change: the influences of college major and environmental group membership on survey knowledge scores *J. Environ. Educ.* **46** 149–65
Jones R P, Cox D and Navarro-Rivera J 2014 Believers, sympathizers, and skeptics: why Americans are conflicted about climate change, environmental policy and science: findings from the PRRI/AAR religions, values, and climate change survey (available at: www.prri.org/wp-content/uploads/2014/11/2014-Climate-Change-FINAL1-1.pdf)
Kayser B D and Summers G F 1973 The adequacy of student reports of parental SES characteristics *Sociol. Methods Res.* **1** 303–15
Kees J, Berry C, Burton S and Sheehan K 2017 An analysis of data quality: professional panels, student subject pools, and Amazon's Mechanical Turk *J. Advert.* **46** 141–55
Kerckhoff A C, Mason W M and Poss S S 1973 On the accuracy of children's reports of family social status *Sociol. Educ.* **46** 219–47
Konisky D M 2018 The greening of Christianity? A study of environmental attitudes over time *Environ. Polit.* **27** 267–91
Krantz L 2019 For evangelicals, climate change causes a split between young and old that could hurt republicans *The Boston Globe* (available at: www.bostonglobe.com/news/politics/2019/12/28/for-evangelicals-climate-change-causes-split-between-young-and-old-that-could-hurt-republicans/YiUEhdCIE8wlN60kiVR7GK/story.html)
Lamb R L, Lowe B S and Meyaard-Schaap K J 2019 Renewing evangelical engagement on climate change: the birth and growth of" young evangelicals for climate action" *Perspect. Sci. Christ. Faith* **71** 50–51
Lawson D F, Stevenson K T, Peterson M N, Carrier S J, L, Strnad R and Seekamp E 2019 Children can foster climate change concern among their parents *Nat. Clim. Change* **9** 458–62
Lawson D F, Stevenson K T, Peterson M N, Carrier S J, Strnad R and Seekamp E 2018 Intergenerational learning: are children key in spurring climate action? *Glob. Environ. Change* **53** 204–8
Leiserowitz A, Feinberg G, Rosenthal S, Smith N, Anderson A, Roser-Renouf C and Maibach E 2014 What's in a name? Global warming vs. climate change (New Haven, CT: Yale University and George Mason University, Yale Project on Climate Change Communication) (available at: https://climatecommunication.yale.edu/publications/whats-in-a-name-global-warming-vs-climate-change)
Leiserowitz A, Maibach E, Rosenthal S, Kotcher J, Carman J, Wang X, Marlon J, Lacroix K and Goldberg M 2021 Climate Change in the American Mind, March 2021 (New Haven,

CT: Yale University and George Mason University, Yale Program on Climate Change Communication) (available at: https://climatecommunication.yale.edu/publications/climate-change-in-the-american-mind-march-2021)
Lien N, Friestad C and Klepp K I 2001 Adolescents' proxy reports of parents' socioeconomic status: how valid are they? *J. Epidemiol. Community Health* **55** 731–7
Looker E D 1989 Accuracy of proxy reports of parental status characteristics *Sociol. Educ.* **62** 257–76
Lowe B S, Israel G D, Paudyal R and Wallen K E 2022a The influence of evangelical and political identity on climate change views *Soc. Nat. Resour.* 1–18
Lowe B S, Lamb R L and Toly N J 2022b Climate skepticism, politics, and the bible *The Oxford Handbook of the Bible and Ecology* (Oxford : Oxford University Press) p 425
Markowitz E M 2012 Is climate change an ethical issue? Examining young adults' beliefs about climate and morality *Clim. Change* **114** 479–95
Marshall A, Altman D G, Holder R L and Royston P 2009 Combining estimates of interest in prognostic modelling studies after multiple imputation: current practice and guidelines *BMC Med. Res. Methodol.* **9** 1–8
McCright A M 2010 The effects of gender on climate change knowledge and concern in the American public *Popul. Environ.* **32** 66–87
McCright A M and Dunlap R E 2011 Cool dudes: the denial of climate change among conservative white males in the United States *Glob. Environ. Change* **21** 1163–72
Mead E, Roser-Renouf C, Rimal R N, Flora J A, Maibach E W and Leiserowitz A 2012 Information seeking about global climate change among adolescents: the role of risk perceptions, efficacy beliefs, and parental influences *Atl. J. Commun.* **20** 31–52
Morris A 2021 For these young evangelical activists, facing the climate crisis is an act of faith *Rolling Stone* (available at: www.rollingstone.com/culture/culture-features/young-evangelical-climate-change-activists-1144370)
Motta M 2018 The enduring effect of scientific interest on trust in climate scientists in the United States *Nat. Clim. Change* **8** 485–8
National Center for Education Statistics 2021 *Report on the Condition of Education: Undergraduate Enrollment* (Institute of Education Sciences, U.S. Department of Education) (available at: https://nces.ed.gov/programs/coe/indicator/cha)
NOAA National Centers for Environmental Information 2022 State of the climate: monthly global climate report for annual 2021(available at: www.ncei.noaa.gov/access/monitoring/monthly-report/global/202113) (Accessed 27 August 2022)
O'Brien K, Selboe E and Hayward B M 2018 Exploring youth activism on climate change *Ecol. Soc.* **23** 42
Peifer J L, Ecklund E H and Fullerton C 2014 How evangelicals from two churches in the American Southwest frame their relationship with the environment *Rev. Relig. Res.* **56** 373–97
Peterson R A 2001 On the use of college students in social science research: insights from a second-order meta-analysis *J. Consum. Res.* **28** 450–61
Peterson R A and Merunka D R 2014 Convenience samples of college students and research reproducibility *J. Bus. Res.* **67** 1035–41
Pew Research Center 2014 Religious landscape study (available at: www.pewforum.org/religious-landscape-study)
Pew Research Center 2019 In U.S., decline of Christianity continues at rapid pace (available at: www.pewforum.org/2019/10/17/in-u-s-decline-of-christianity-continues-at-rapid-pace)
Pew Research Center 2020 As economic concerns recede, environmental protection rises on public's policy agenda: partisan gap on dealing with climate change gets even wider (available at: www.pewresearch.org/politics/2020/02/13/as-economic-concerns-recede-environmental-protection-rises-on-the-publics-policy-agenda)
Pew Research Center 2021 Gen Z, Millennials stand out for climate change activism, social media engagement with issue (available at: www.pewresearch.org/science/2021/05/26/gen-z-millennials-stand-out-for-climate-change-activism-social-media-engagement-with-issue)
PRRI 2021 The 2020 census of American religion (available at: www.prri.org/wp-content/uploads/2021/07/PRRI-Jul-2021-Religion.pdf)
Reinhart R 2018 Global warming age gap: younger Americans most worried. Gallup (available at: https://news.gallup.com/poll/234314/global-warming-age-gap-younger-americans-worried.aspx)
Ridolfo H and Maitland A 2011 Factors that influence the accuracy of adolescent proxy reporting of parental characteristics: a research note *J. Adolesc.* **34** 95–103
Rode J B, Dent A L, Benedict C N, Brosnahan D B, Martinez R L and Ditto P H 2021 Influencing climate change attitudes in the United States: a systematic review and meta-analysis *J. Environ. Psychol.* **76** 101623
Schafer J L and Graham J W 2002 Missing data: our view of the state of the art *Psychol. Methods* **7** 147–77
Schultz P W, Zelezny L and Dalrymple N J 2000 A multinational perspective on the relation between Judeo-Christian religious beliefs and attitudes of environmental concern *Environ. Behav.* **32** 576–91
Šimunović M, Reić Ercegovac I and Burušić J 2018 How important is it to my parents? Transmission of STEM academic values: the role of parents' values and practices and children's perceptions of parental influences *Int. J. Sci. Educ.* **40** 977–95
Smith A E and Veldman R G 2020 Evangelical environmentalists? Evidence from Brazil *J. Sci. Study Relig.* **59** 341–59
Smith E K, Hempel L M and MacIlroy K 2018 What's 'evangelical' got to do with it? Disentangling the impact of evangelical protestantism on environmental outcomes *Environ. Polit.* **27** 292–319
Smith N and Leiserowitz A 2013 American evangelicals and global warming *Glob. Environ. Change* **23** 1009–17
Soutter A R B and Mõttus R 2020 "Global warming" versus "climate change": a replication on the association between political self-identification, question wording, and environmental beliefs *J. Environ. Psychol.* **69** 101413
Stevenson K T, Peterson M N and Bondell H D 2019 The influence of personal beliefs, friends, and family in building climate change concern among adolescents *Environ. Educ. Res.* **25** 832–45
Stover D 2019 Evangelicals for climate action *Bull. At. Sci.* **75** 66–72
Subramanian M 2018 Generation climate: can young evangelicals change the climate debate? Inside climate news (available at: https://insideclimatenews.org/news/21112018/evangelicals-climate-change-action-creation-care-wheaton-college-millennials-yeca)
Taber S M 2010 The veridicality of children's reports of parenting: a review of factors contributing to parent–child discrepancies *Clin. Psychol. Rev.* **30** 999–1010
Taylor B, Van Wieren G and Zaleha B D 2016 Lynn White Jr. and the greening-of-religion hypothesis *Conserv. Biol.***30** 1000–9
Veldman R G 2019 *The Gospel of Climate Skepticism: Why Evangelical Christians Oppose Action on Climate Change* (Oakland, CA: Univ of California Press) (https://doi.org/10.2307/j.ctvpb3zdh)
Veldman R G, Wald D M, Mills S B and Peterson D A 2021 Who are American evangelical Protestants and why do they matter for US climate policy? *Wiley Interdiscip. Rev. Clim. Change* **12** e693

Whitehead A L and Perry S L 2020 *Taking America Back for God: Christian Nationalism in the United States* (Oxford : Oxford University Press) (https://doi.org/10.1093/oso/9780190057886.001.0001)

Wilkinson K K 2012 *Between God and Green: How Evangelicals are Cultivating a Middle Ground on Climate Change* (Oxford : Oxford University Press) (https://doi.org/10.1093/acprof:oso/9780199895885.001.0001)

Yuan Y C 2010 *Multiple Imputation for Missing Data: Concepts and New Development (Version 9.0)* vol 49 (Rockville: SAS Institute Inc) pp 1–11