

April 17, 2019

## ***Cracking the Code: Exploratory and verification surveys on millennials and their science curiosity, interest, engagement, identity, media habits, and cultural and religious behaviors.***

Science media professionals make decisions every day. They usually involve editorial choices: what topic to cover; how to distribute the content (on a digital platform or social media, for example); what other packaging elements should be included (a video or an image); and what type of outreach will encourage engagement (a newsletter or alert). These decisions are based on the real-world experience and judgment of the media professional.

What is needed beyond these real-world professional “hunches” is the input of science communication researchers. Empirical researchers can equip media professionals with evidence about their hunches that are most likely to affect their reporting and producing practice by collaborating and bringing together media practices with their research.

***Cracking the Code: Influencing Millennial Science Engagement*** is a project to do just that. Its goal is to examine how to design and adopt new audience and editorial practices that combine the expertise of media professionals and science communication researchers to increase engagement with science media. We specifically want to study the millennial generation because it is soon to be the largest adult generation in the U.S., and this generation has already radically changed media consumption habits and will continue to do so. Ultimately, KQED believes the future of public media depends on reaching and keeping this critical audience engaged.

As a result, KQED undertook its first research project: conduct the first ever national survey of millennial science media habits and examine how political views, religious values and science curiosity interact with one another to influence science media consumption and engagement for this generation. The collaboration for this survey included KQED, Jacobs Media Strategies, The Science Communication and Cognition Lab at Texas Tech University and The Cultural Cognition Project at Yale Law School with funding from Templeton Religion Trust and the Templeton World Charity Foundation, with additional support from the National Science Foundation.

This collaboration embraced a unique approach to fact finding. Our goal was to use the procedures common in academic social science research to learn more about who does (and who does not) consume science-related media, how they consume it, who is science curious and how that curiosity could or could not affect cultural behavior.

## **Key Findings About Millennial Science Media Consumption Habits**

- When it comes to science content discovery, millennials are most likely to rely on their own instinct, rather than recommendations or familiar/trusted sources. Yet, expertise in the field is also an important criterion in determining the credibility of science content among millennials.
- Online video and social media are the top two sources for science content consumption among all millennials.
- Science curiosity and gender strongly predict different types of interest in science, such as life science, computer science and technology and health and wellness.

- Consistent with prior research, science curiosity is overall a stronger predictor of climate change beliefs than educational attainment.
- Most millennials say they can separate their personal political views from their opinions on science.
- Three in ten millennials feel their personal religious beliefs sometimes clash with their acceptance of scientific facts. That said, most millennials agree that religion and science can coexist.

## About Our Survey Methods

As is common in academic research, we began our study by investigating millennials' science media consumption habits in a large exploratory study. We call this the "exploratory phase." We then followed it up with a smaller study designed to replicate portions of the exploratory phase in a nationally representative sample of U.S. adults. We call this the "verification stage."

In the exploratory phase, KQED contracted Jacobs Media Strategies to survey a large number of millennials and non-millennials to provide an initial assessment and comparison of science media consumption habits, and to examine their levels of science curiosity. For this nationwide sample of millennials and non-millennials, Jacobs recruited from SoapBoxSample's online panel. In addition, the same survey questions were asked of a sample of regular science media consumers who were recruited from KQED's and its public media partners' database members. The survey instrument used to measure science curiosity, developed by Dan Kahan, Cultural Cognition Project at Yale Law School, and Asheley Landrum, Science Communication and Cognition Lab at Texas Tech University, is a tool used to predict engagement with, and interest in, science. During the exploratory phase data was also collected on millennial and non-millennial media habits, cultural and ideological behaviors, and spiritual and religious practice.

The exploratory study found that millennials were substantially more science curious than other age cohorts, and suggested that this generation makes up a large portion of the "missing science content audience." The missing audience here is defined as millennials that are science curious and are not engaging with public media at least monthly.

In the verification study, researchers Dan Kahan, Asheley Landrum and Matthew Motta, a postdoctoral fellow of the Annenberg Public Policy Center of the University of Pennsylvania and the Cultural Cognition Project at Yale Law School, sought to verify portions of the Jacobs study; specifically the findings related to the demographic profiles of science curious people who compose the missing audience. The verification study fielded a nationally representative sample of American adults, recruited via YouGov. The purpose of this study was to build on what we learned in the exploratory phase, and to determine whether or not the exploratory results for science curious millennials held in nationally representative data.

Using an updated metric for finding who can be considered part of the "missing science content audience," **the verification study reaffirmed that a large number of millennials are both high in science curiosity and low in science media consumption.** However, the study did not find that millennials were substantially more science curious than other generational cohorts as the first study did.

The differences found between the exploratory and verification studies may be partly attributed to the use of different non probability sampling methods used by the survey companies both to recruit participants from their online panel for our study as well as to populate their online panels.

## Future Research

Future research will continue to improve upon how we measure the size and demographic composition of the missing science content audience. In order to measure science media viewing across a wide range of platforms, we asked respondents to self-report media consumption habits in both the exploratory and verification stages of this research. Although this approach is efficient, one potential issue with self-reports is that people may inaccurately recall the types of media they use, and how often they use it; often leading to overestimates of consumption habits. This likely does not influence our conclusions about the composition of the engaged and missing science audiences, but it could be the case that our estimates of the overall size of each audience may be too large.

In future research, we will address this issue by developing behavioral measures of individuals' science media consumption habits. Rather than ask people about their science media viewing habits across a wide range of platforms, we will instead develop ways to *observe* science media consumption on just one or two platforms (as these types of measures tend to be more time intensive to administer than self-reports). Our hope is that results from future research can complement those observed from the exploratory and verification stages of this project by providing a sense of the extent to which self-reported measures may be overestimating science media consumption.

We are looking forward to expanding our understanding of millennials' science media consumption habits through future research and testing. We will be posting our findings and updates at **[KQED.org/CrackingtheCode](http://KQED.org/CrackingtheCode)**.

Thank you for your interest in this project. The results of both surveys are included in this document below.

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# EXPLORATORY SURVEY BY JACOBS MEDIA

October 2018

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KQED

**Jacobs**  
media strategies

TEMPLETON  
RELIGION TRUST

  
TEMPLETON WORLD  
CHARITY FOUNDATION

# CRACKING THE MILLENNIAL CODE

A STUDY ON THE SCIENCE MEDIA HABITS AND CULTURAL BELIEFS OF MILLENNIALS, THE MOST SCIENCE CURIOUS ADULT GENERATION IN THE U.S. *October 2018*

KQED

Jacobs  
media strategies

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## Partners

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NPR News ■ PBS NewsHour ■ PBS Digital Studios  
*Science Friday* ■ *Nature* ■ *NOVA* ■ *Scientific American*  
UNC-TV Public Media North Carolina ■ Twin Cities PBS

## Funders

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# Introduction

KQED, the NPR and PBS affiliate in San Francisco, in partnership with Jacobs Media Strategies, the Cultural Cognition Project at Yale Law School and Texas Tech University, along with several public media partners conducted the first ever survey of Millennial science media habits, science curiosity and cultural beliefs. Millennials, born between 1981 and 1996, are projected to soon be the largest and most diverse adult generation in the U.S. and have radically changed media consumption habits.

The study, entitled Cracking the Millennial Code, provides a greater understanding of how and if Millennials consume scientific information and how the interaction between science, politics, religious values and science curiosity will be key predictors for understanding science communication and this generation.

We particularly want to thank the Templeton World Charity Foundation and the Templeton Religion Trust for their generous support of this study. We'd also like to thank the National Science Foundation (NSF) for funding the publication and continuation of this study over the next three years.

For more information about Cracking the Millennial Code, please contact Sue Ellen McCann at [smccann@kqed.org](mailto:smccann@kqed.org).

# Methodology

## **National Panels Surveys (June/July 2018)**

- Nationally representative third party online panels of Millennials and Non-Millennials
- Average survey length: 15 minutes
- Data weighted to U.S. Census population figures

## **Partner Surveys (June/July 2018)**

- Dedicated/targeted email invites to member/audience database, Millennials and Non-Millennials (most partners)
- Online survey link embedded in weekly newsletters (some partners)
- Social media outreach (paid Facebook ads, Twitter posts) to further help reach Millennials
- Each partner had its own separate, individually branded survey
- Average survey length: 15 minutes
- Data is unweighted and represents those opting in to take the survey
- Widely varying degrees of participation among Millennials by partner
- Reflective of partners' audiences and/or database composition

# DEFINING THE GENERATIONS

GENERATION	BIRTH YEAR	AGE IN 2018	POPULATION ESTIMATE
Generation Z	1997-2015	3-21	77 million
<b>Millennials</b>	<b>1981-1996</b>	<b>22-37</b>	<b>72 million</b>
Generation X	1965-1980	38-53	66 million
Baby Boomers	1946-1964	54-72	73 million
Silent Generation	1917-1945	73+	26 million

*Source: Pew Research Center; U.S. Census estimates*

# Survey In-Tab Sample Sizes By National Panel Samples & Partner Studies

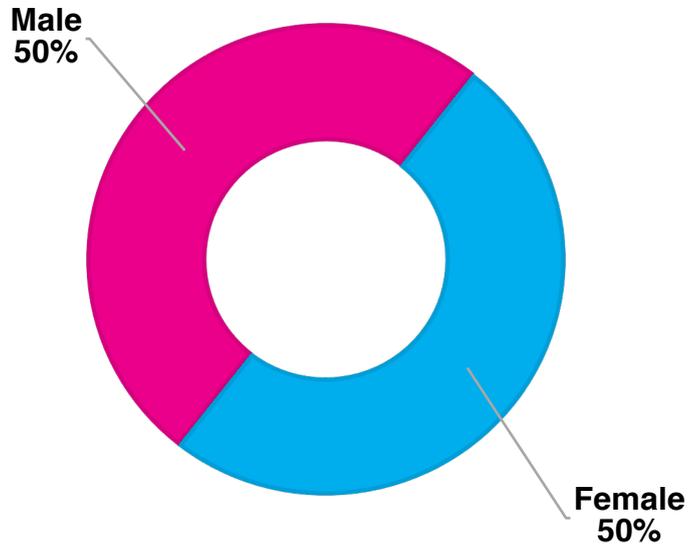
	<u>Millennials</u>	<u>Non-Millennials</u>
<b>National Panel Sample</b>	<b>1,176</b>	<b>838</b>
<b>NOVA</b>	<b>762</b>	<b>1105</b>
<b>Science Friday</b>	<b>133</b>	<b>683</b>
<b>NPR</b>	<b>121</b>	<b>289</b>
<b>Twin Cities Public TV</b>	<b>102</b>	<b>1,015</b>
<b>KQED</b>	<b>40</b>	<b>266</b>
<b>UNC-TV</b>	<b>39</b>	<b>128</b>
<b>PBS Digital Studios</b>	<b>34</b>	<b>10</b>
<b>PBS NewsHour</b>	<b>11</b>	<b>248</b>

# THE SAMPLE

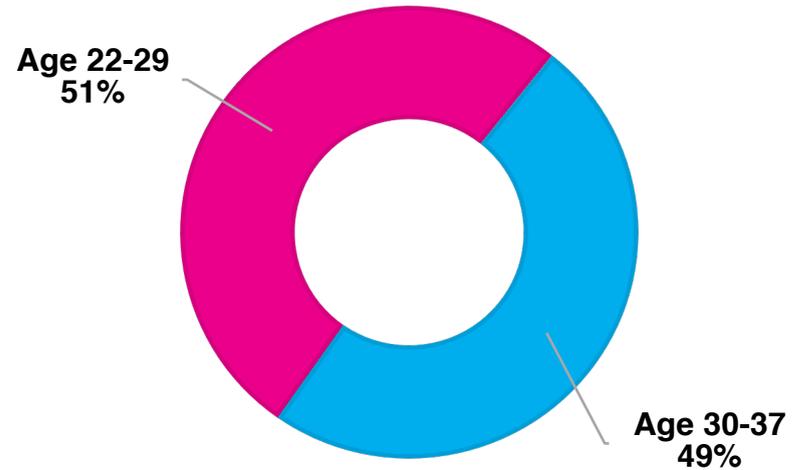


# Millennials: Gender & Age

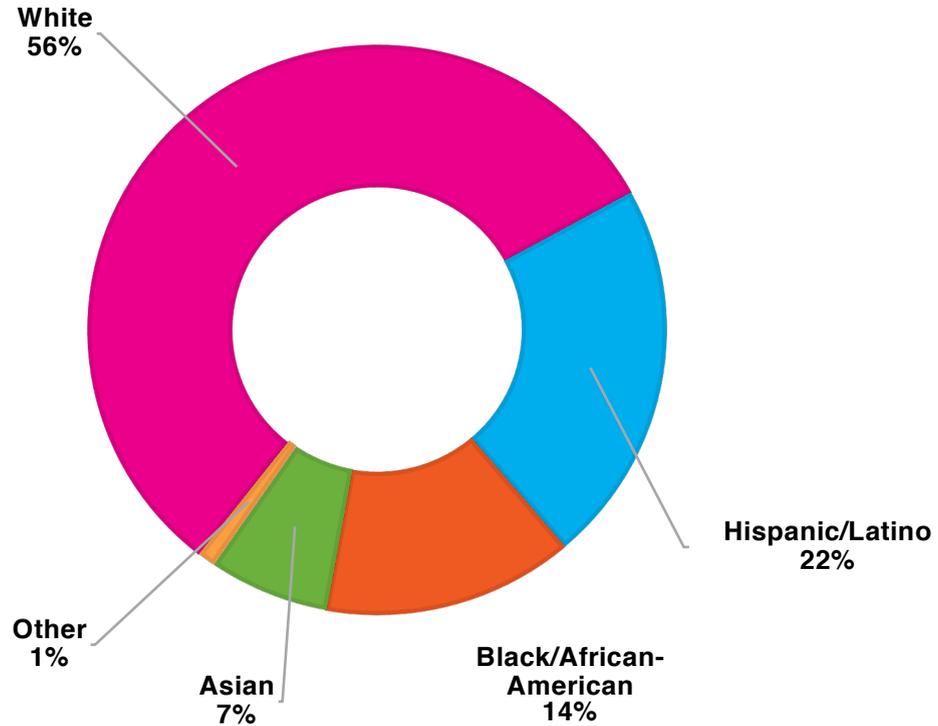
Gender



Age



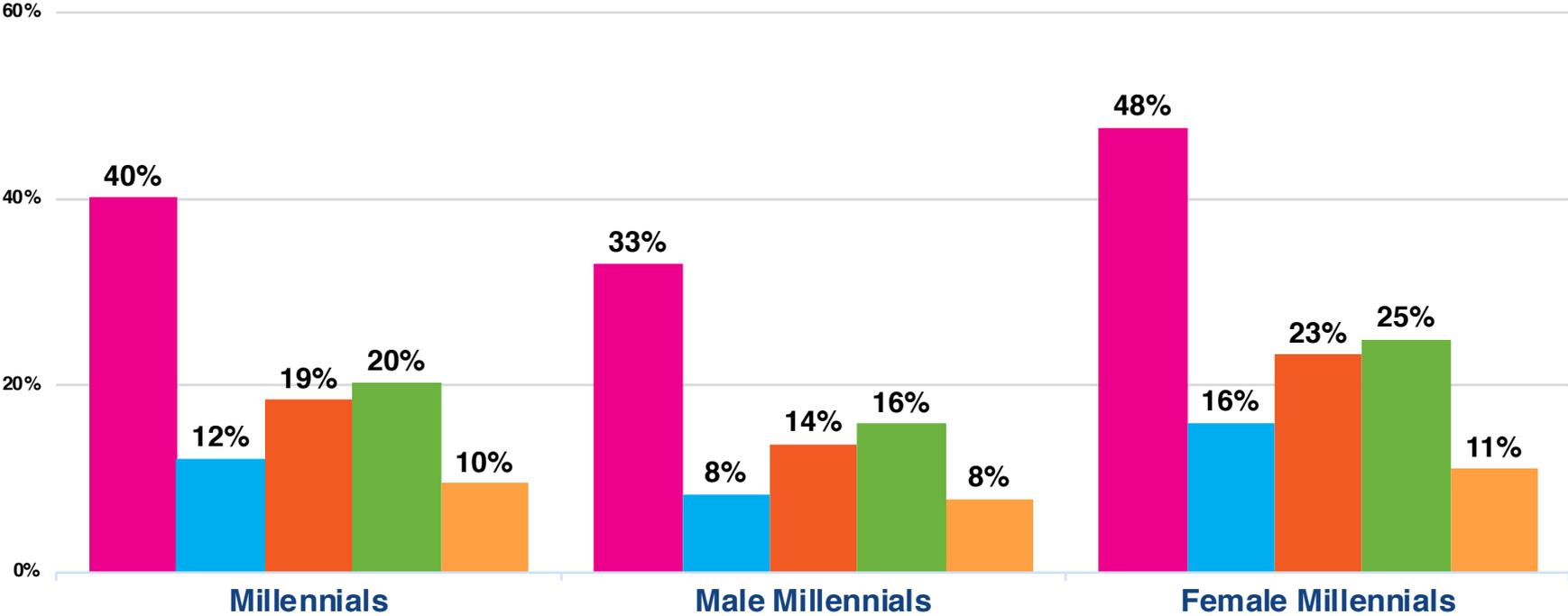
# Millennials: Race



Base: National Panel Sample Millennials

# Millennials: Children at Home

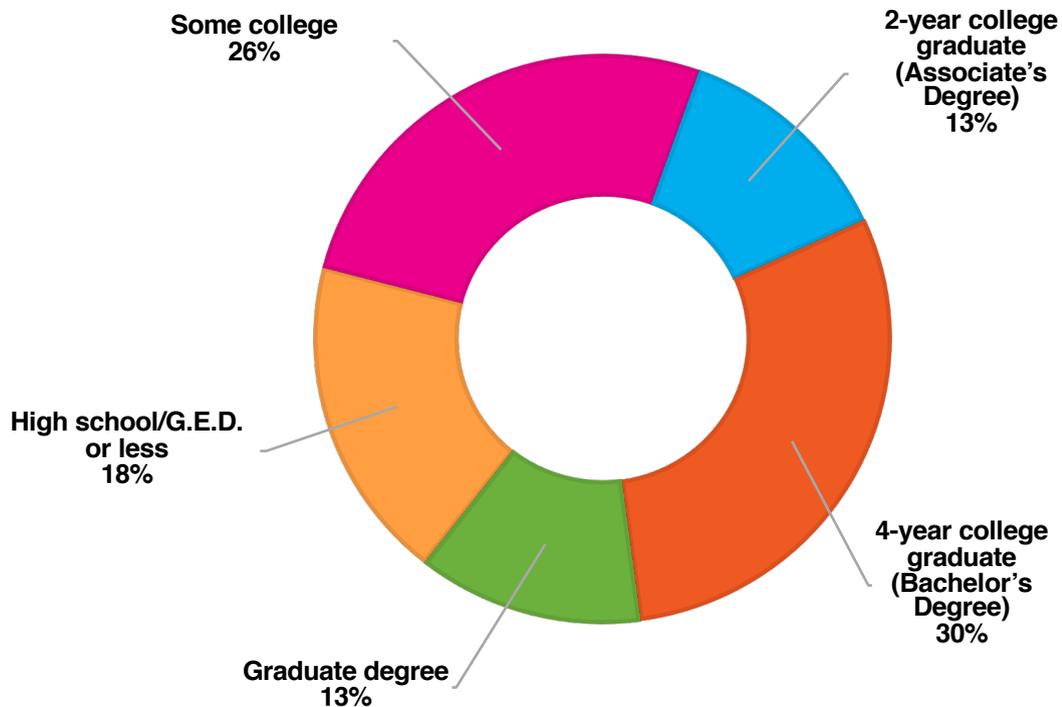
% Who Have Children at Home...



■ Any child under 18 ■ < Age 2 ■ Age 2-5 ■ Age 6-11 ■ Age 12-17

Base: National Panel Sample

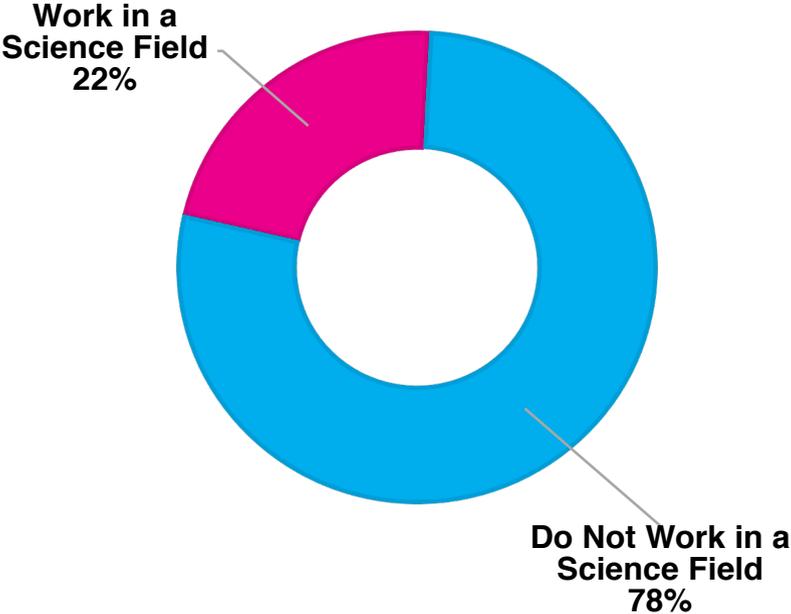
# Millennials: Education



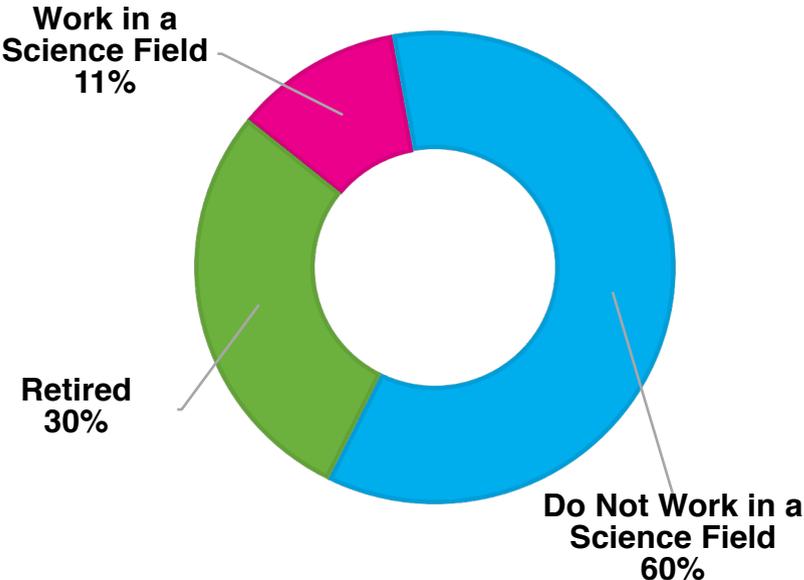
Base: National Panel Sample Millennials

# Millennials Are Twice as Likely as Non-Millennials to Work in a Science Field

**Millennials**



**Non-Millennials**



A microscopic image of plant tissue, likely a stem or root, showing wavy cell walls and several red-stained tips. The background is a uniform yellowish-green color. A black horizontal bar is overlaid on the left side of the image, containing the text "SCIENCE CURIOSITY" in white, bold, uppercase letters.

# SCIENCE CURIOSITY

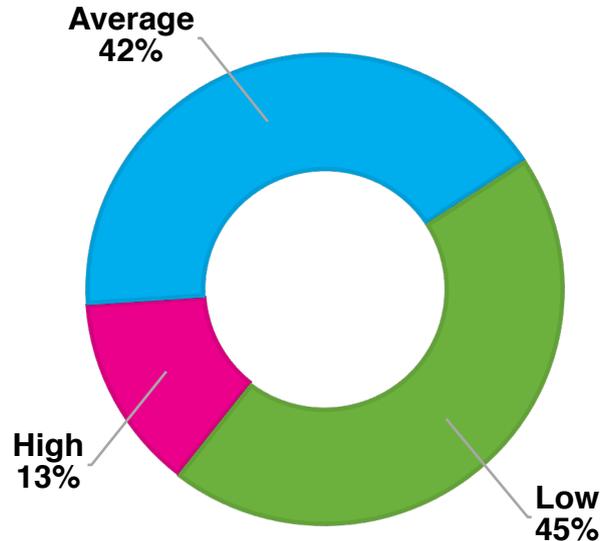
## Science Curiosity Scale (SCS)

- Developed by Dan Kahan (Yale University) and Asheley Landrum (Texas Tech University) to better measure science curiosity through a combination of behavioral and self-reported measures, rather than relying on self-reported measures only.
- The SCS scores were derived using all survey respondents from both the national online panel samples of Millennials and Non-Millennials, and the individual partner surveys.

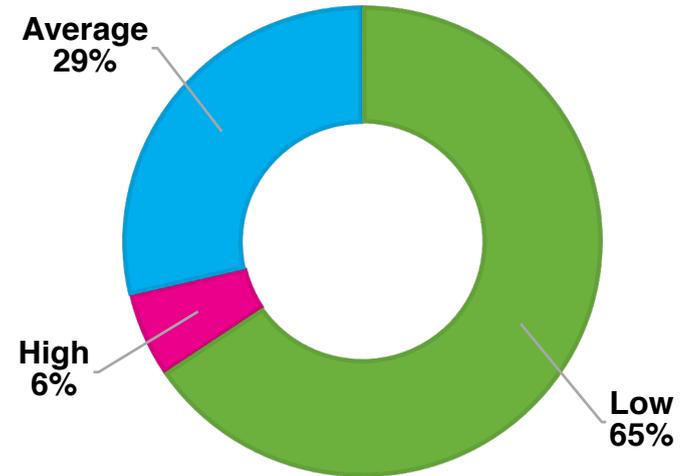
# More Than Twice as Many Millennials as Non-Millennials Have High Science Curiosity

## Science Curiosity Scale (SCS)

### Millennials



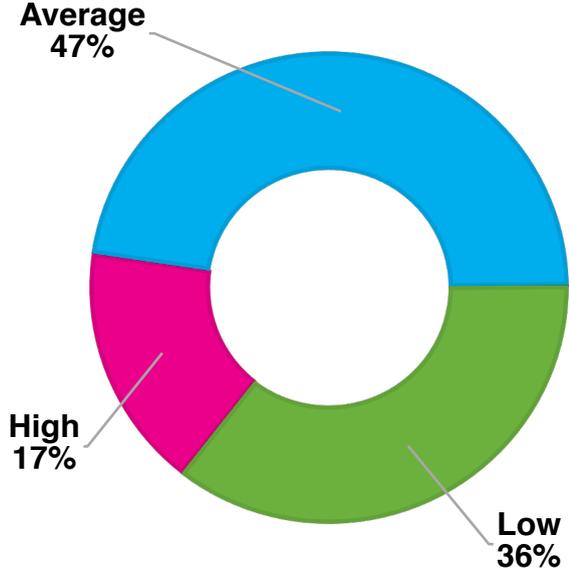
### Non-Millennials



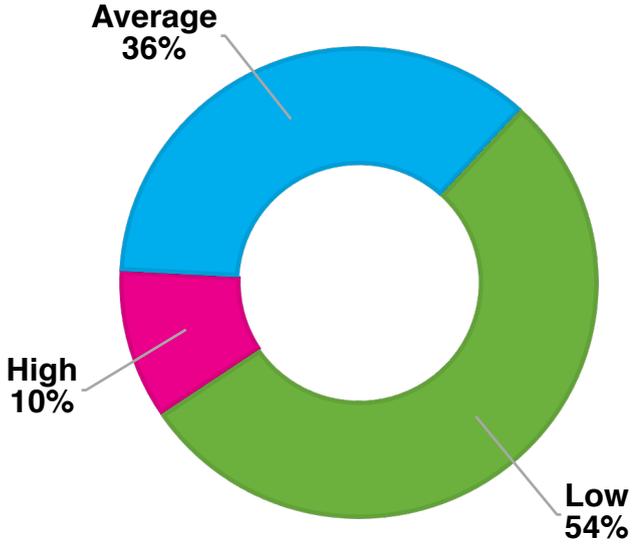
# Male Millennials Exhibit Higher Levels of Science Curiosity Than Female Millennials

## Science Curiosity Scale (SCS)

**Male Millennials**

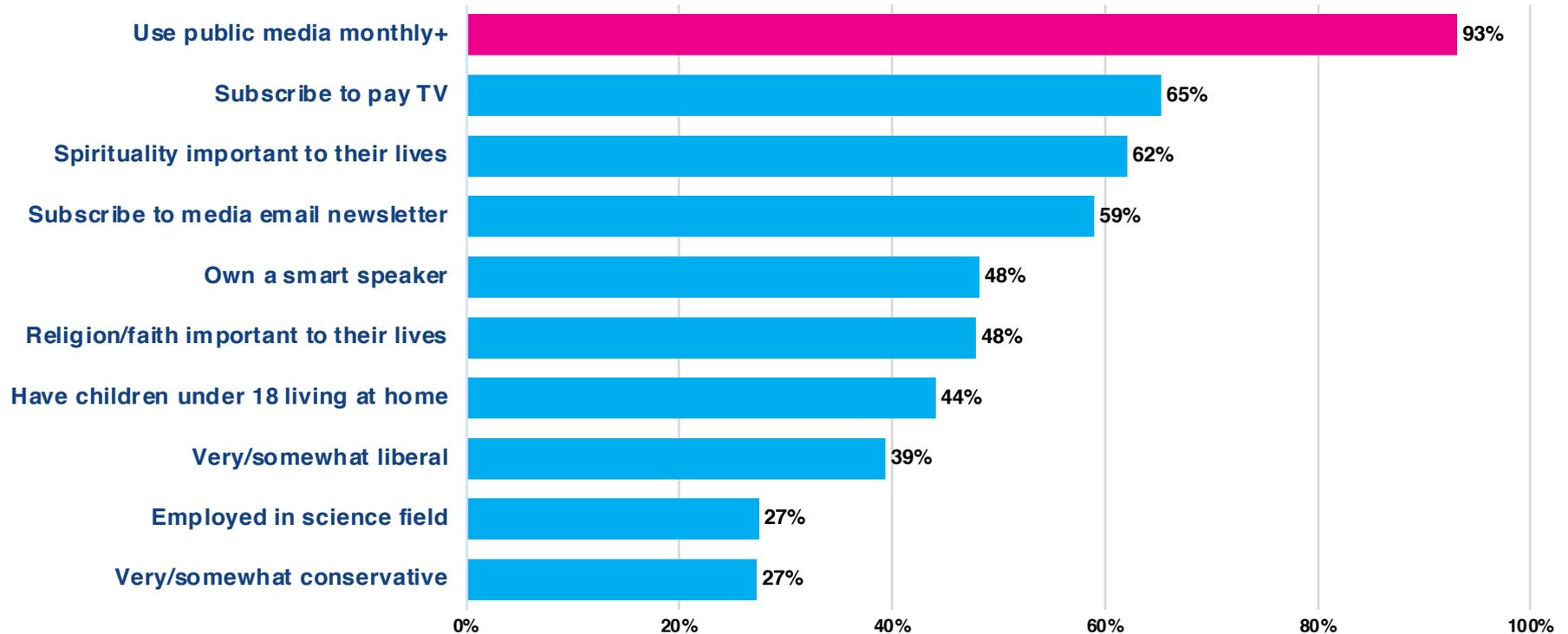


**Female Millennials**



# High Science Curiosity Millennials Profile

% of Millennials With a High Science Curiosity Score Who...





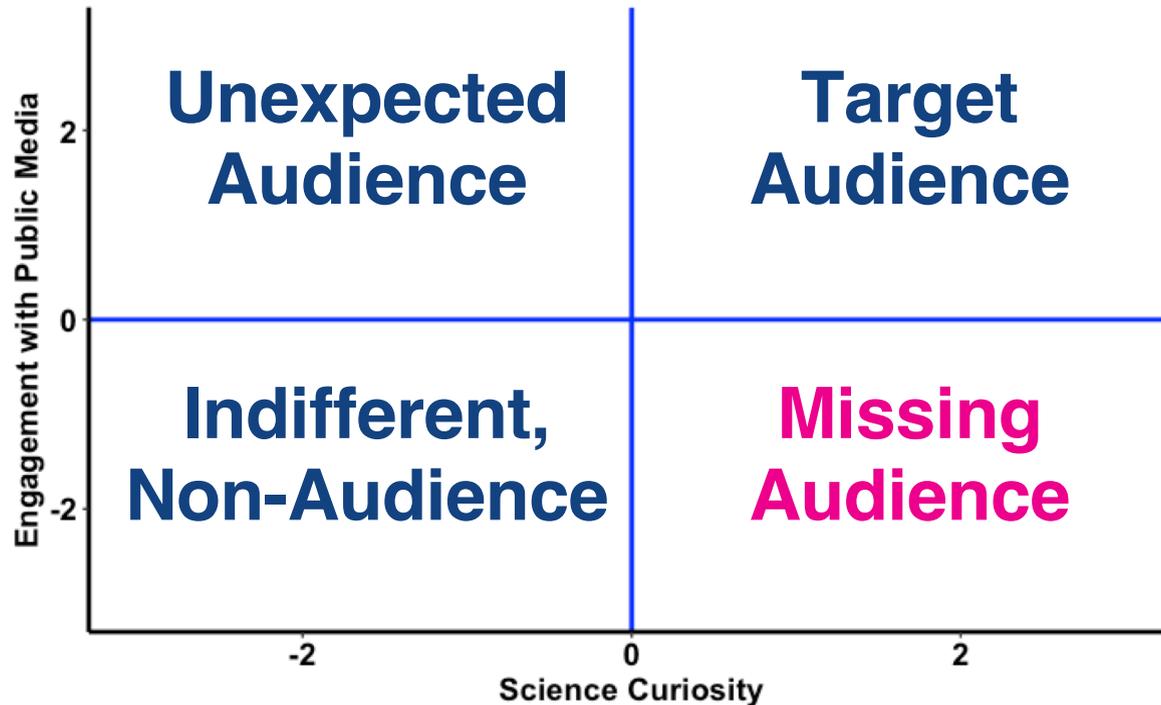
**MILLENNIAL AUDIENCE PROFILES**



The image is a composite. The top portion shows two baby heads wearing blue caps, looking upwards. The bottom portion shows a group of people in a dark environment, illuminated by bright yellow light beams that create a dramatic, high-contrast scene. The text 'MILLENNIAL AUDIENCE PROFILES' is centered in a black bar across the middle of the image.

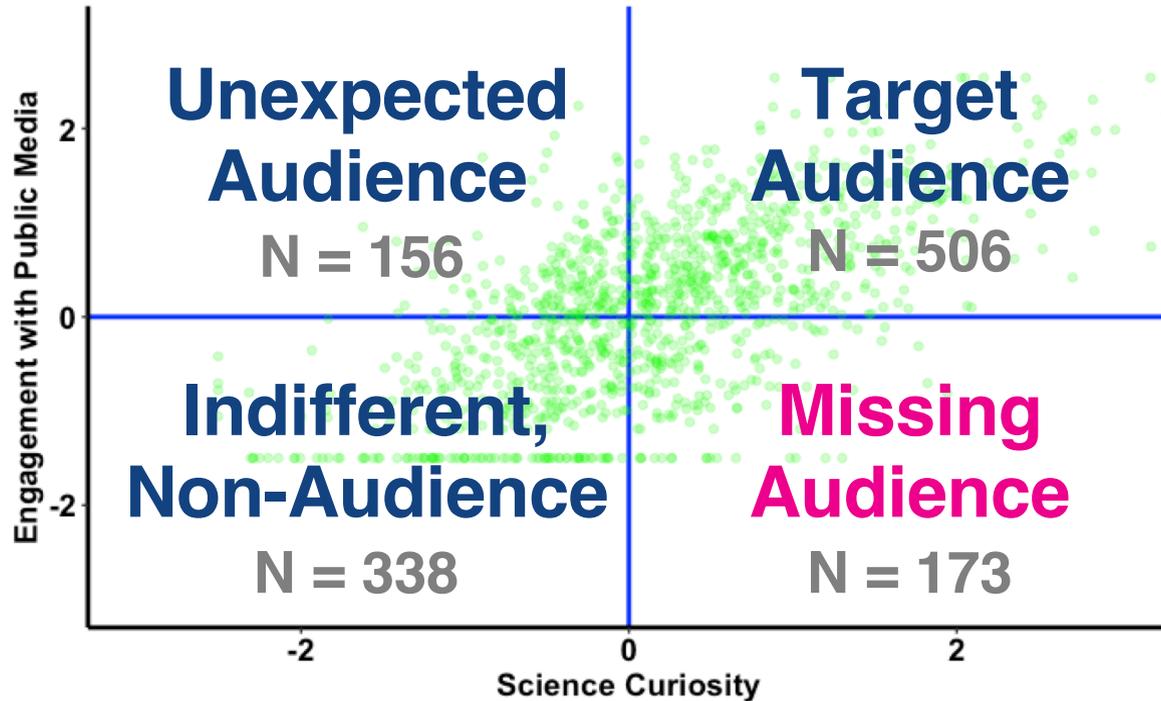
# Building the Profiles

What are we looking for?



# Building the Profiles

What are we looking for?



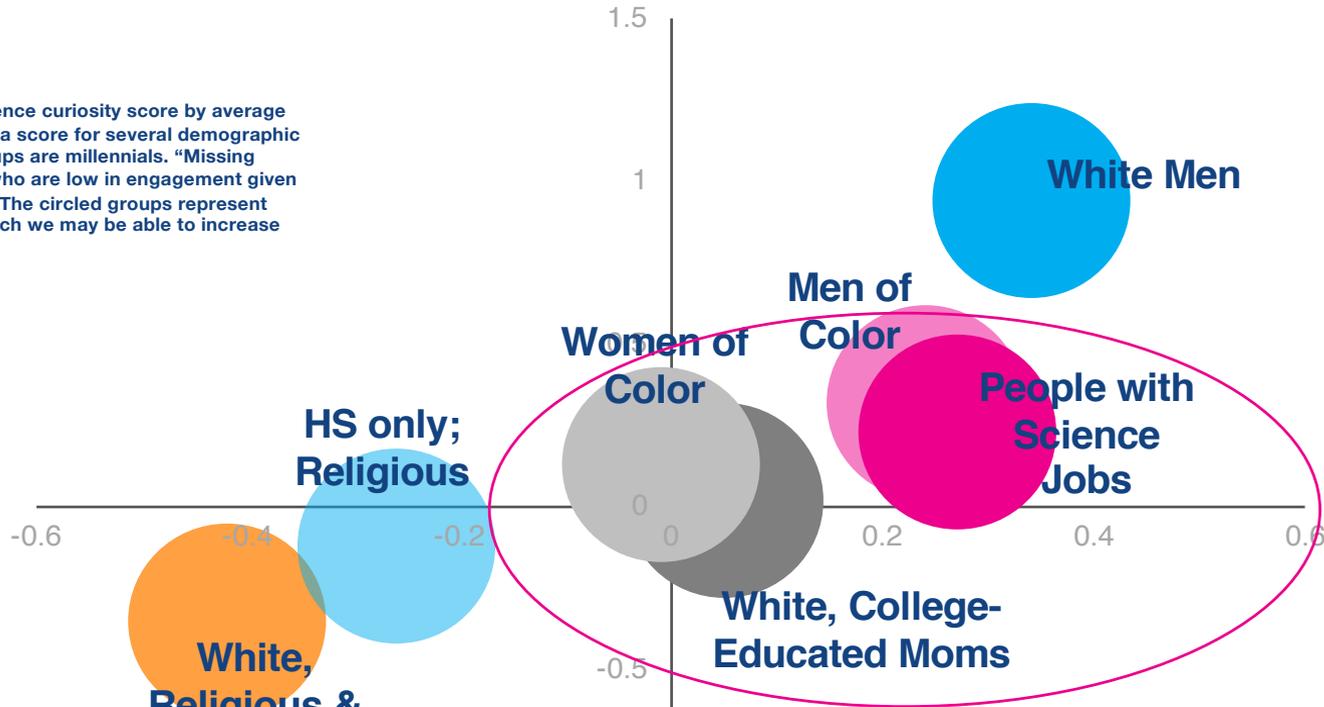
# Demographic Differences

## Higher Engagement

### Figure Caption:

Here we plot the average science curiosity score by average engagement with public media score for several demographic groups. All demographic groups are millennials. "Missing audiences," here, are those who are low in engagement given their science curiosity score. The circled groups represent demographics groups for which we may be able to increase engagement.

Lower  
Science  
Curiosity



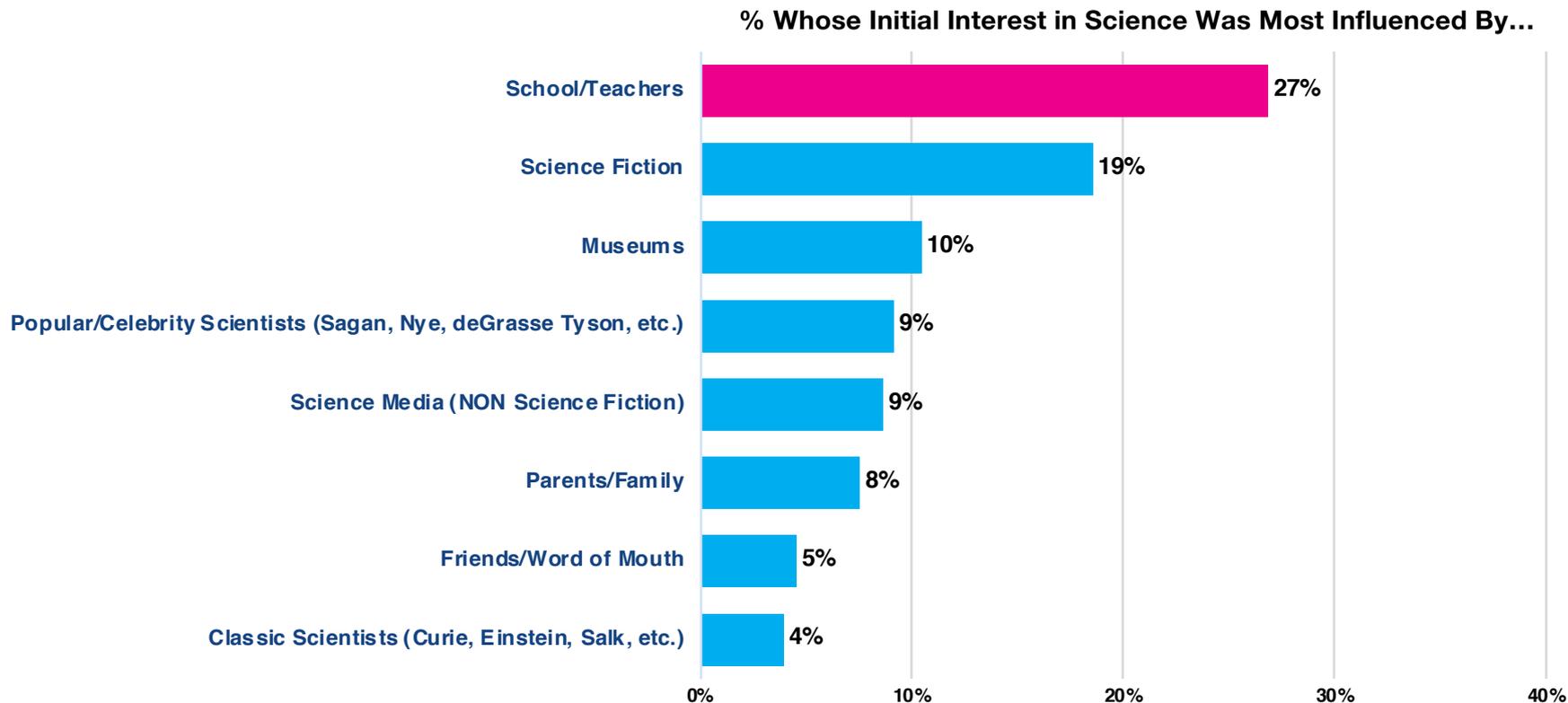
Higher  
Science  
Curiosity

Lower Engagement

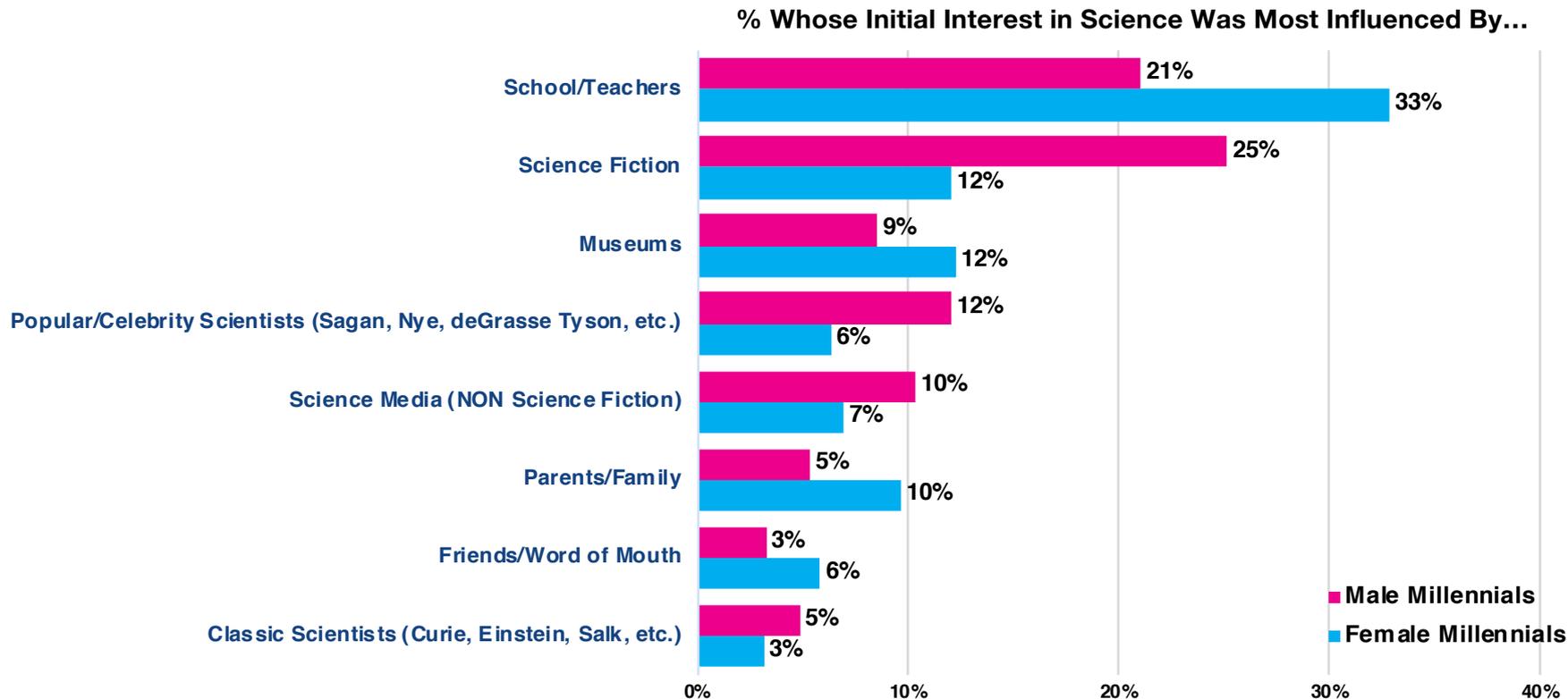


# SCIENCE INFLUENCERS

# Schools and Teachers Are the Single Greatest Influence on Millennials' Initial Science Interest, Followed by Science Fiction



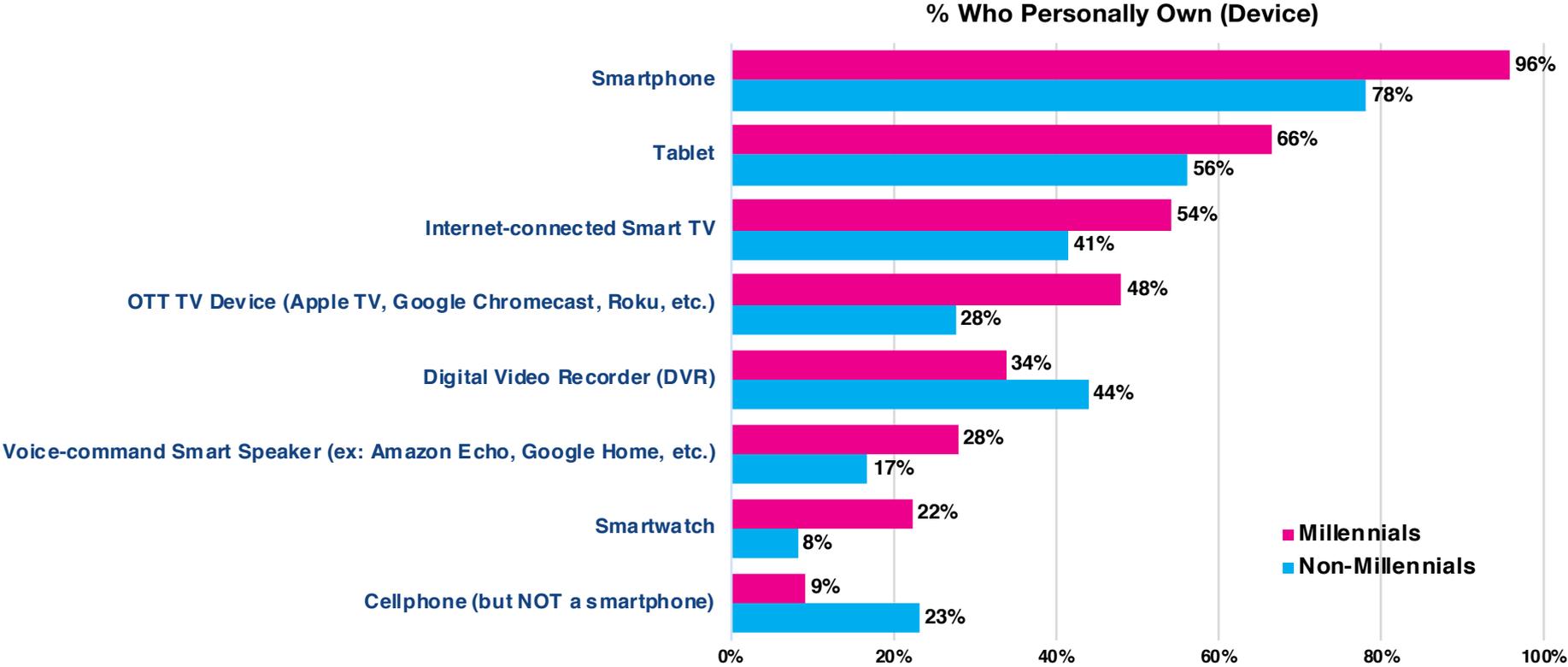
# Teachers Are by Far Most Influential to Science Interest Among Female Millennials; It's Science Fiction for Male Millennials





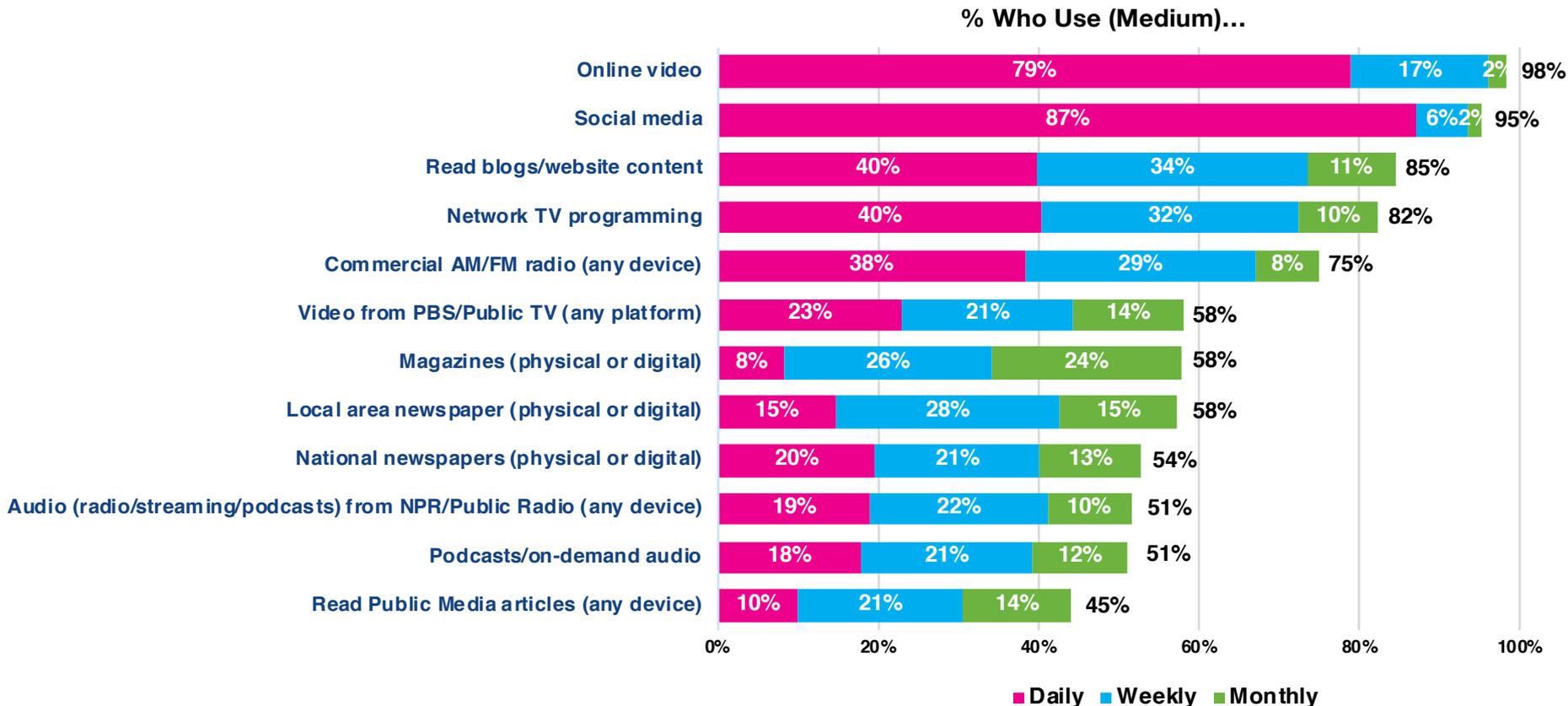
# MILLENNIALS & MEDIA CONSUMPTION

# Millennials Use More Technology Than Non-Millennials



Base: National Panel Sample

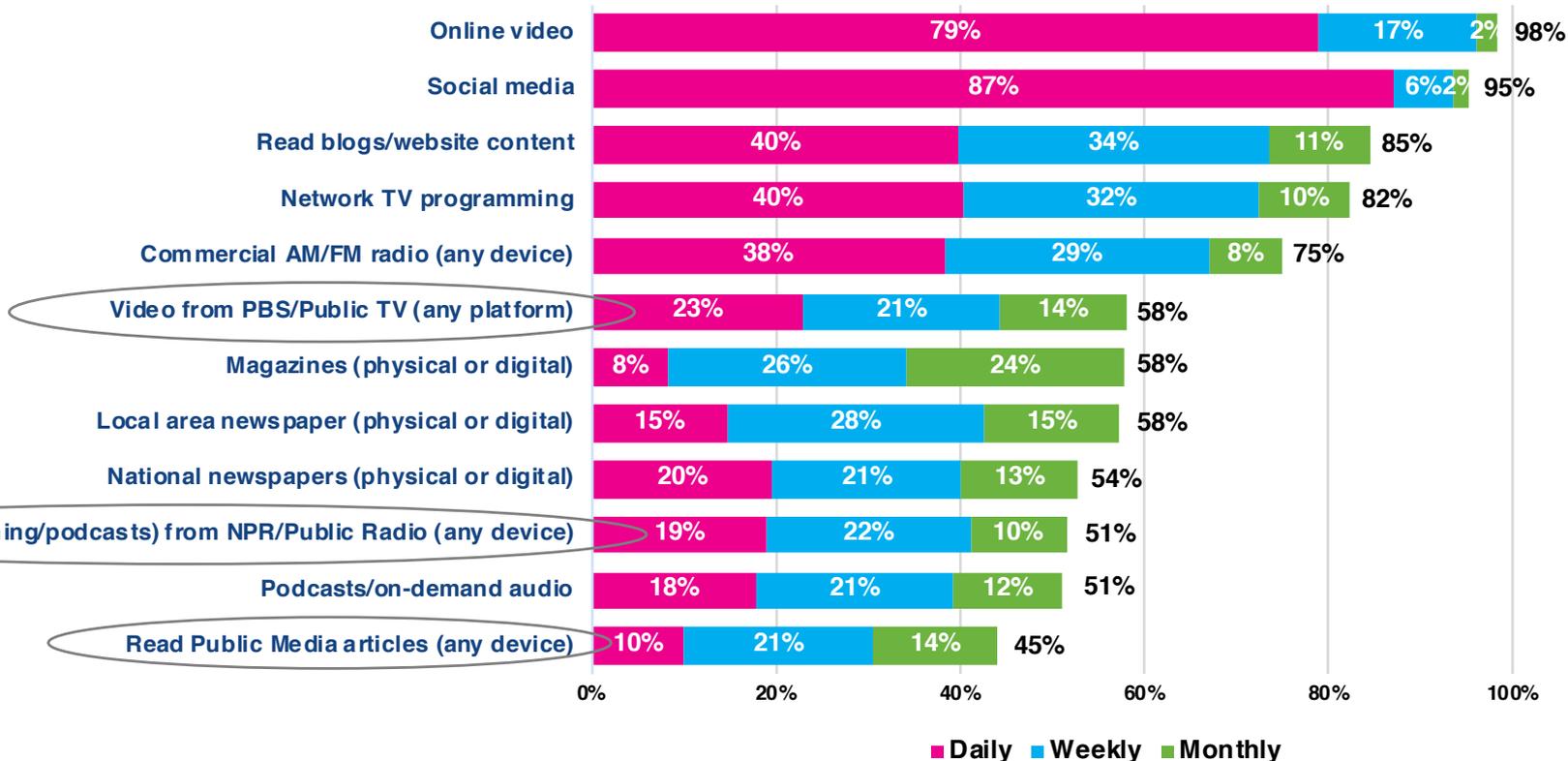
# Millennials Use Online Video and Social Media Nearly Universally



Base: National Panel Sample Millennials

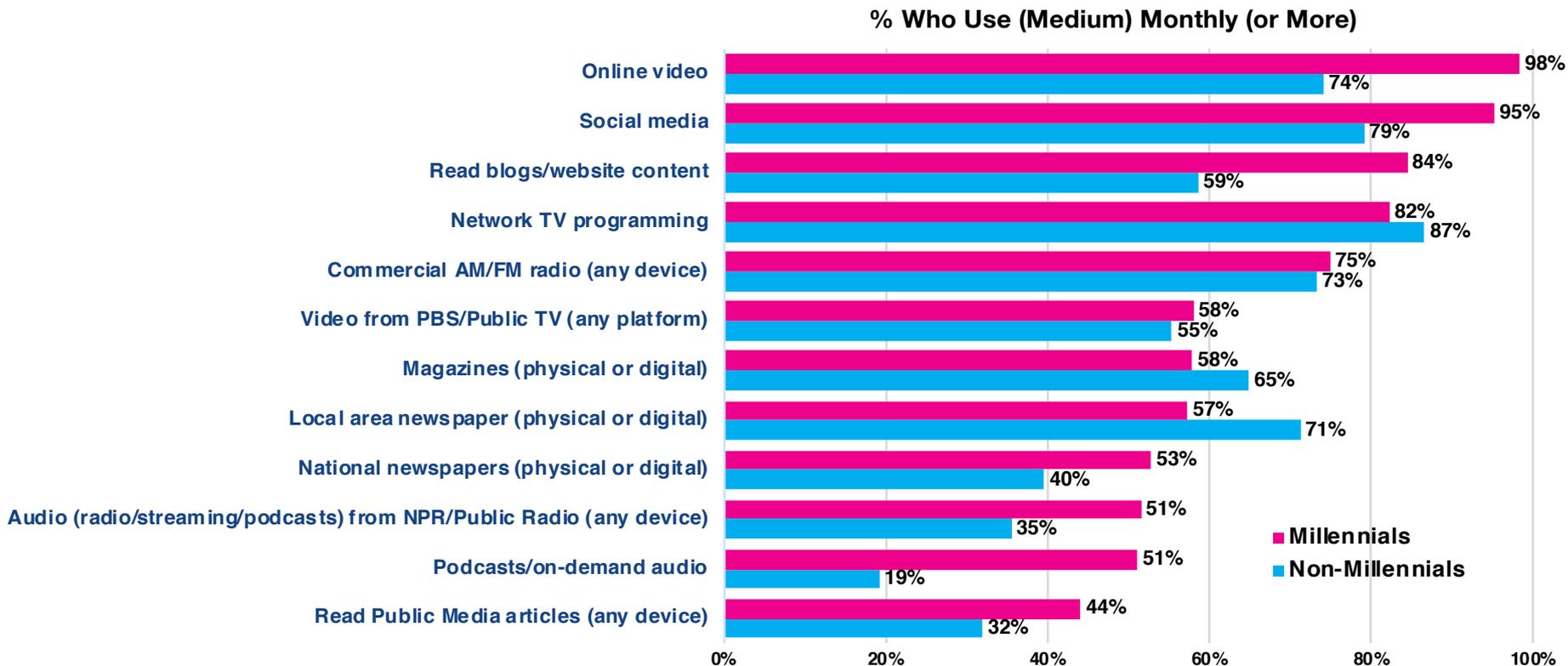
# Millennials Use Online Video and Social Media Nearly Universally

% Who Use (Medium)...



Base: National Panel Sample Millennials

# Millennials Use Online Video and Social Media Nearly Universally



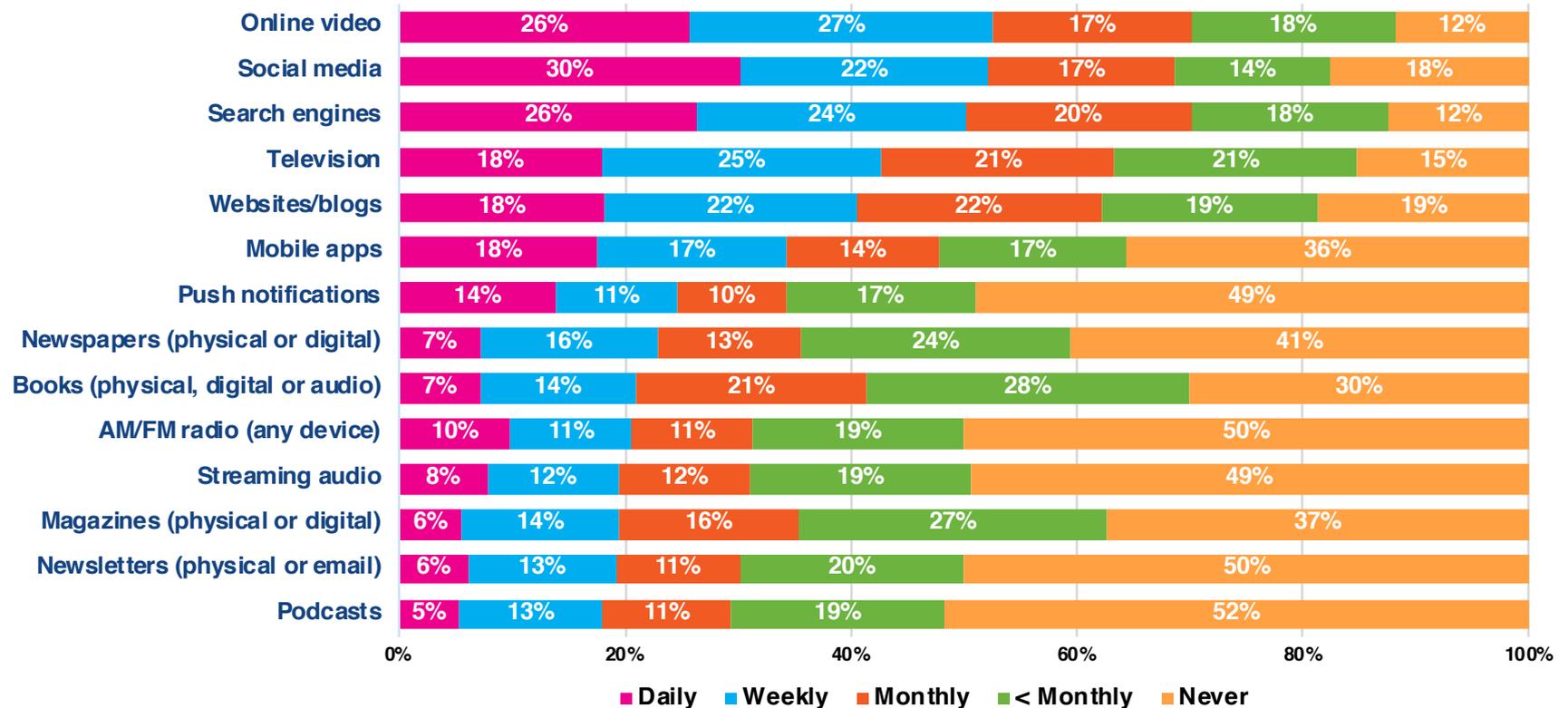
Base: National Panel Sample



# **MEDIA USAGE & SCIENCE**

# About Seven in Ten Millennials Use Online Video, Social Media and Search Engines at Least Monthly to Access Science Content

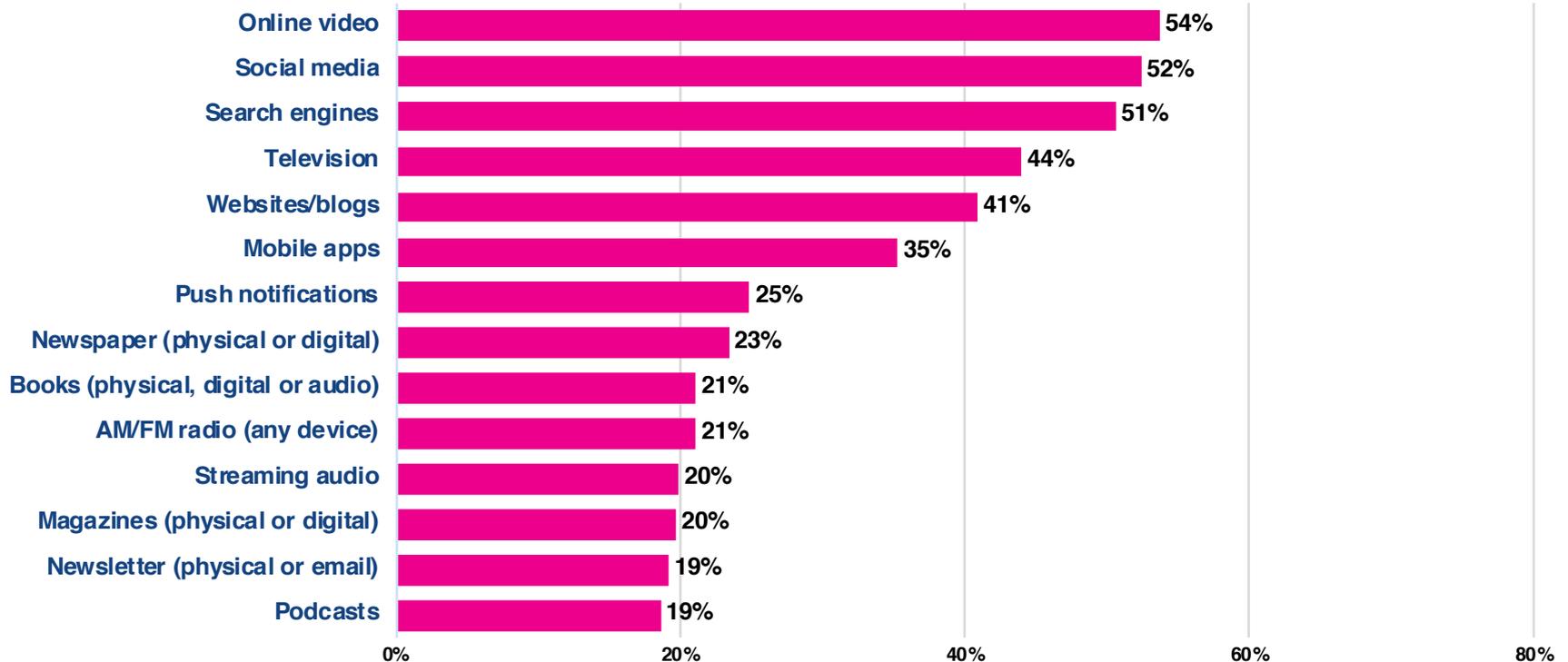
% Who Access/Discover Science Content (Via Platform)...



Base: National Panel Sample Millennials

# Online Video, Social Media and Search Engines Are Used Most by Millennials on a Weekly Basis for Science Consumption

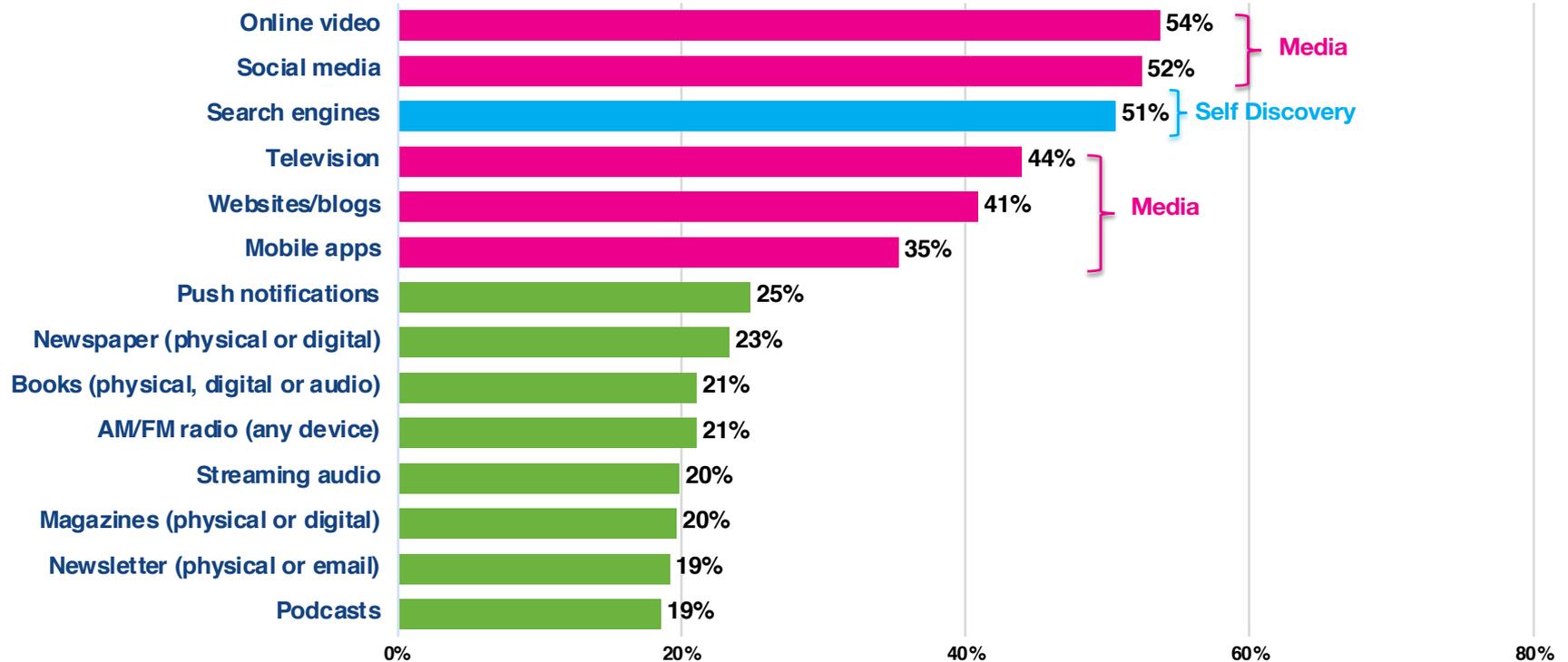
% Who Access/Discover Science Content Weekly (or More) Via...



Base: National Panel Sample Millennials

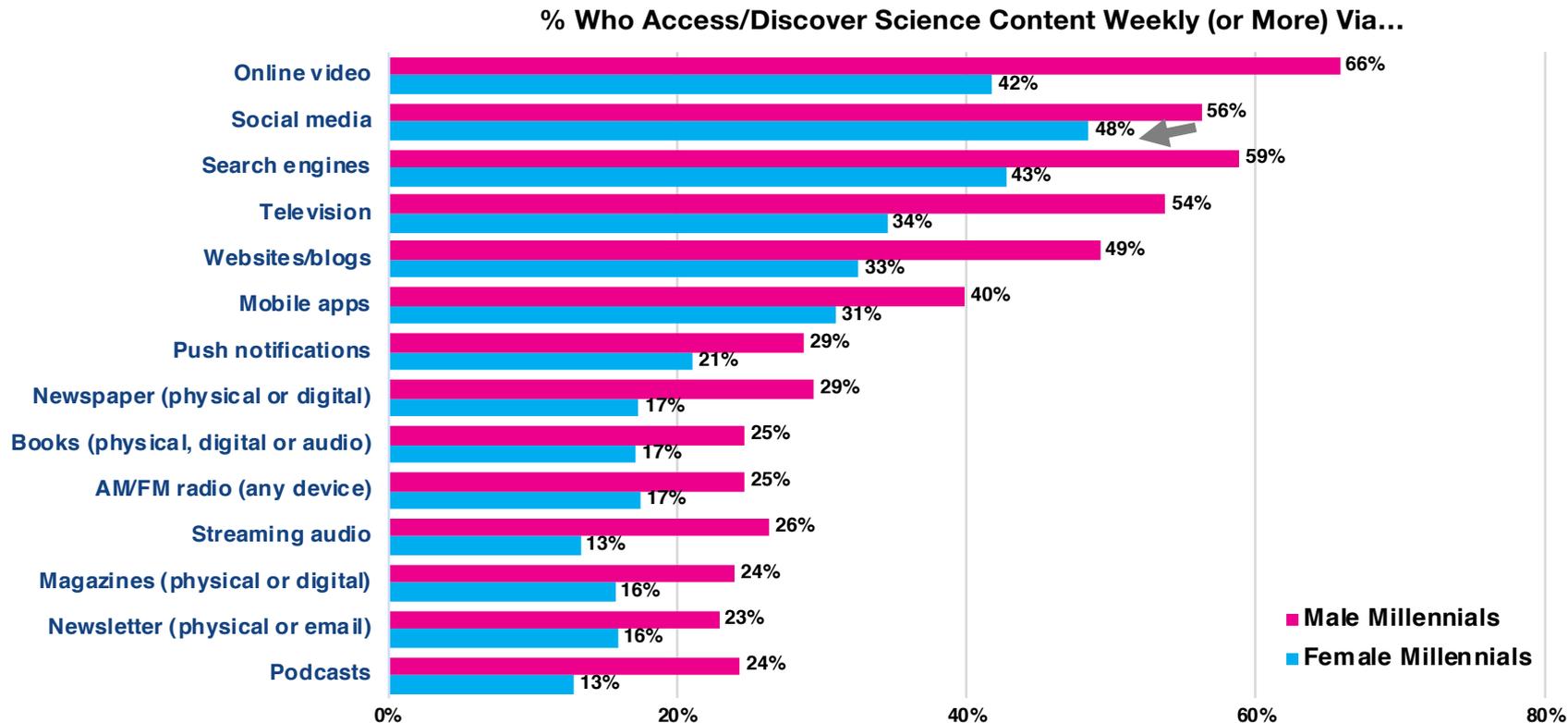
# Online Video, Social Media and Search Engines Are Used Most by Millennials on a Weekly Basis for Science Consumption

% Who Access/Discover Science Content Weekly (or More) Via...



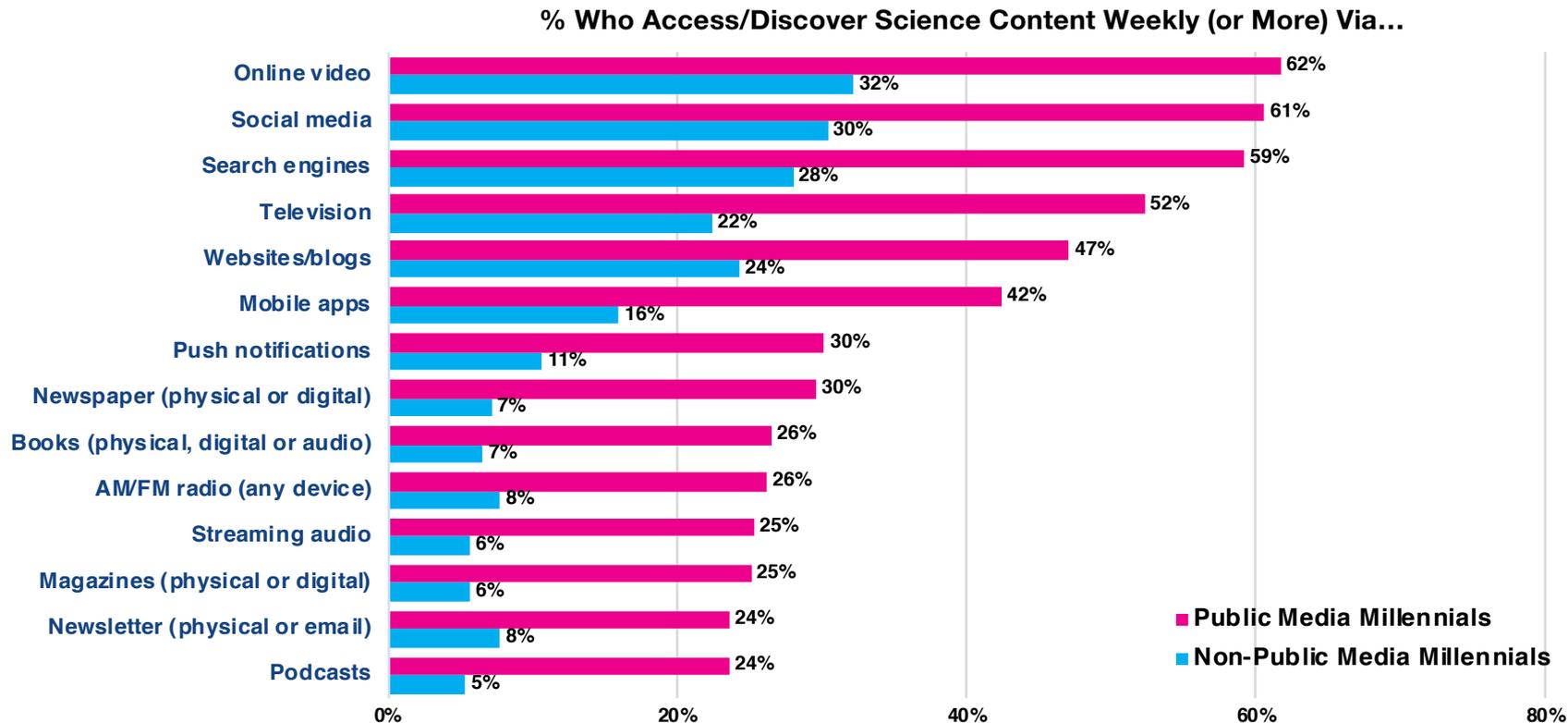
Base: National Panel Sample Millennials

# Male Millennials Outpace Females For Science Access on All Media



Base: National Panel Sample

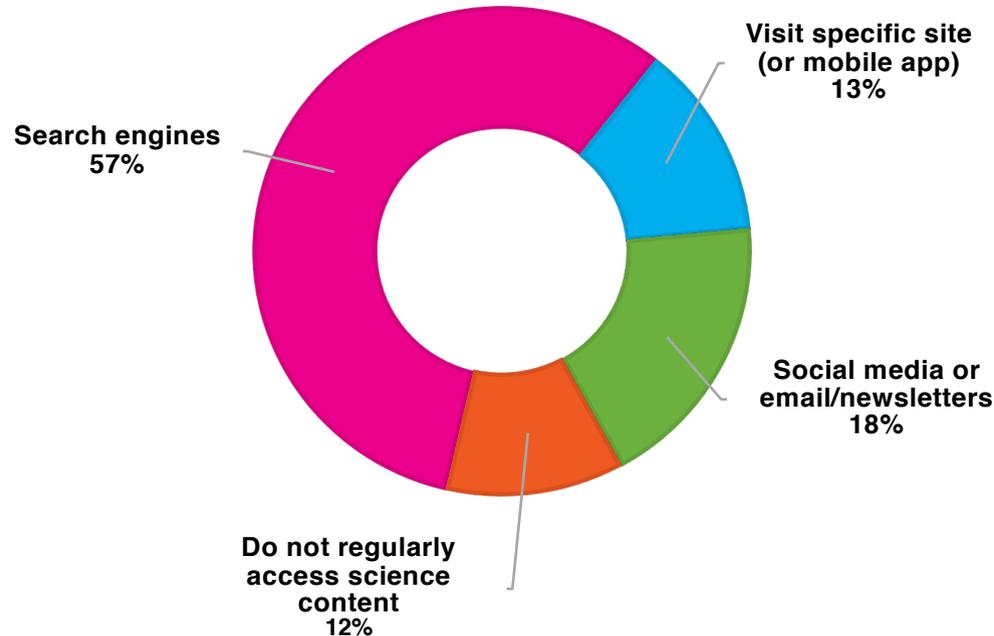
# Public Media Millennials Regularly Use Science Media More Than Non-Public Media Consumers



Base: National Panel Sample

# Search Engines Are the First Conduit to Seeking Out Science Content Online Among Millennials

*“In general, when you're interested in accessing science content online, which of the following do you do FIRST?”*



Base: National Panel Sample Millennials

A woman with dark curly hair, wearing a black leather jacket, is looking down at her smartphone. She is wearing a silver watch on her left wrist. The background is a blurred, light-colored wall.

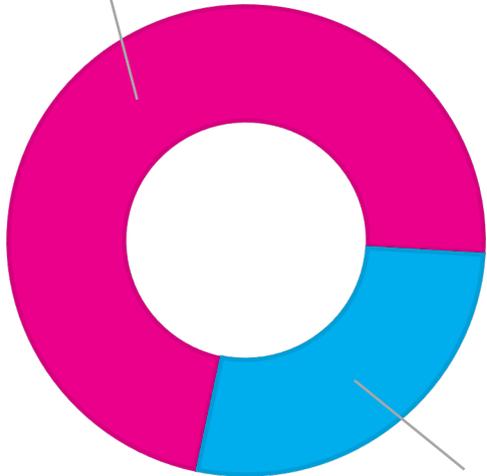
# SCIENCE & PUBLIC MEDIA USAGE

# Nearly Three in Four Millennials Use Public Media at Least Monthly

## Public Media Users (Monthly or More)

### Millennials

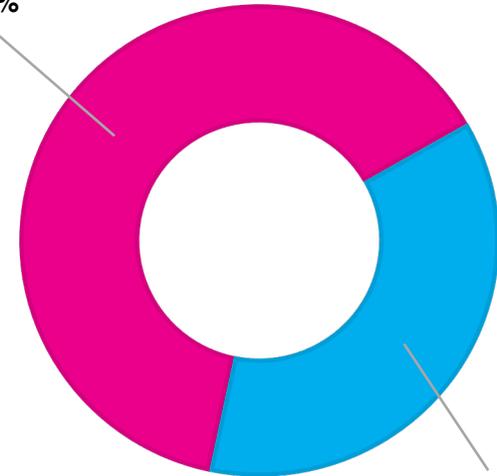
Use Public Media  
Monthly or More Often  
73%



Do Not Use Public  
Media At Least Monthly  
27%

### Non-Millennials

Use Public Media  
Monthly or More Often  
63%

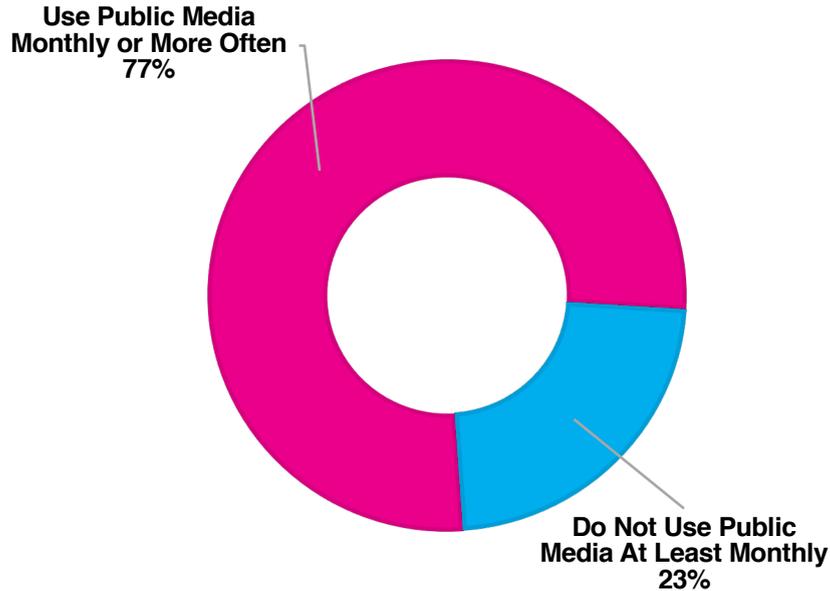


Do Not Use Public  
Media At Least Monthly  
37%

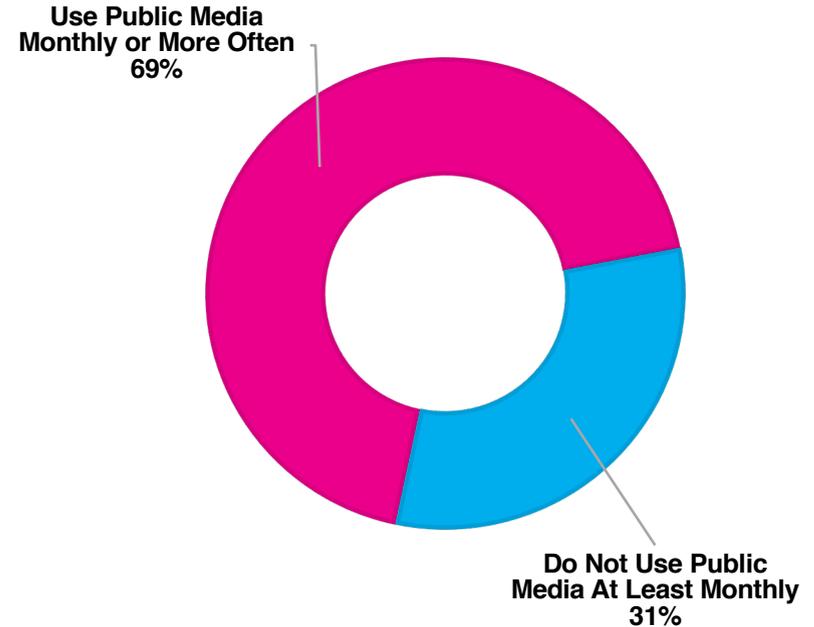
# Male Millennials Are More Likely Than Female Millennials to Use Public Media at Least Monthly

## Public Media Users (Monthly or More)

### Male Millennials



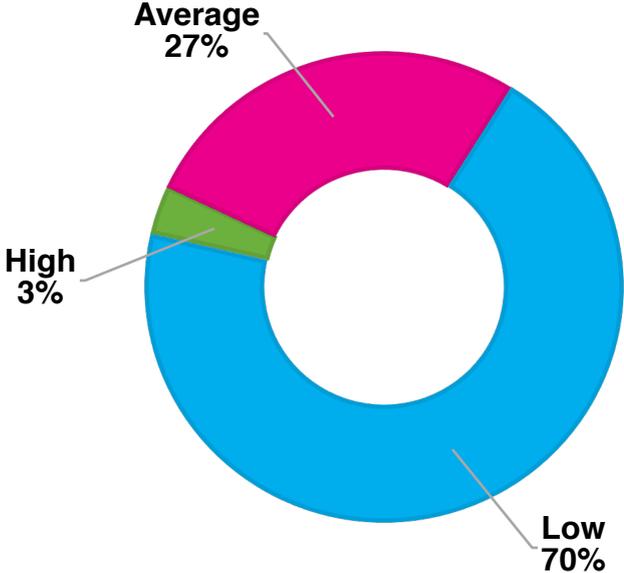
### Female Millennials



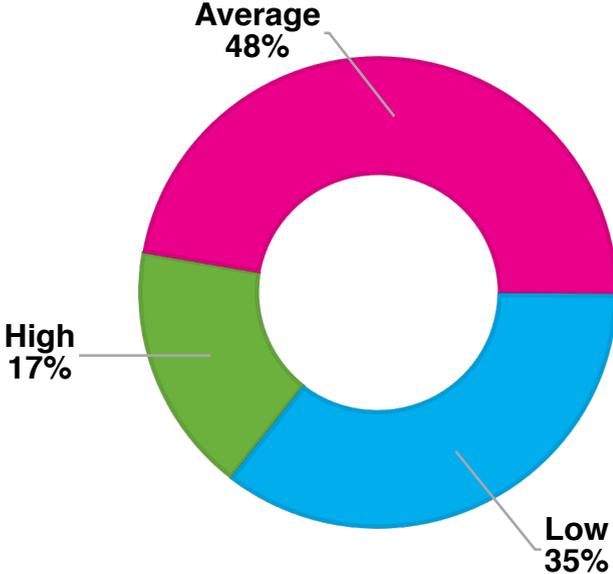
# Millennials Who Use Public Media Are Nearly Six Times More Likely to Have a High SCS

## Science Curiosity Scale (SCS)

### Non-Public Media Millennials

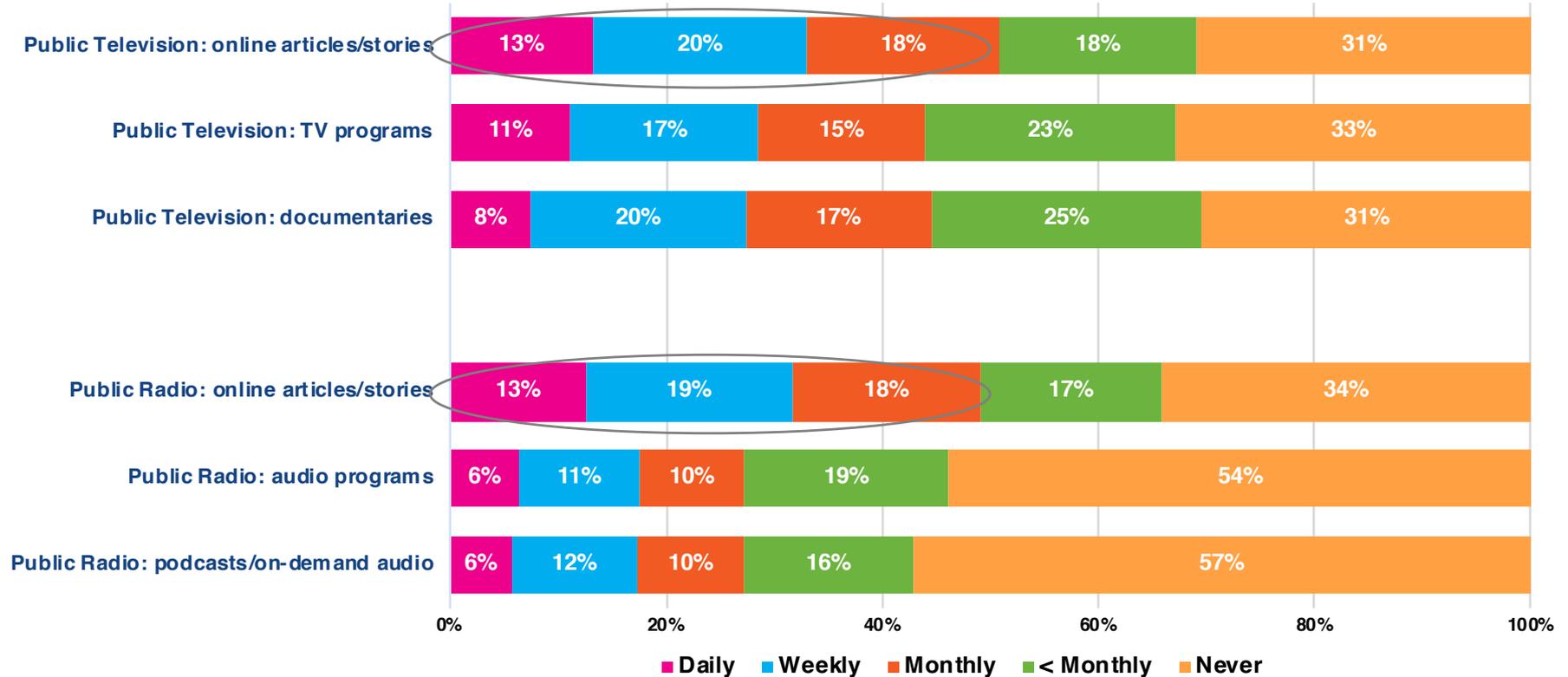


### Public Media Millennials



# Online Content Is Public Media's Most Regularly Used Source For Science Consumption Among Millennials

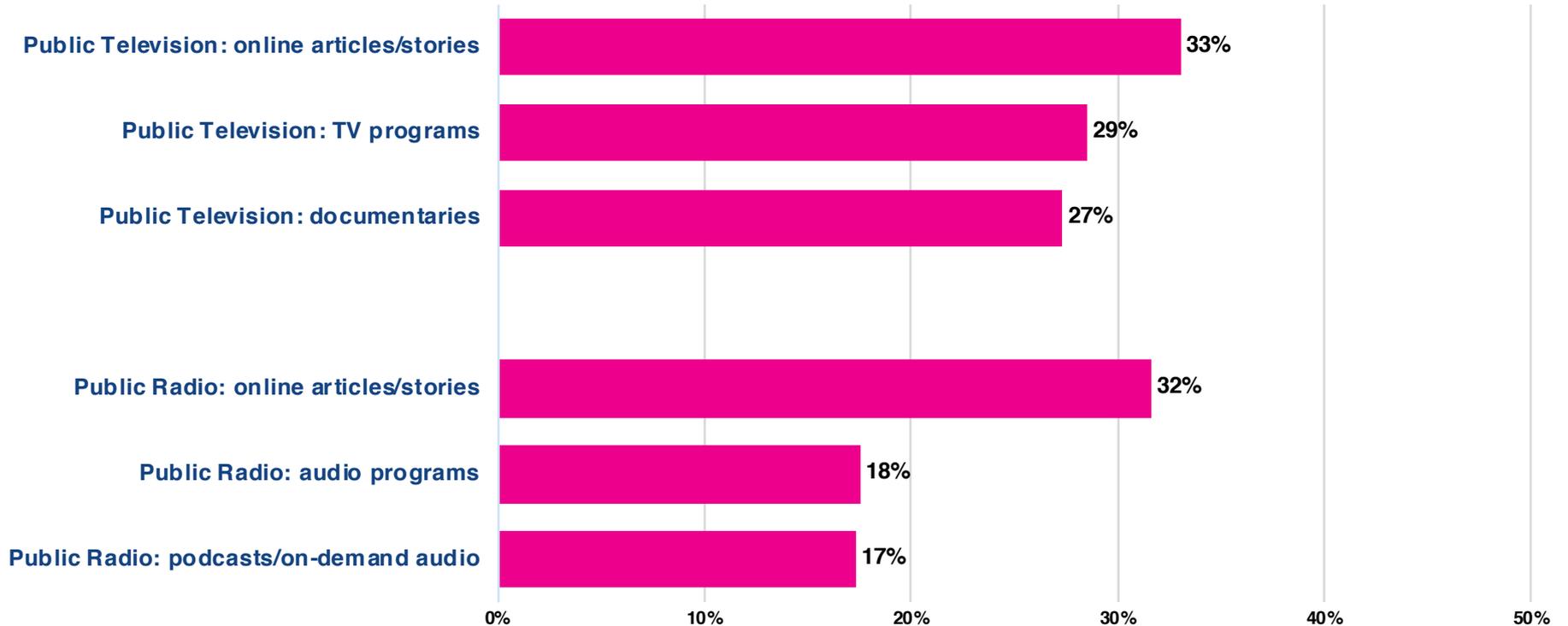
% Who Access/Discover Science Content (Via Platform)...



Base: National Panel Sample Millennials

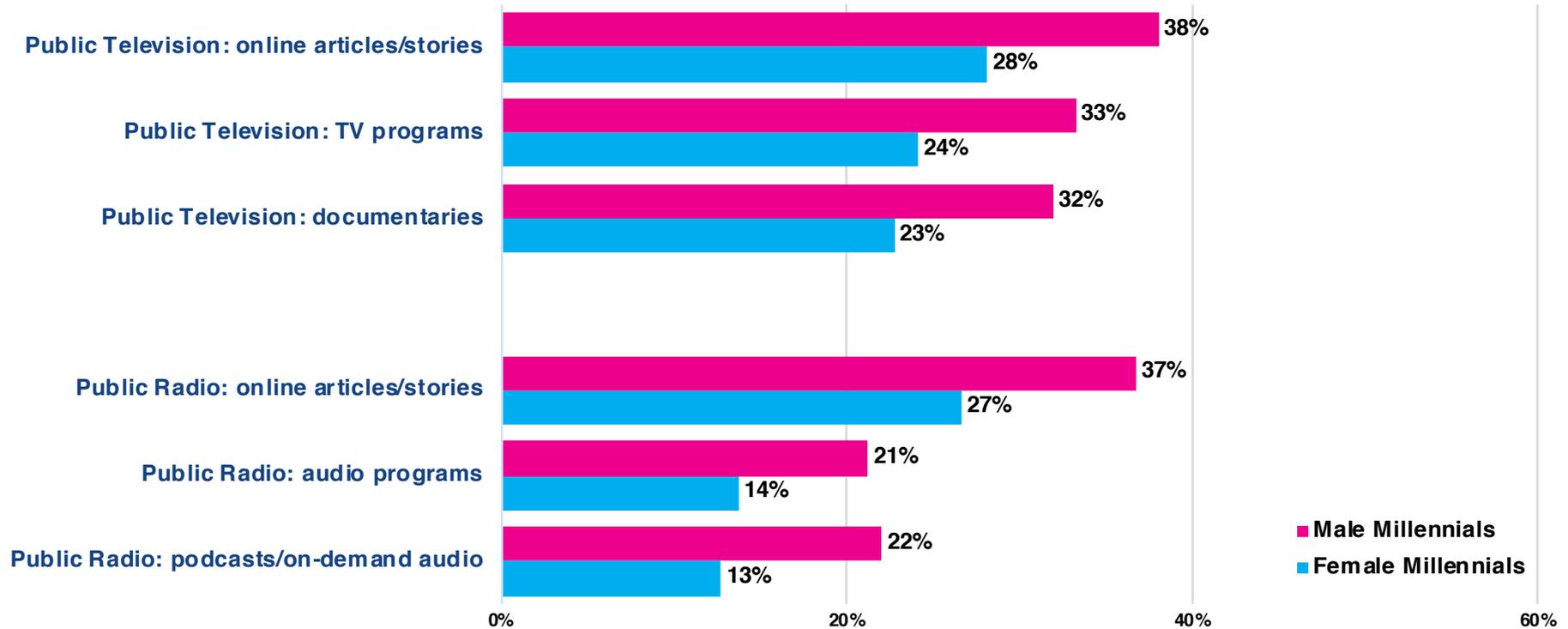
# About One-Third of Millennials Use Online Science Content From Public TV and Public Radio at Least Weekly

% Who Access/Discover Science Content Weekly (or More) Via...



# More Male Millennials Than Female Millennials Use Public Media Weekly to Access/Discover Science

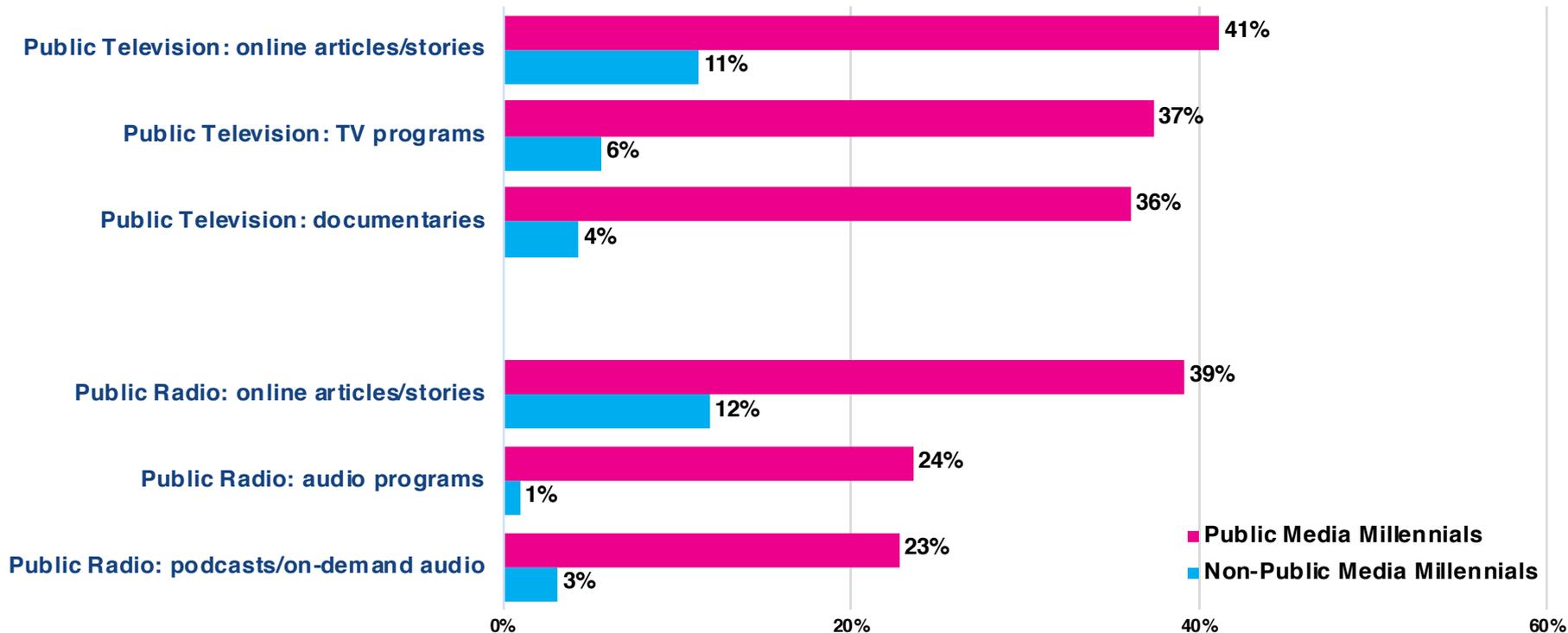
% Who Access/Discover Science Content Weekly (or More) Via...



■ Male Millennials  
■ Female Millennials

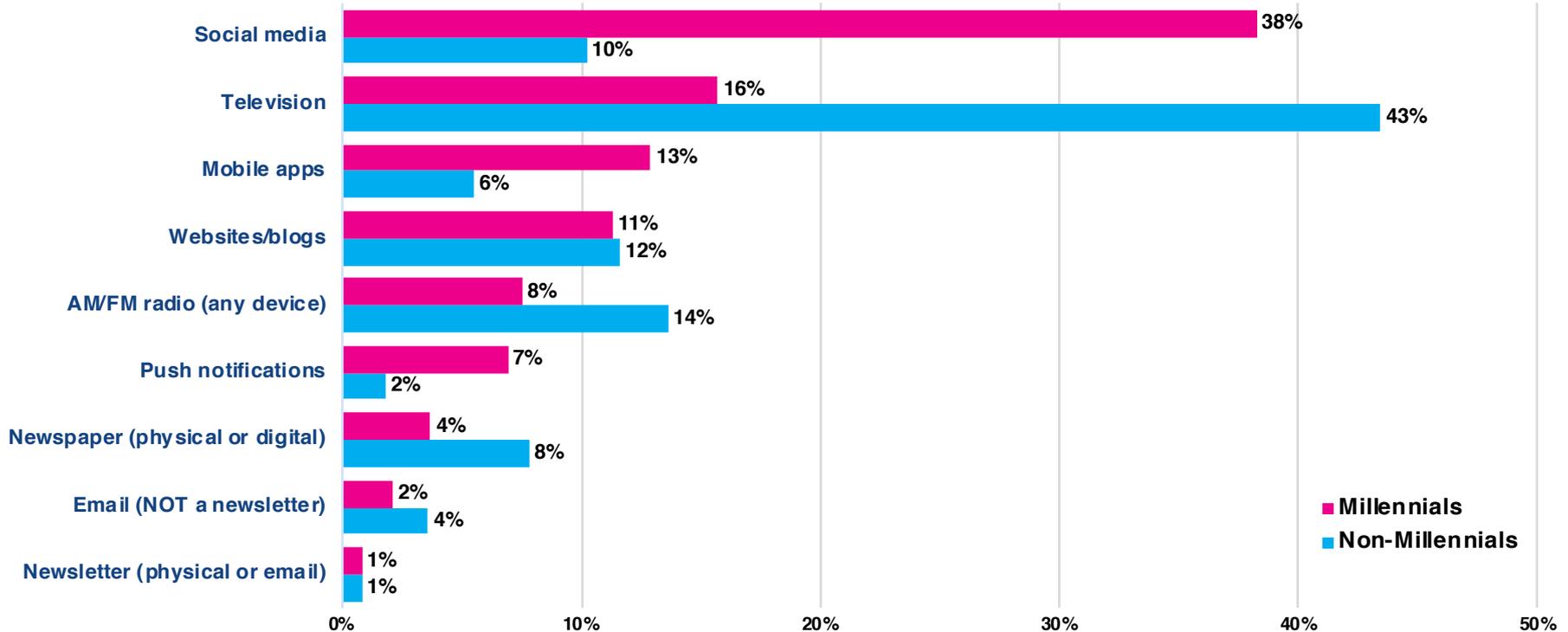
# By Far, Public Media Millennials Are Core Users of its Content

% Who Access/Discover Science Content Weekly (or More) Via...



# Millennials Much More Apt to Use Social Media First On Weekday Mornings For News/Information

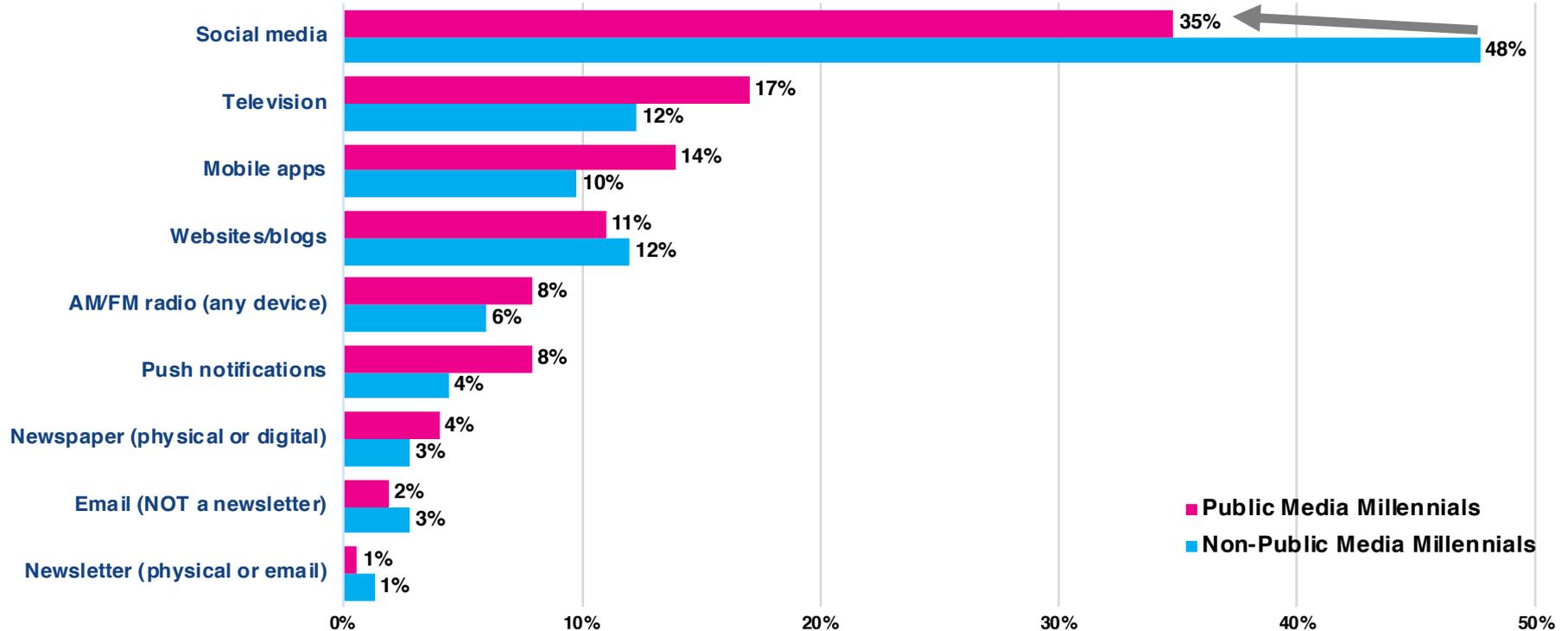
% Who Use (Platform) First in the Morning for News/Information on Typical Weekday



■ Millennials  
■ Non-Millennials

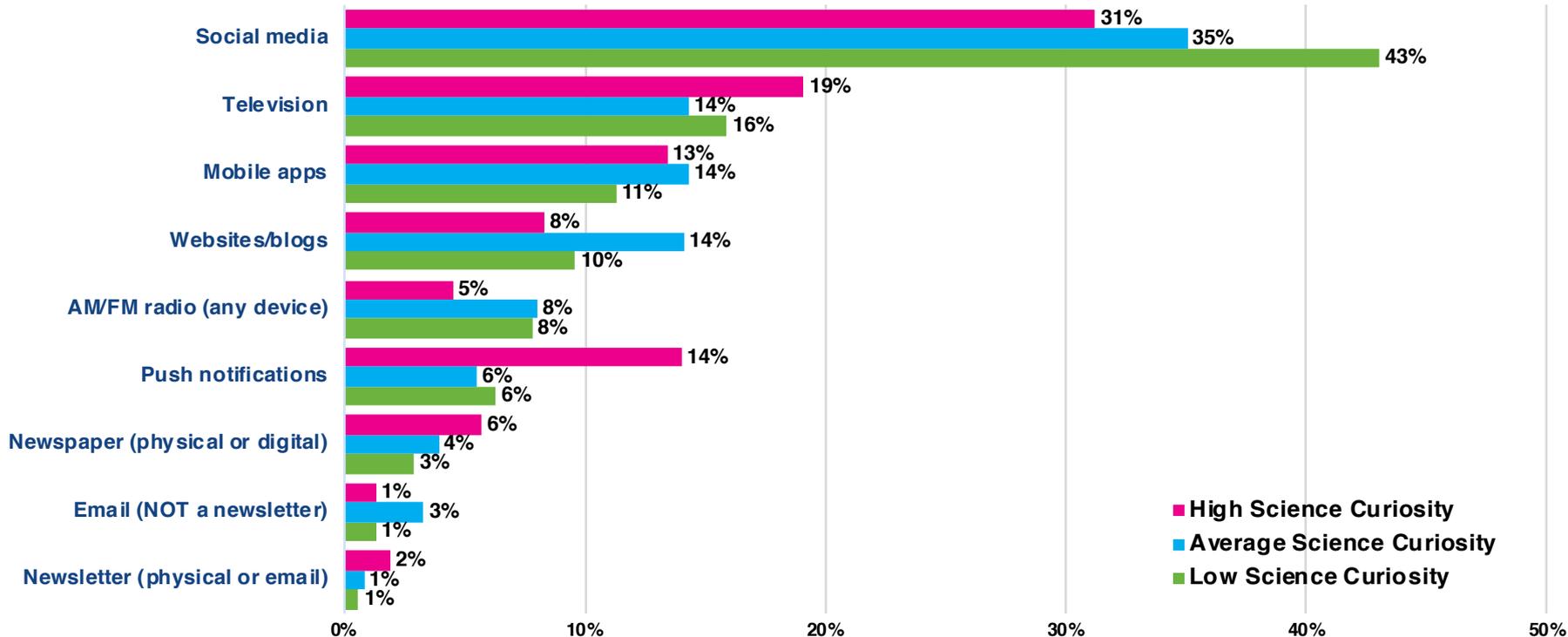
# The Gap Between Social Media and Other Media For First Morning Use Narrows Among Millennials Who Are Public Media Users

% Who Use (Platform) First in the Morning for News/Information on Typical Weekday



# Across All Levels of Science Curiosity, Social Media Is Used First in Mornings, but With Less Usage as SCS Increases

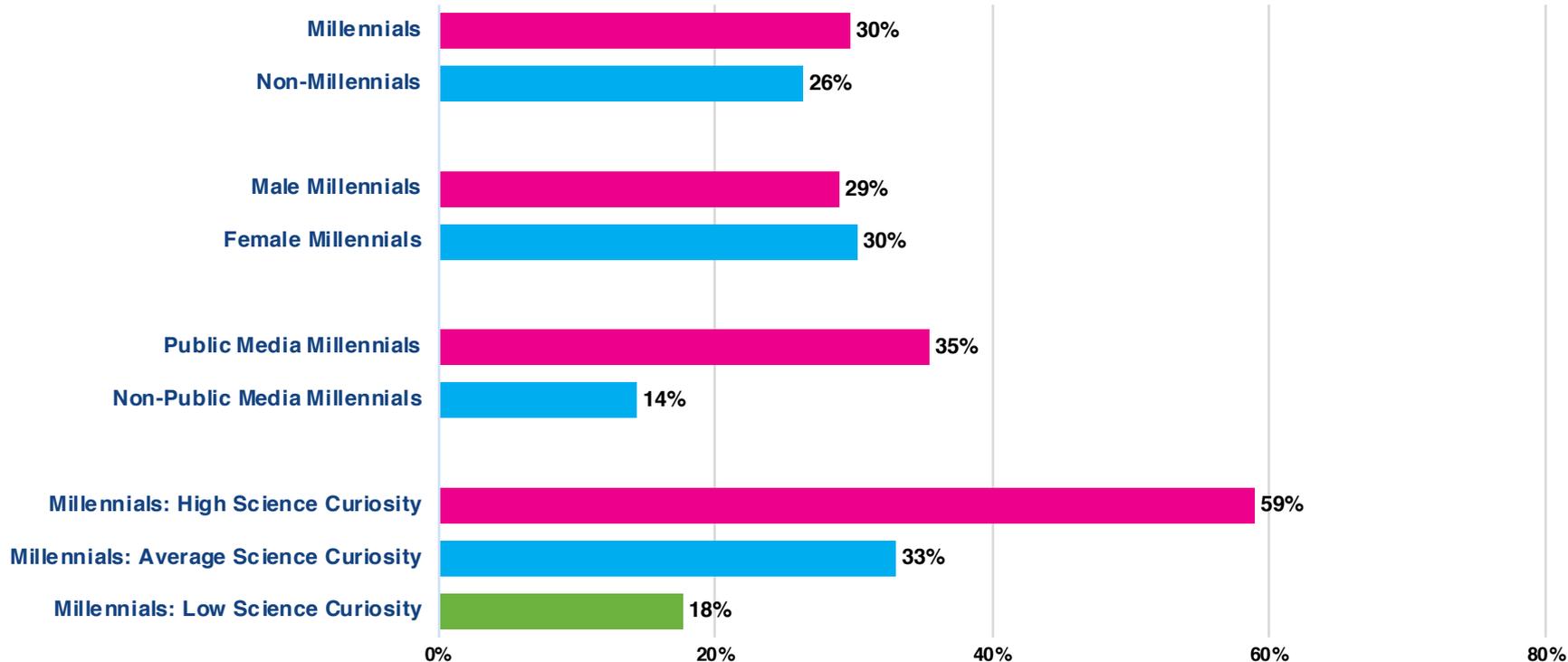
% Who Use (Platform) First in the Morning for News/Information on Typical Weekday



■ High Science Curiosity  
■ Average Science Curiosity  
■ Low Science Curiosity

# Three in Ten Millennials Subscribe to a Media-Related Email Newsletter, Driven by High SCS Millennials & Those Who Use Public Media

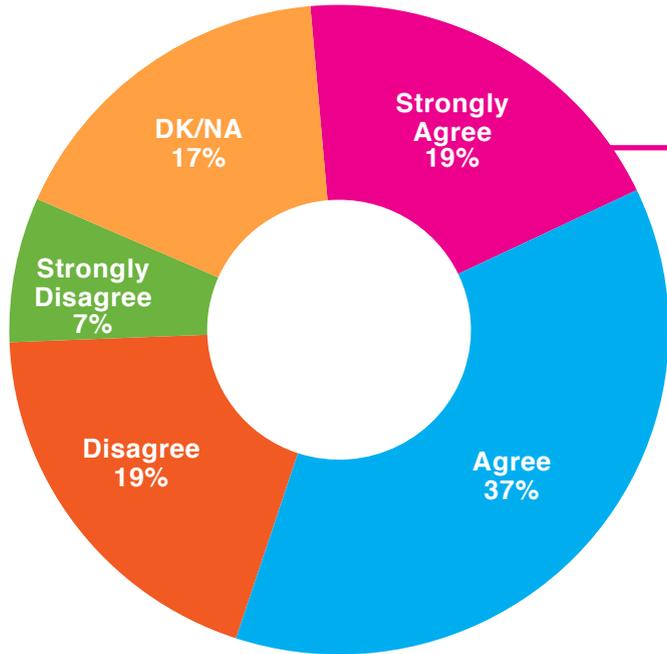
% Who Subscribe to Email Newsletters From Any Media Outlets



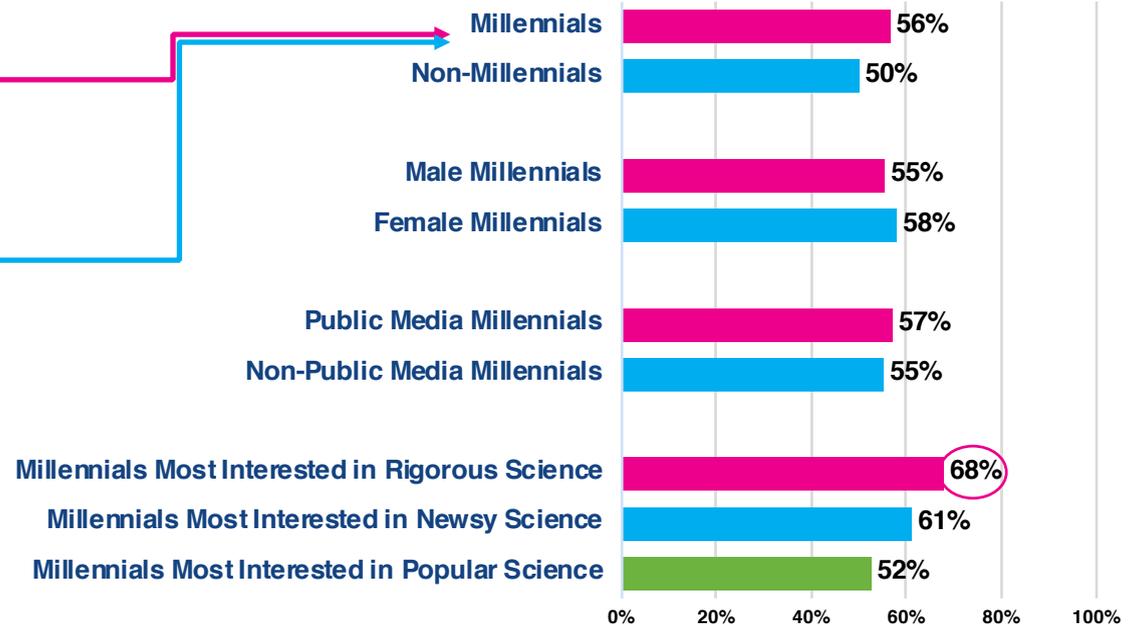
Base: National Panel Sample

# MILLENNIALS & THE STATE OF SCIENCE

# More Than Half of Millennials Agree There Is Too Much “Junk Science” in the Media

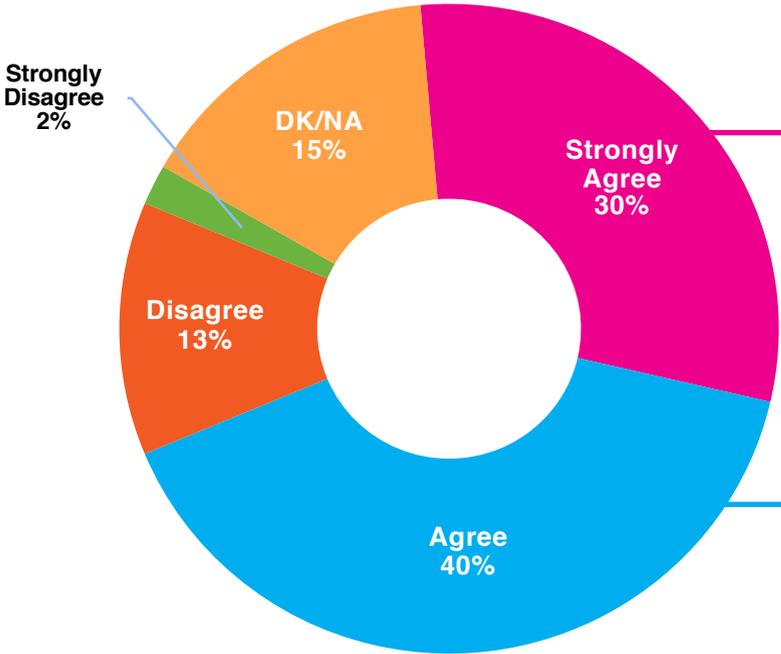


% Agreement (Strongly Agree + Agree)

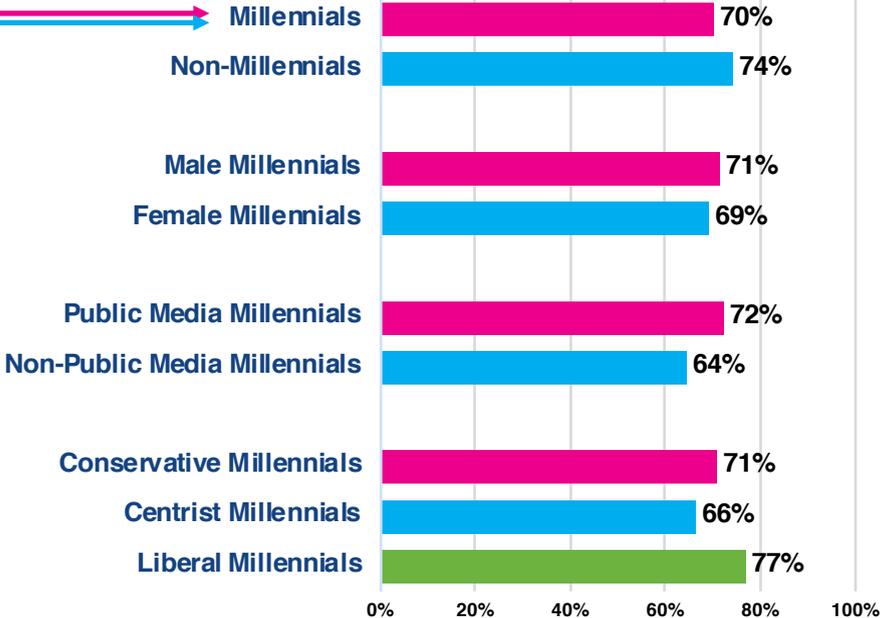


*“There is too much junk science in mainstream media”*

# Most Millennials Say Opposing Beliefs About Climate Change Are Growing

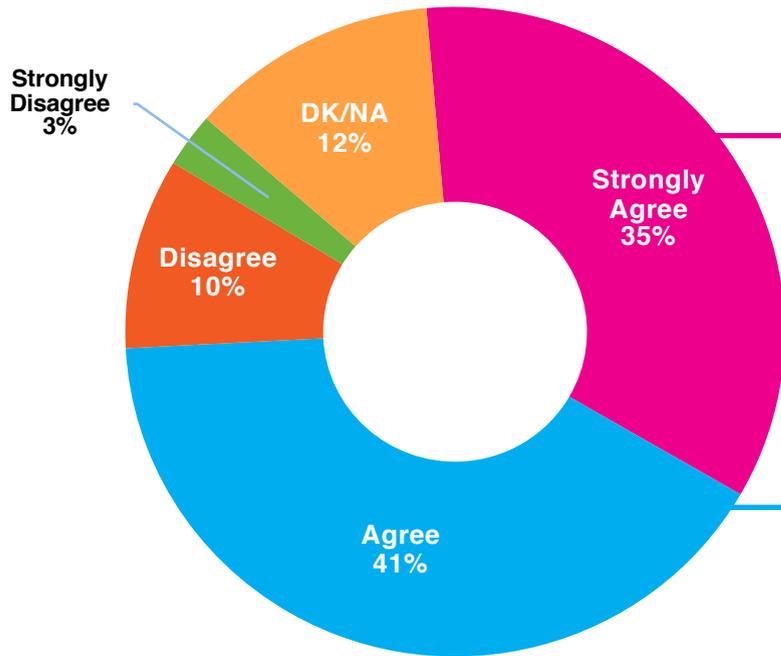


% Agreement (Strongly Agree + Agree)



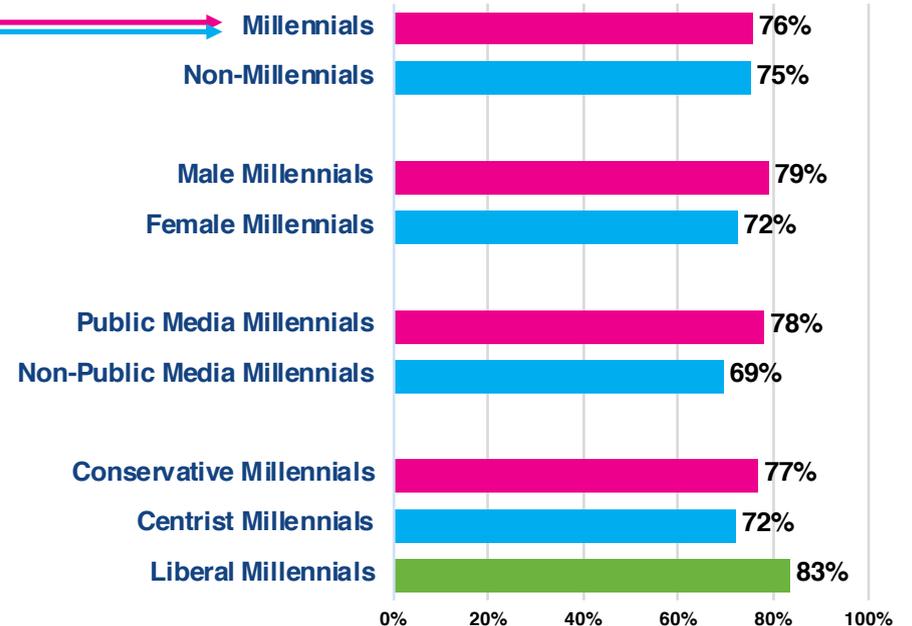
*“There is a widening gap between those who believe climate change is real and those who do not”*

# Three in Four Millennials Say the Scientific Method Is Valid Today

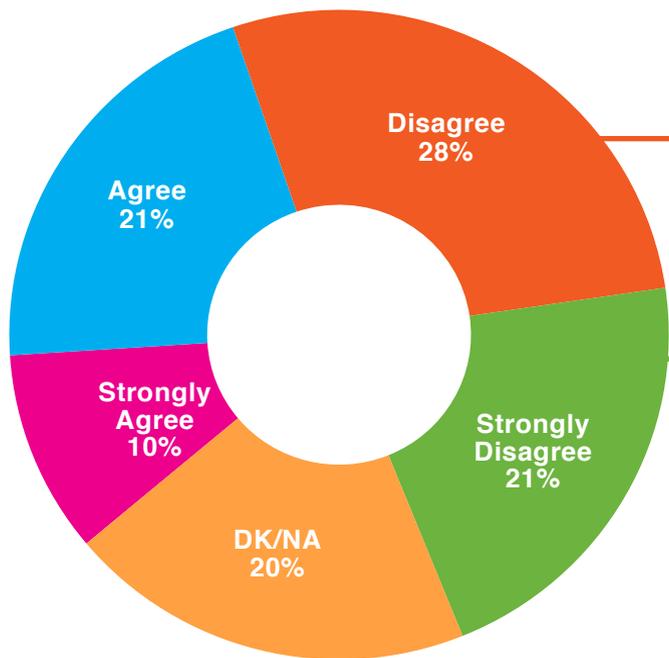


*"I believe the scientific method to question/probe/research/confirm is as valid today as it has been in the past"*

% Agreement (Strongly Agree + Agree)

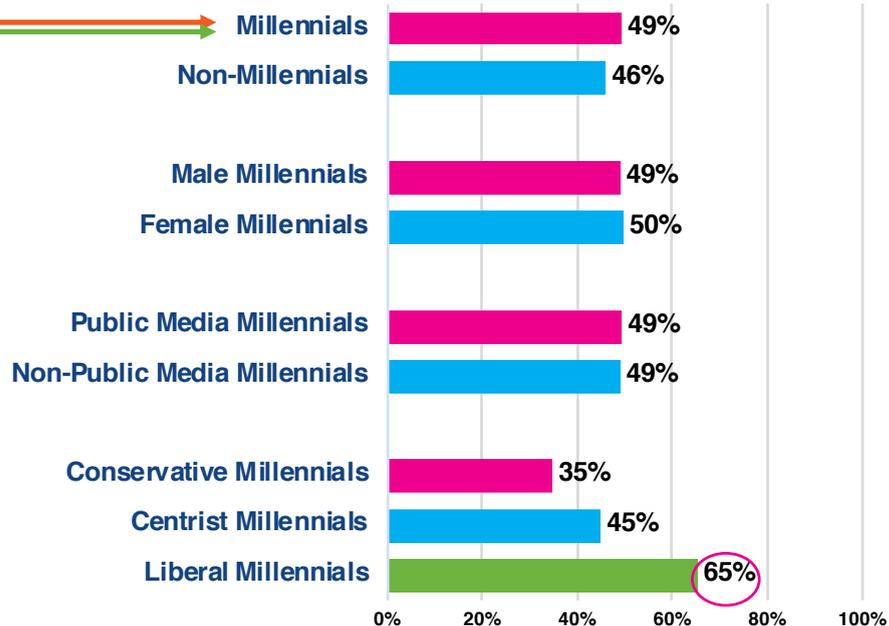


# Half of Millennials Say Science Is Not Being Sufficiently Funded in the U.S.; Political Lean Plays a Role



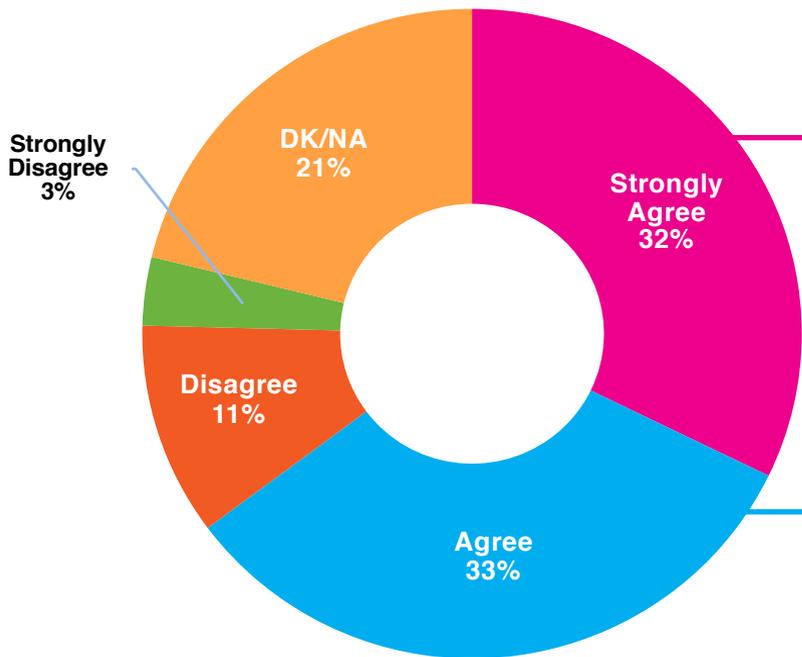
*“In general, there are enough funds being allocated to scientific research and advancement in the United States”*

% Disagreement (Strongly Disagree + Disagree)



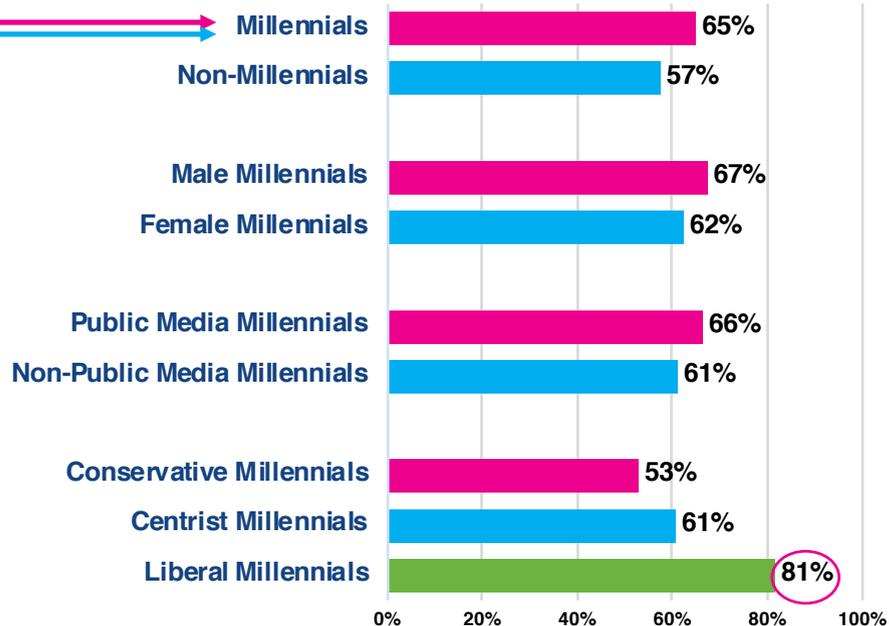
Base: National Panel Sample

# Most Millennials Say Science Is Being Negatively Impacted By Politics, Particularly Liberal Millennials



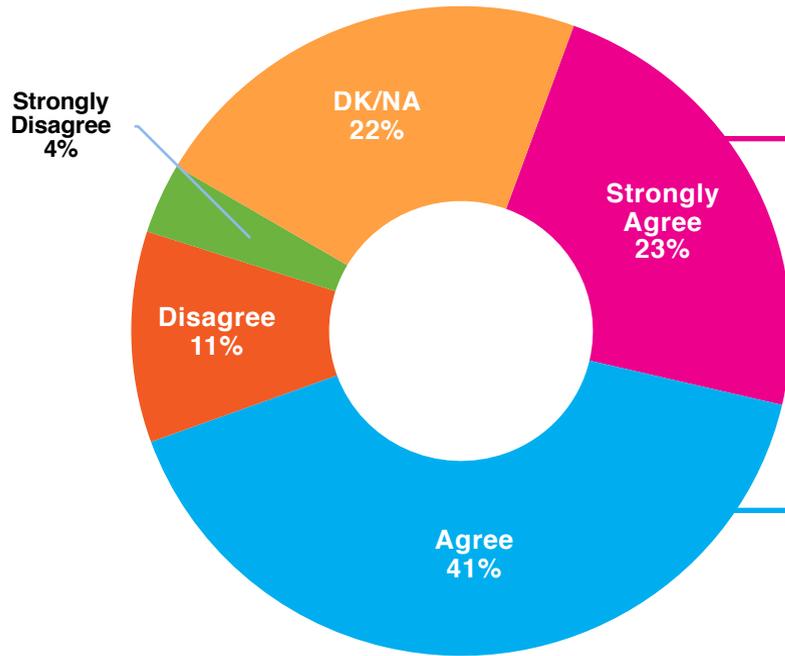
*“The current political climate in the United States is negatively impacting the efforts of the scientific community”*

% Agreement (Strongly Agree + Agree)



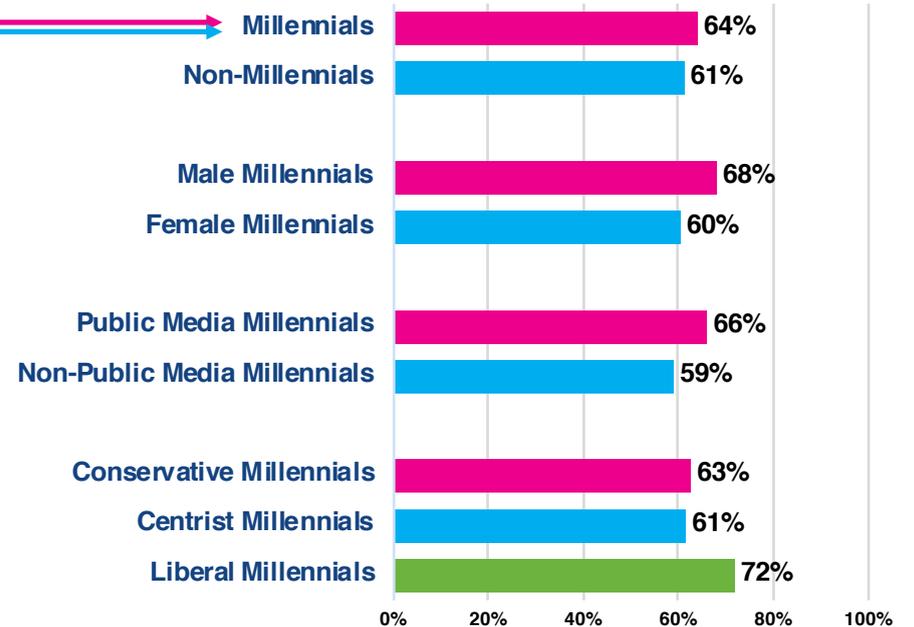
Base: National Panel Sample

# The Majority of Millennials Feel Science Objectivity Is a Challenge for the Private Sector



*“It is difficult for the private sector to remain objective about science due to its nature of considering profits first”*

% Agreement (Strongly Agree + Agree)



An aerial satellite image showing a mountain range with a large lake and agricultural fields. The mountains are brown and rocky, with some green vegetation. A large, dark blue lake is visible in the lower left. To the right, there are green agricultural fields with a grid pattern. A black banner with white text is overlaid on the top half of the image.

# MILLENNIAL INTEREST IN SCIENCE DISCIPLINES

# Definitions of Three Types of General Science

**Popular science:** Such as what might be considered for general mass consumption – and is less about rigor and more about entertainment

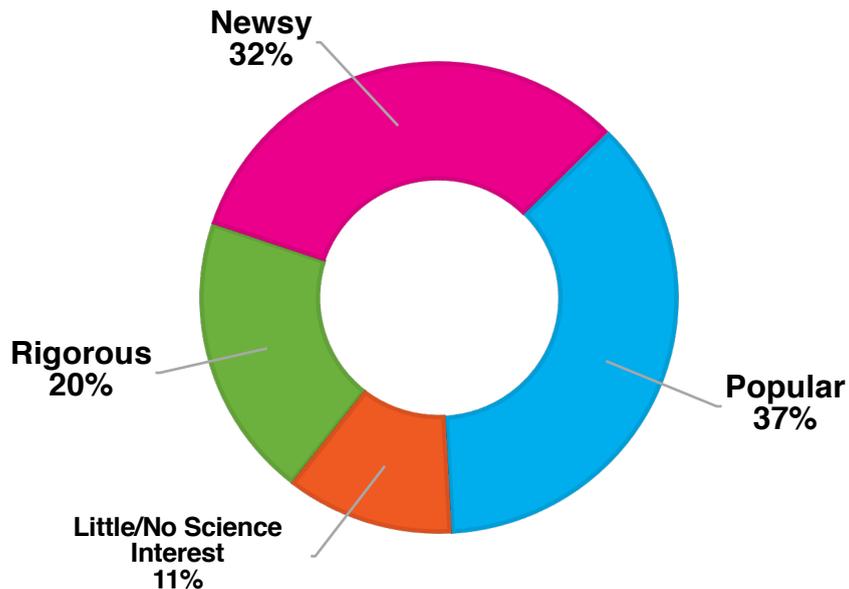
**Newsy science:** Such as what might be considered for general mass consumption – and follows rigor of accuracy, objectivity, fairness and public accountability

**Rigorous science:** Such as what might be found in academic journals – and which follows a measure of methodological rigor, exactitude, and objectivity

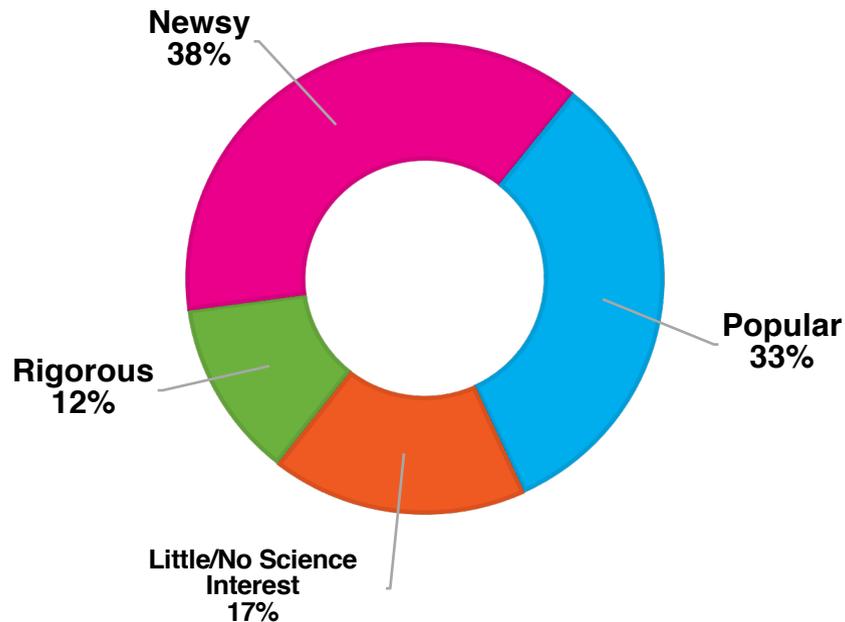
# Millennials Are Most Interested in “Popular” Science – More Entertainment-Based, General Consumption Science

*“In general, which one of the following types of science are you most interested in?”*

**Millennials**



**Non-Millennials**

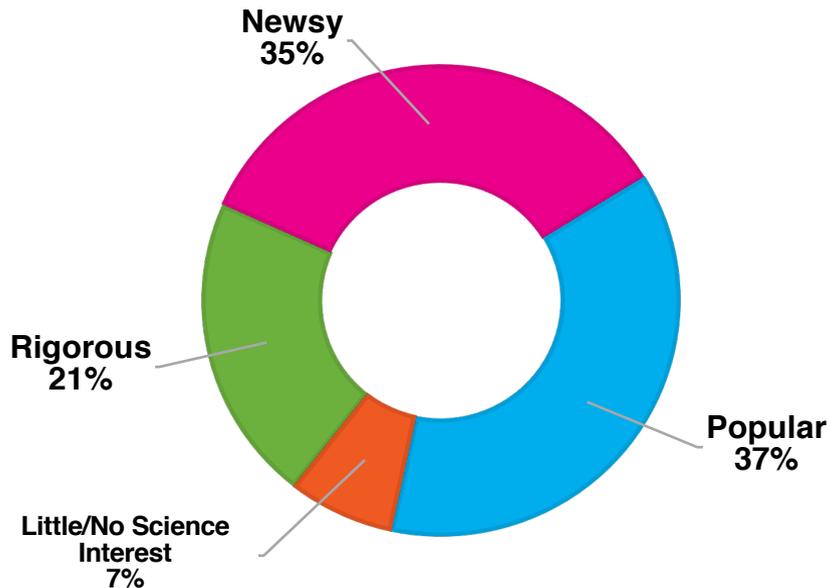


Base: National Panel Sample

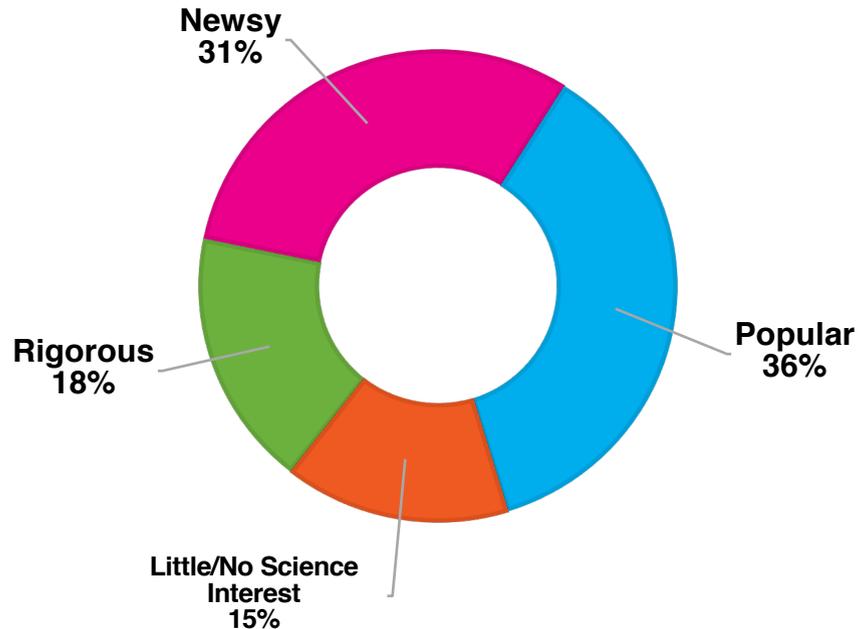
# Both Male and Female Millennials Find “Popular” Science of Most Interest

*“In general, which one of the following types of science are you most interested in?”*

**Male Millennials**



**Female Millennials**

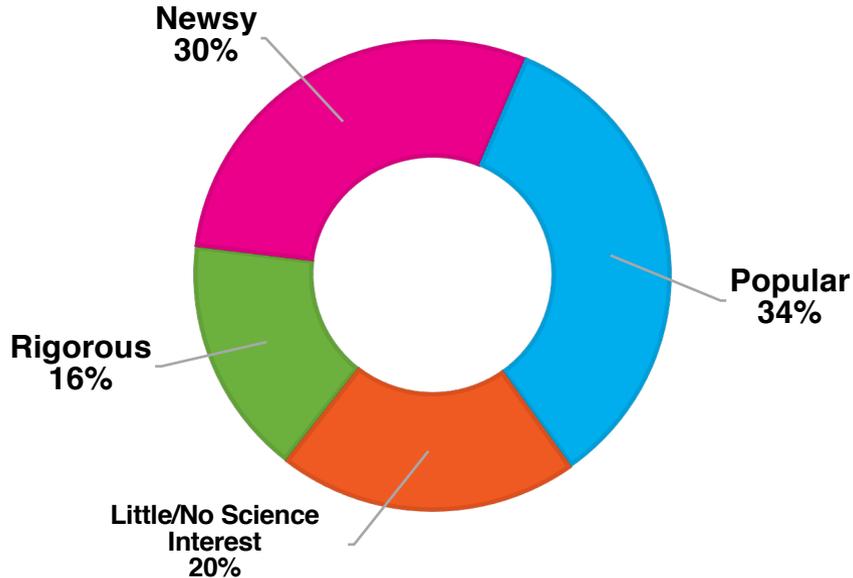


Base: National Panel Sample

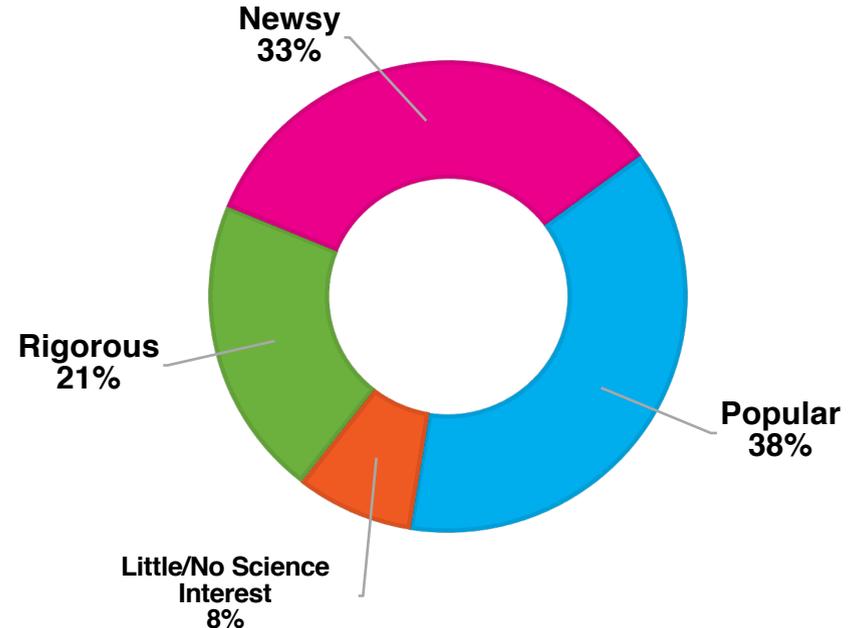
# “Popular” Science Is Most Preferred Among Millennials Who Use Public Media and Those Who Do Not

*“In general, which one of the following types of science are you most interested in?”*

### Non-Public Media Millennials



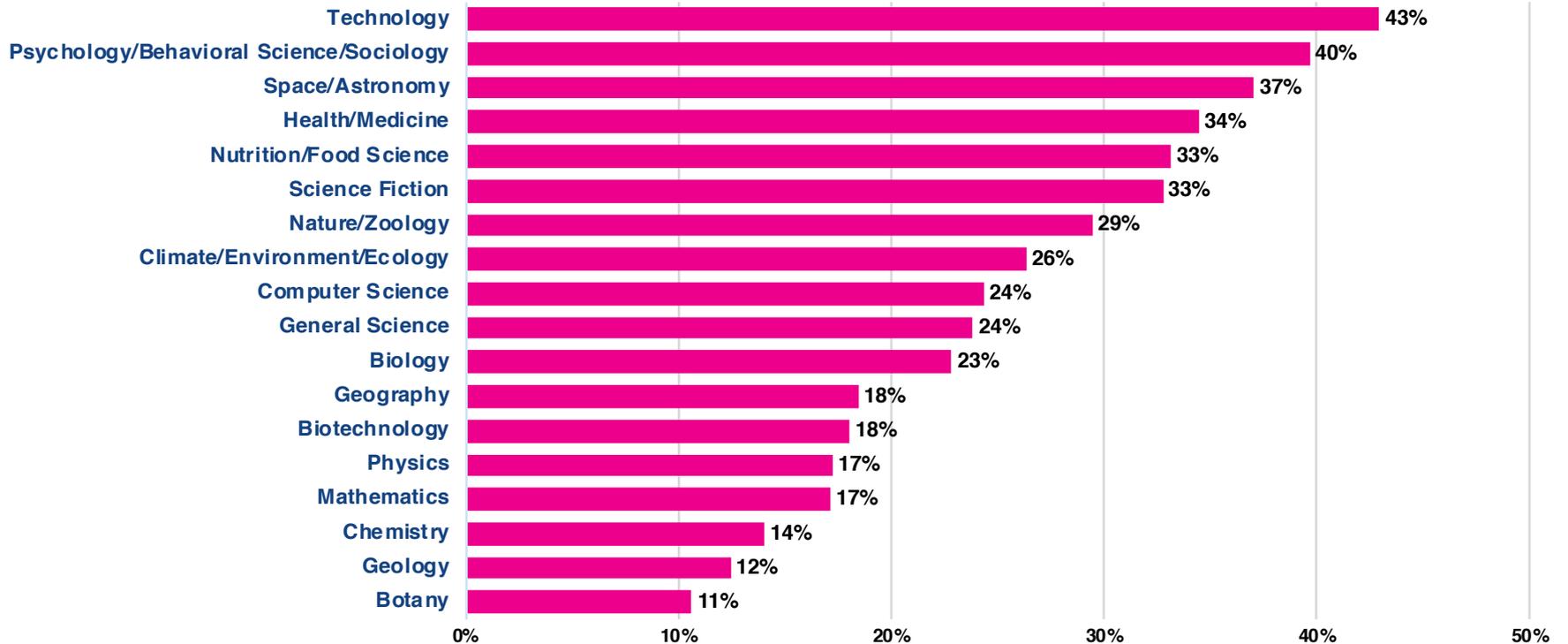
### Public Media Millennials



Base: National Panel Sample

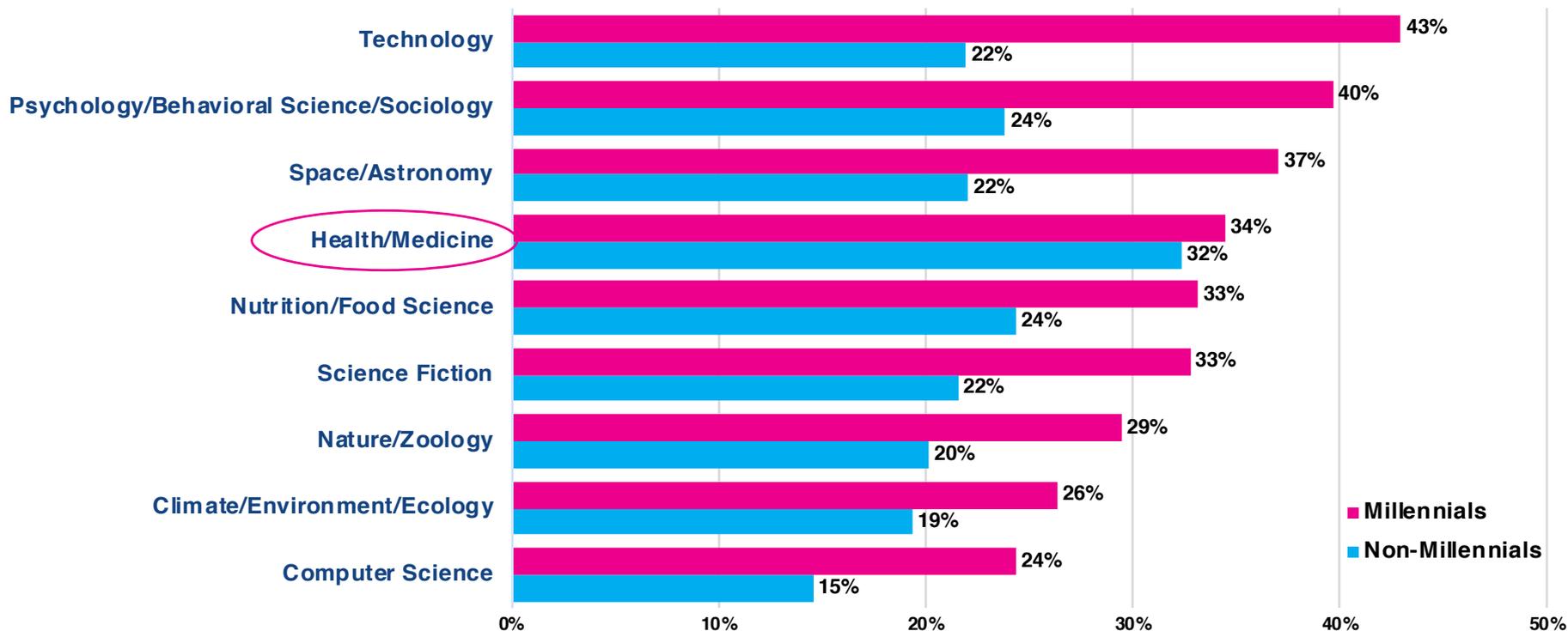
# Millennials Are Most Interested in Technology, Followed by Psychology/Behavioral Science/Sociology, and Space/Astronomy

% "Very" Interested in Each Type of Science

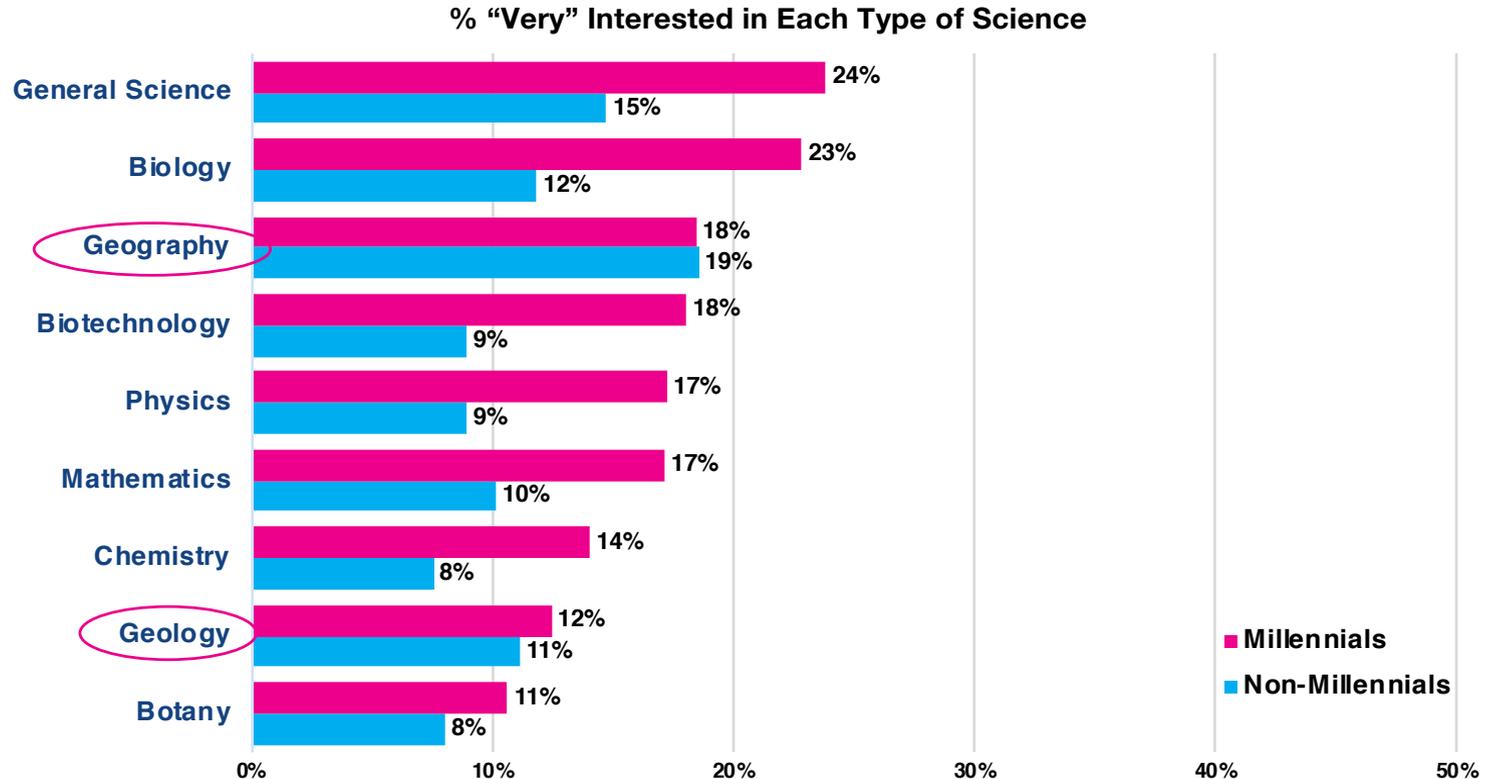


# Health/Medicine Has Similar Appeal Among Millennials and Non-Millennials; There are Bigger Gaps for Other Disciplines

% "Very" Interested in Each Type of Science

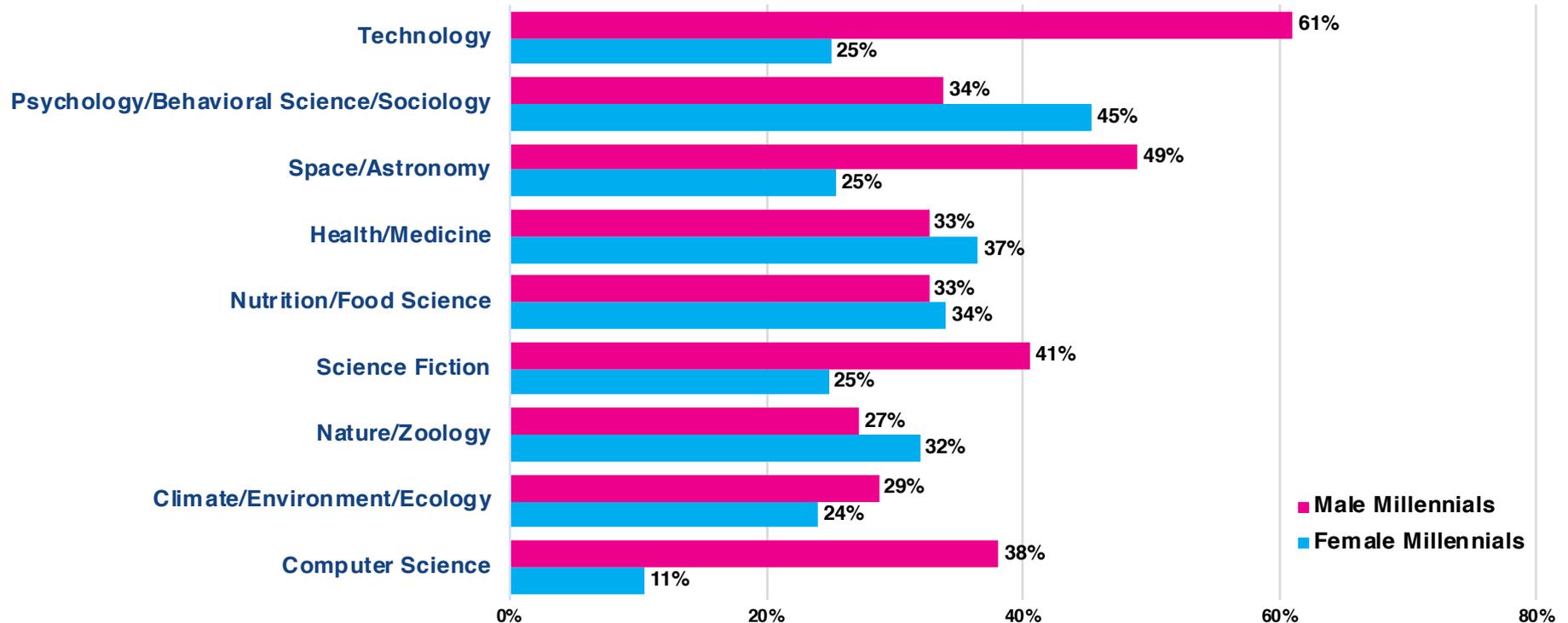


# Geography and Geology Also Share Similar Appeal Between Millennials and Non-Millennials

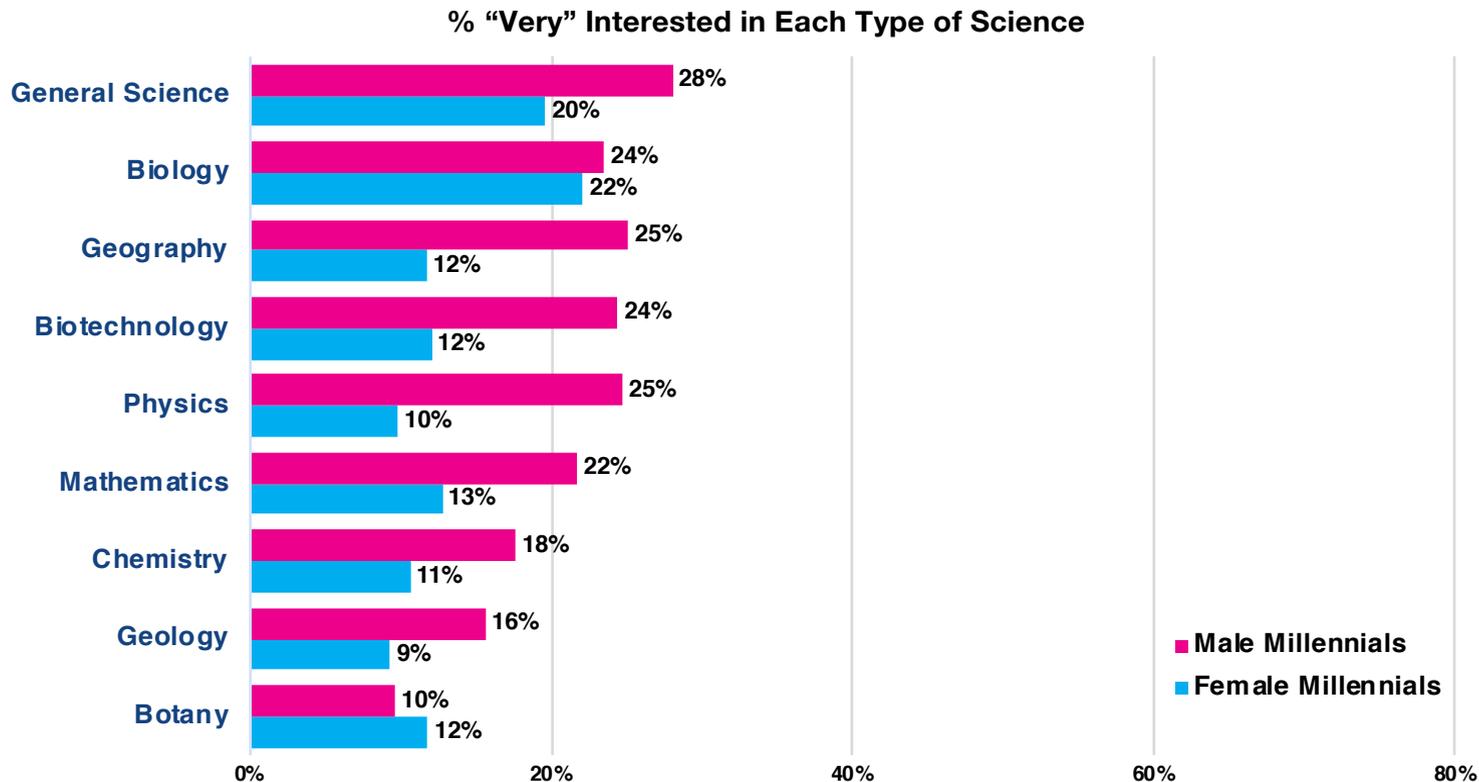


# Technology, Space/Astronomy and Computer Science Are Preferred by Men; Life Sciences Appeal to Women; Health & Wellness Has Crossover Appeal

% "Very" Interested in Each Type of Science

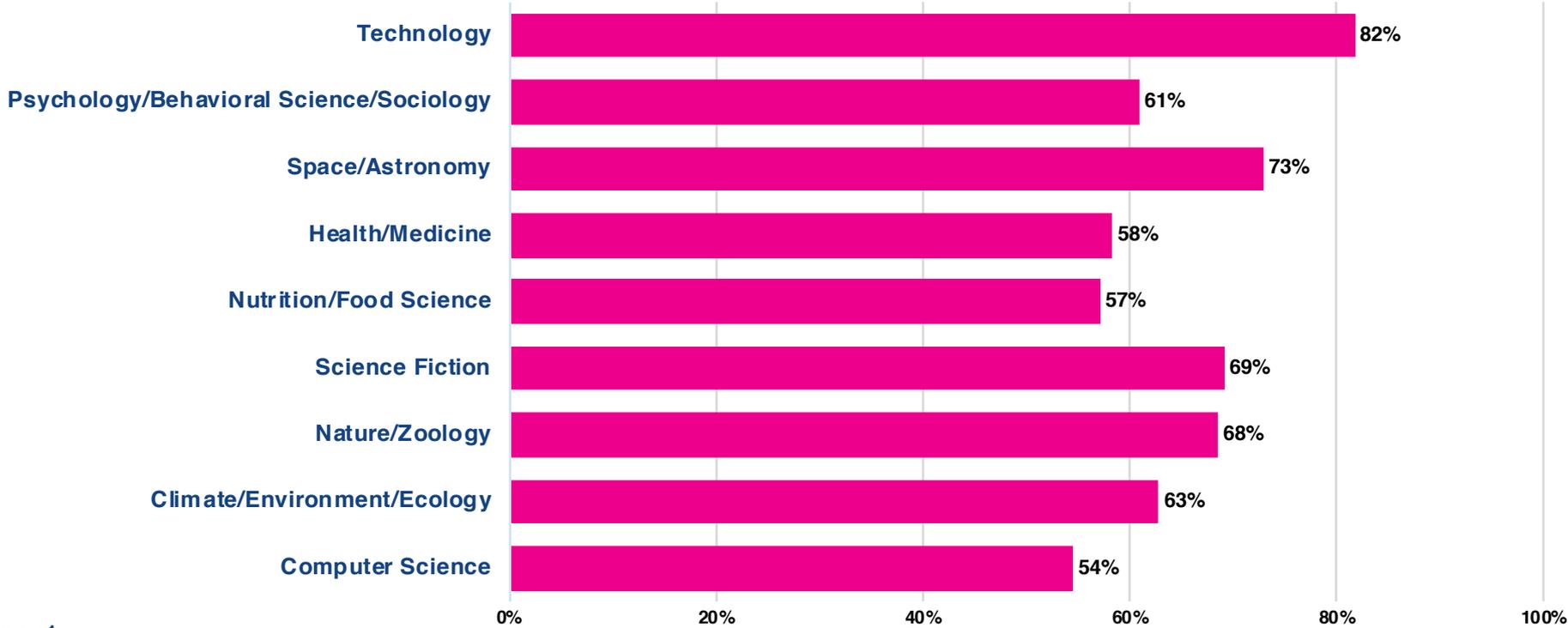


# There Is Less Overall Passion For Most Earth/Physical Sciences, With Men Showing Greater Interest Than Women

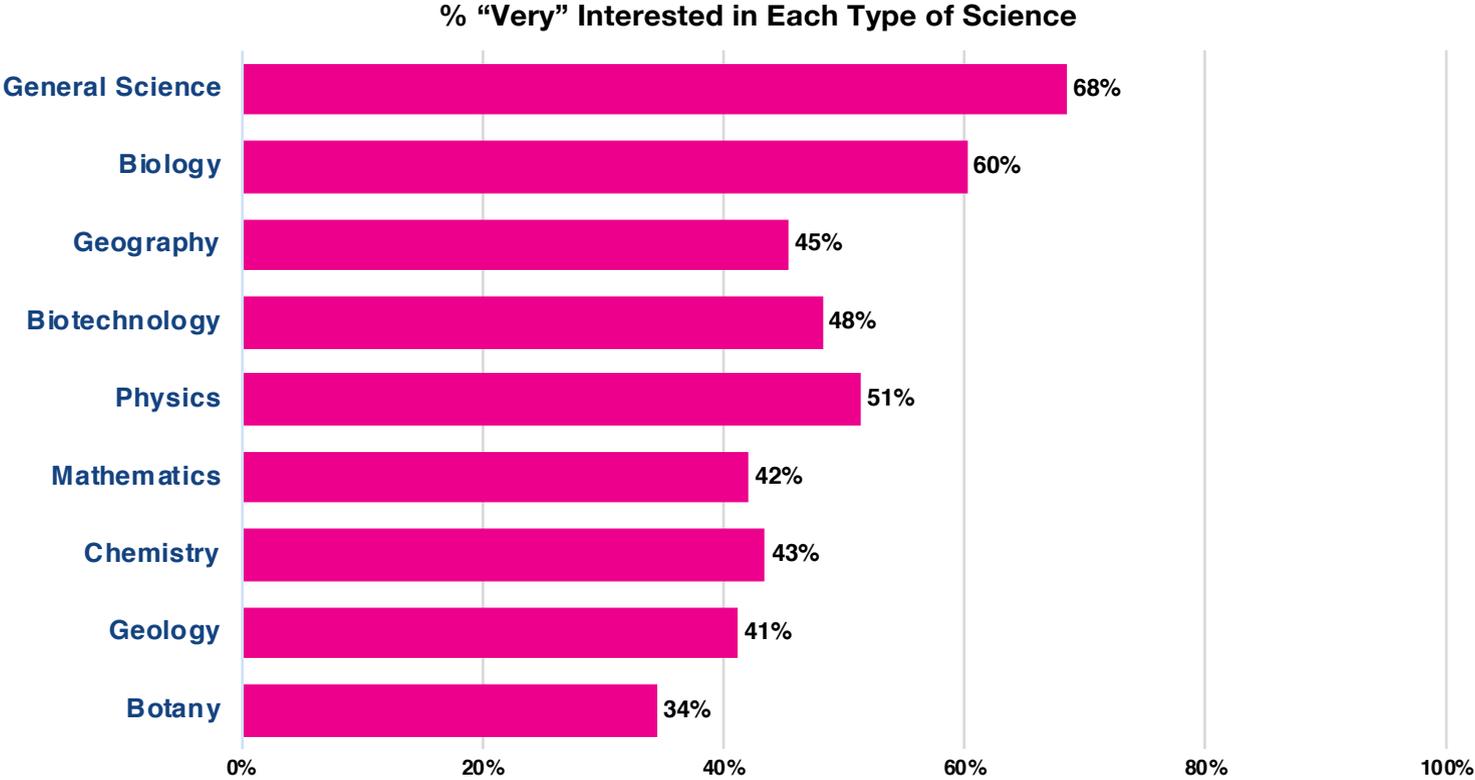


# Millennials - Science Type Interest by High Science Curiosity

% "Very" Interested in Each Type of Science



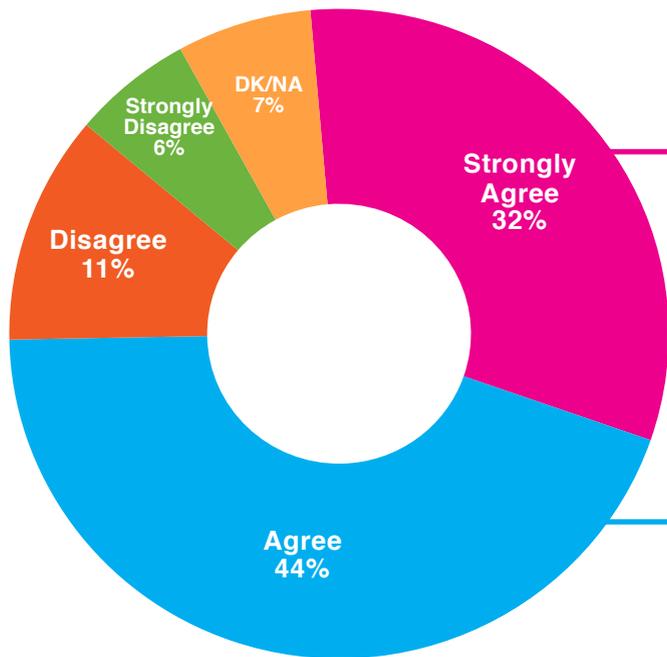
# Millennials - Science Type Interest by High Science Curiosity



# SCIENCE DOCUMENTARIES

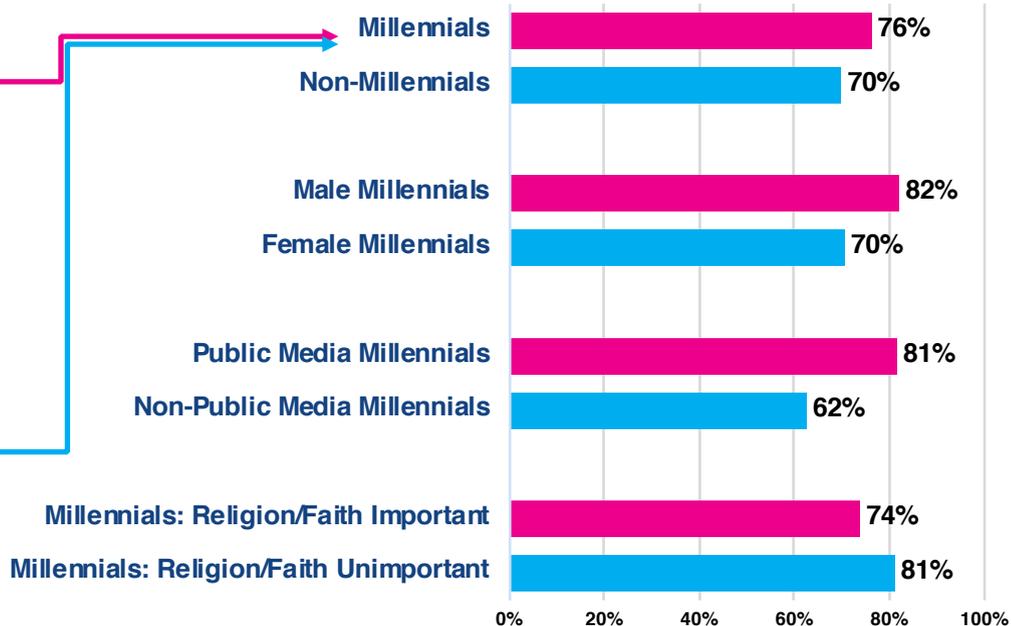


# Most Millennials Enjoy Watching Science Documentaries

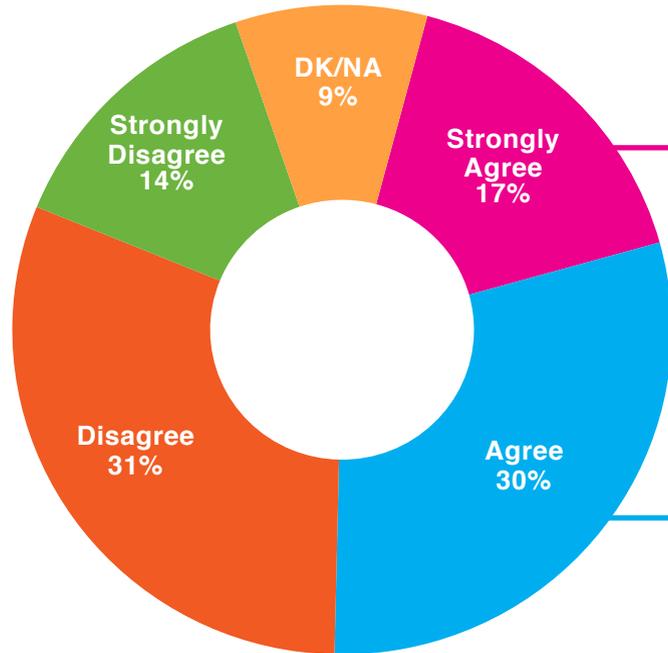


*"I enjoy watching science documentaries online or on TV"*

% Agreement (Strongly Agree + Agree)

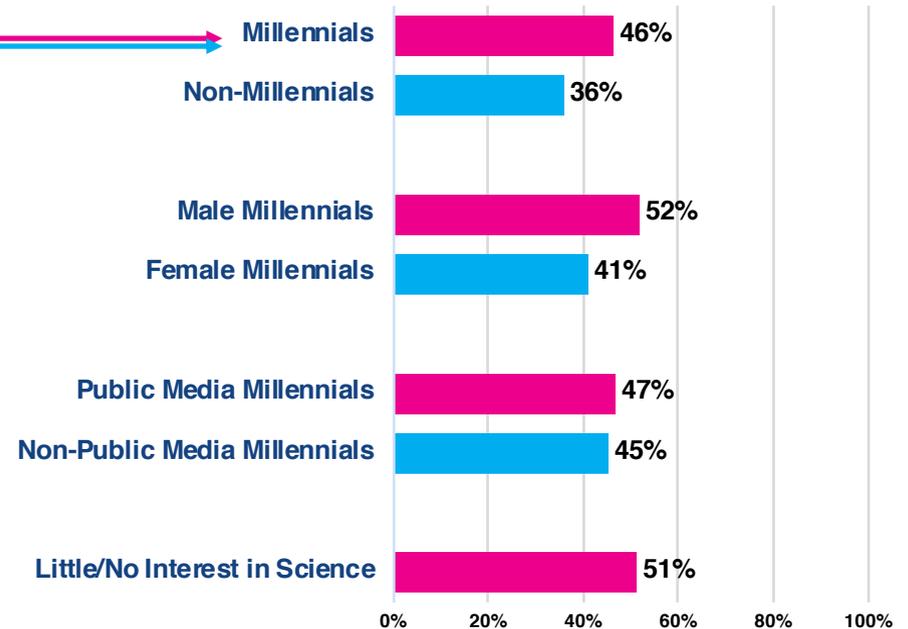


# Science Fiction Movies Are as Appealing to Millennials as Science Documentaries



*"Science fiction movies are more appealing to me than science documentaries"*

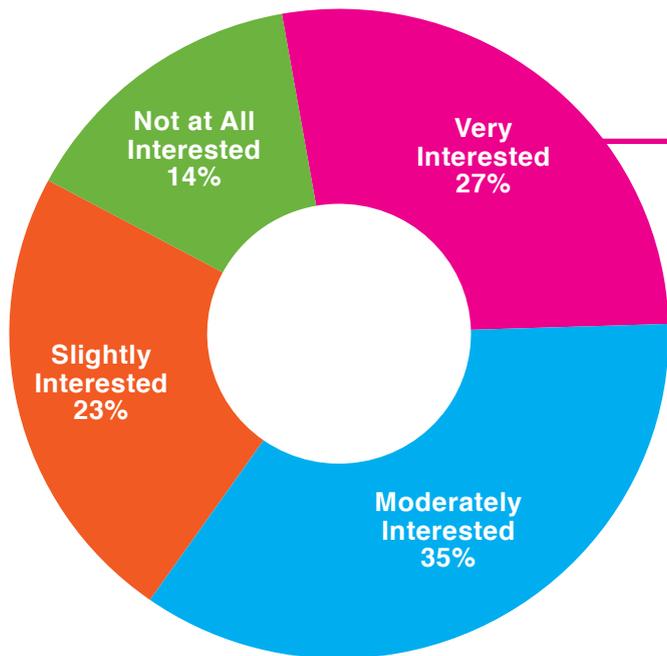
% Agreement (Strongly Agree + Agree)



# SCIENCE SOCIAL GATHERINGS

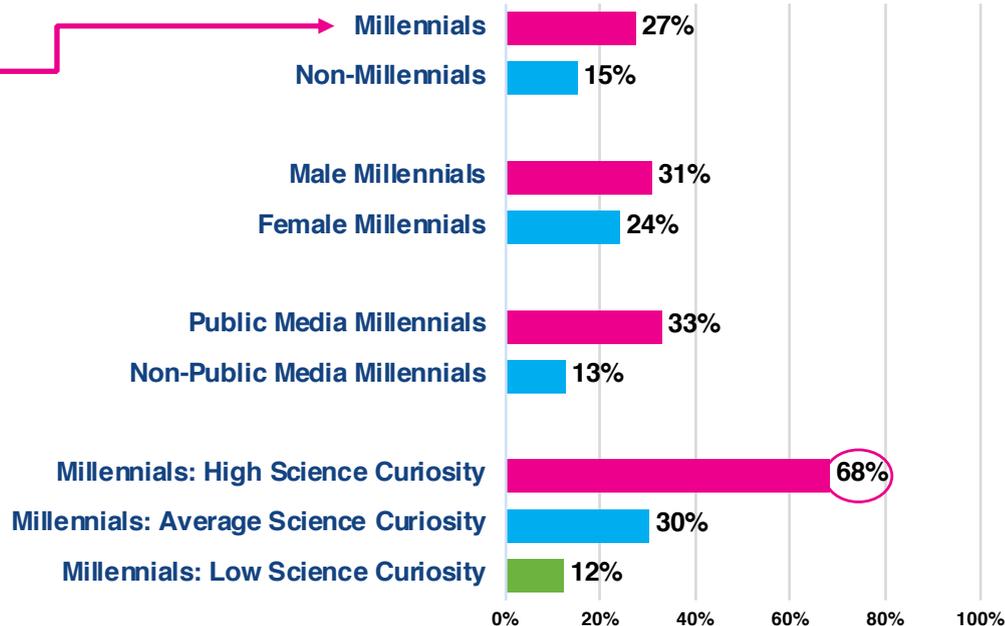


# More Than One in Four Millennials and the Majority of High SCS are Very Interested in Science-Centered Social Events



*“How interested would you be in attending social gatherings centered around one of these areas of science you indicated you are most interested in?”*

**% “Very” Interested in Attending Social Gatherings on Science Areas of Interest**

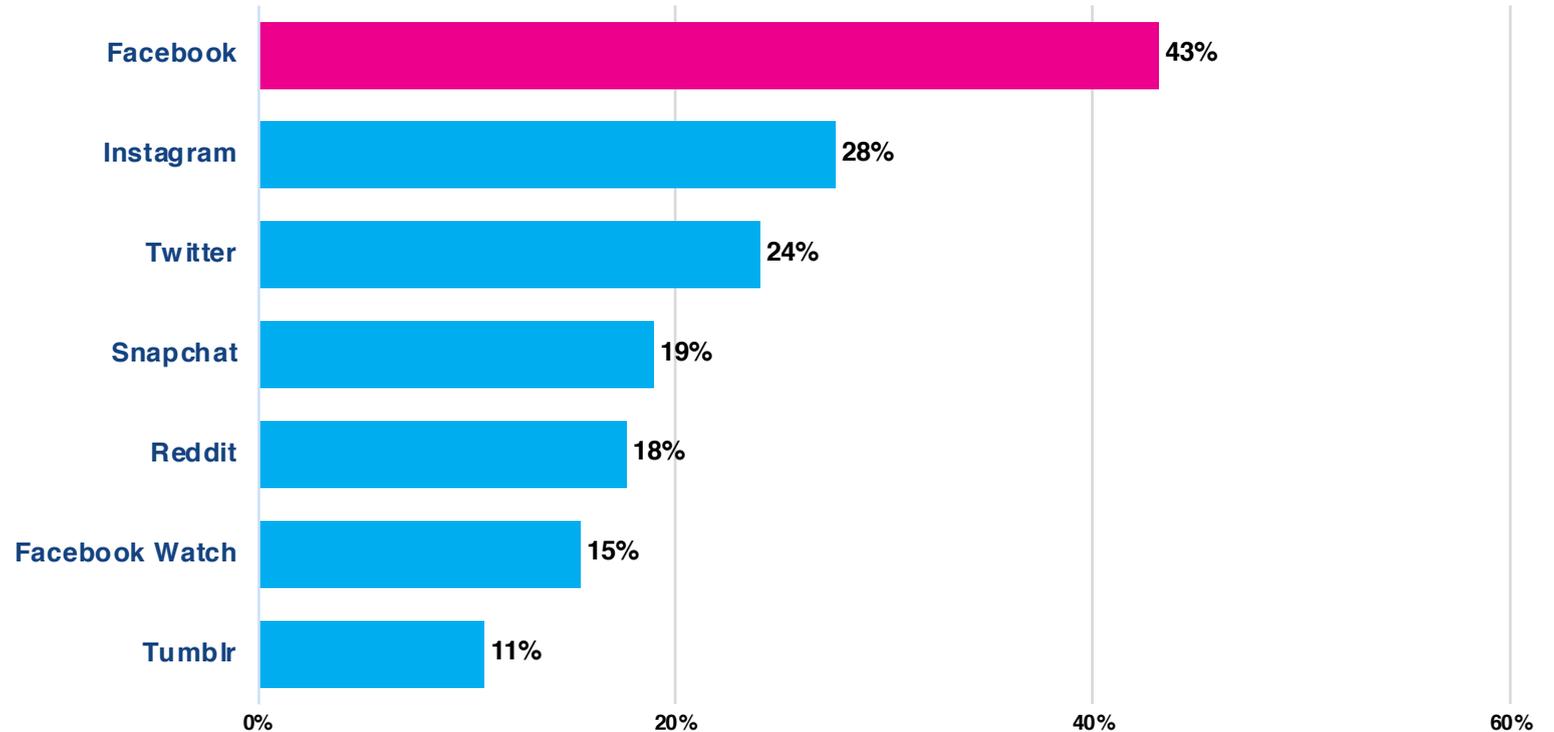


# SCIENCE & SOCIAL MEDIA



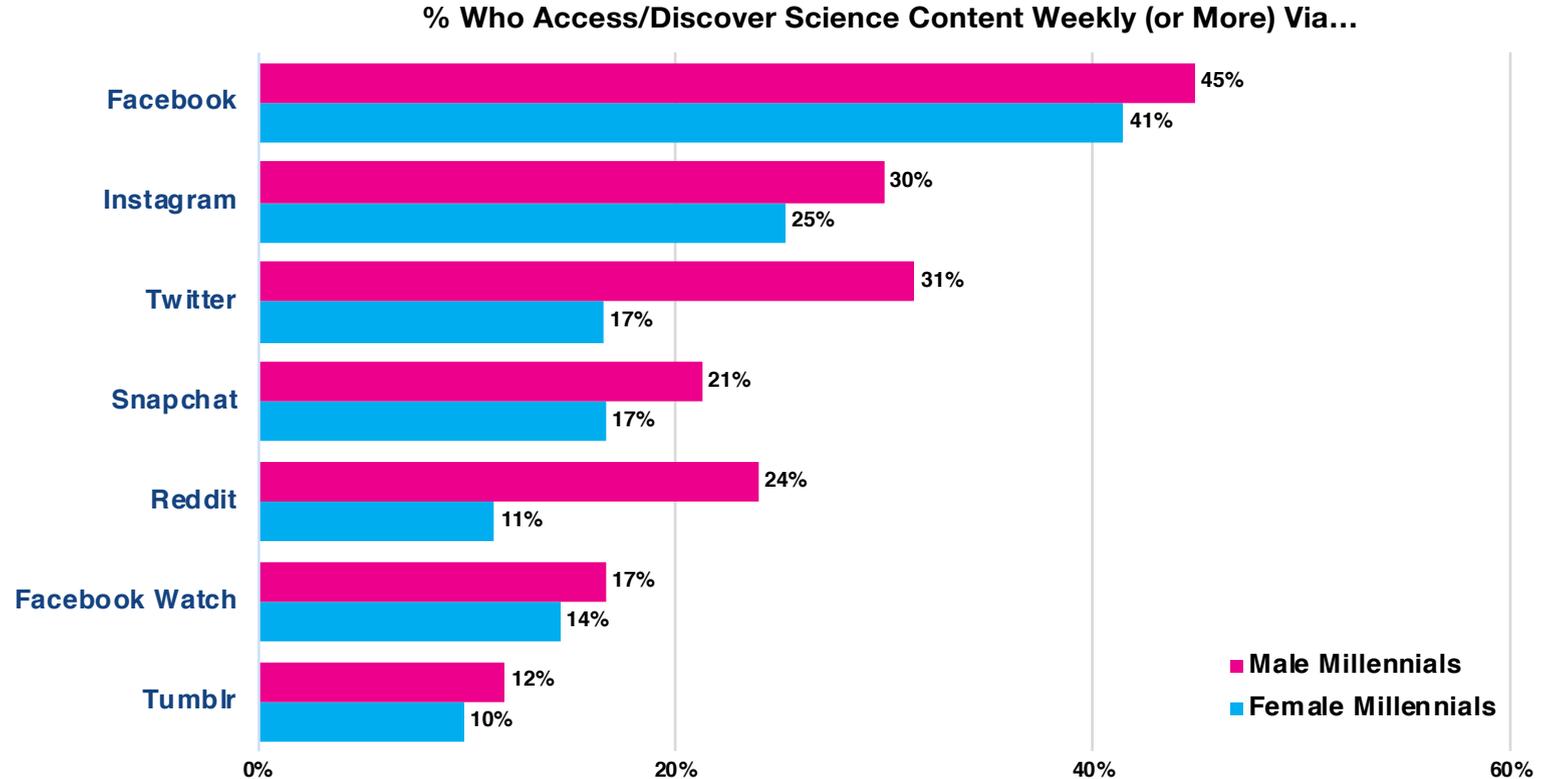
# Facebook Is the Dominant Social Media Platform for Science Consumption Among Millennials

% Who Access/Discover Science Content Weekly (or More) Via...

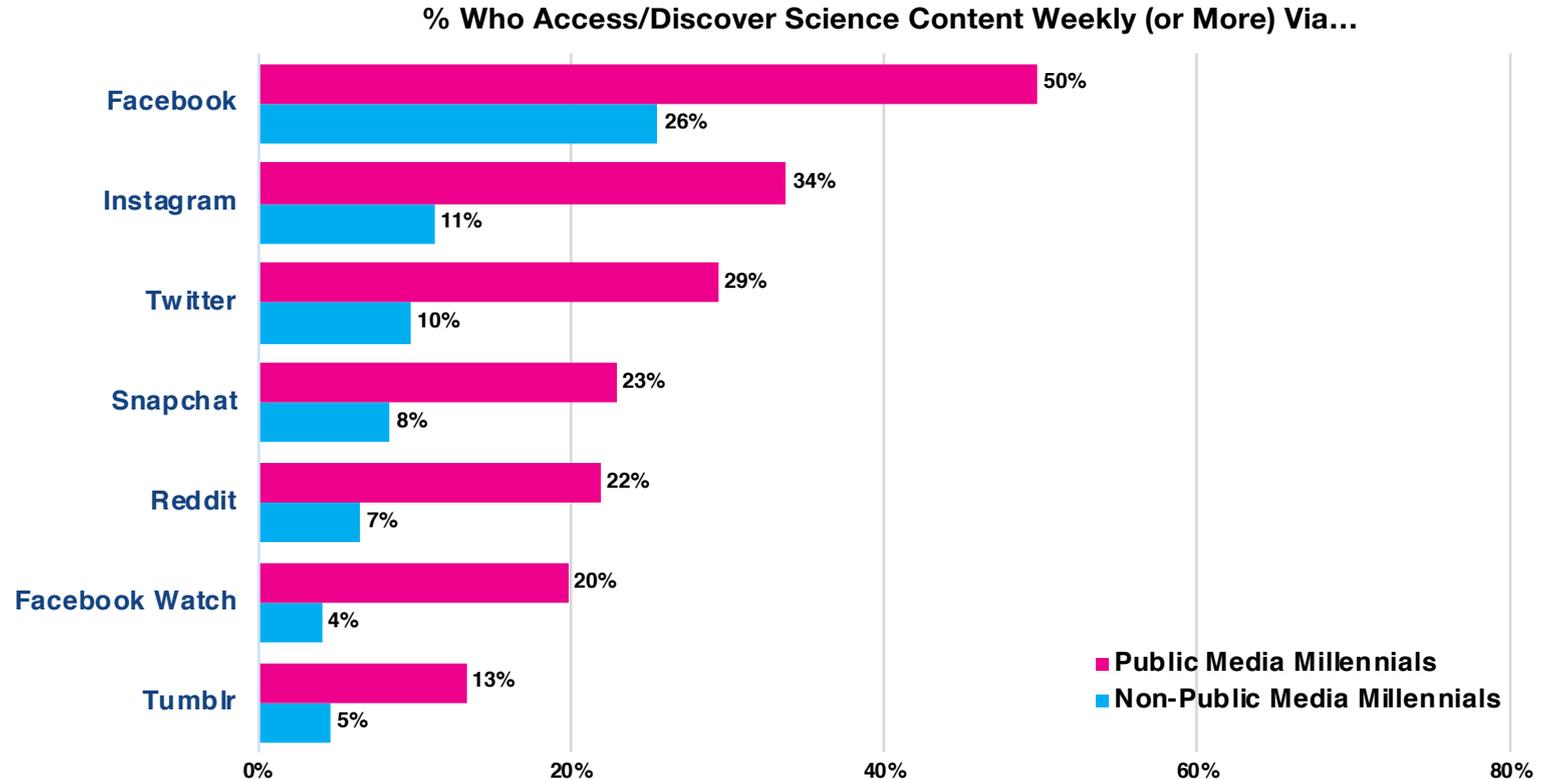


Base: National Panel Sample Millennials

# Male Millennials Are Especially Apt to Use Twitter and Reddit to Follow Science



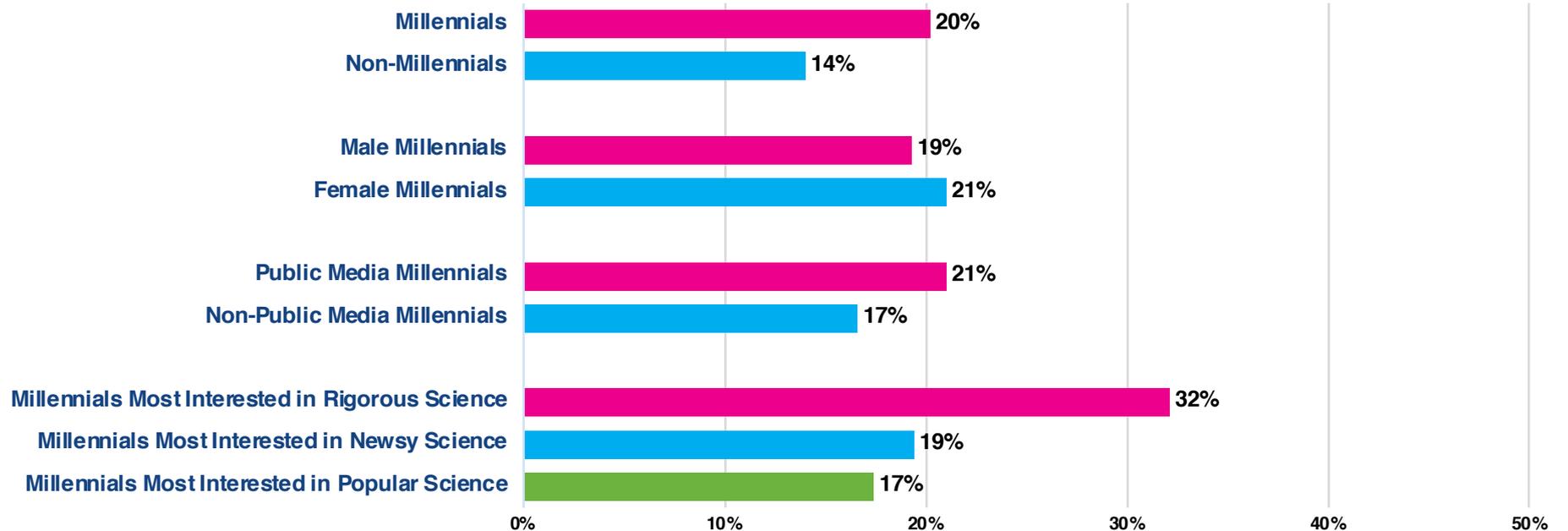
# Facebook Dominates Science Consumption on Social Media, Especially Among Millennials Who Use Public Media



Base: National Panel Sample

# Among Those Who Consume Science Monthly or More Via Social Media, One in Five Millennials Is Involved in a Science-Related Social Group

% Who Follow/Participate in Any Science-Related Groups on Social Media

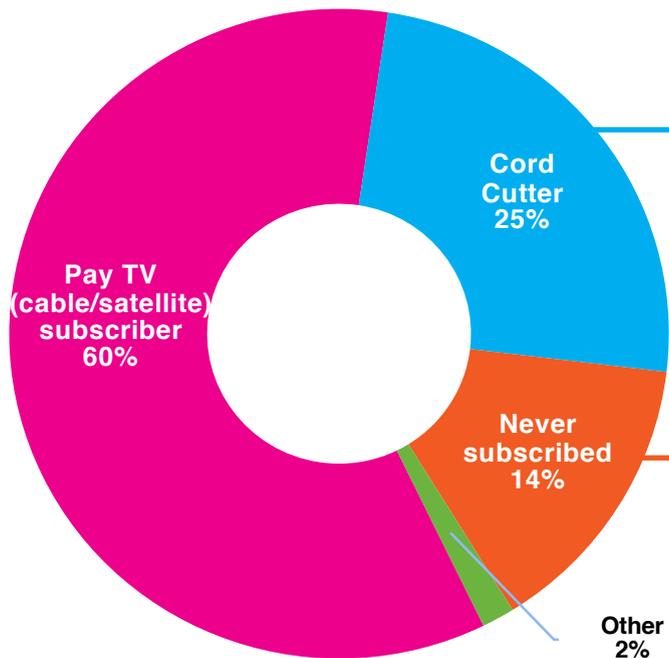


Base: Those who use social media for science at least monthly in the National Panel Sample

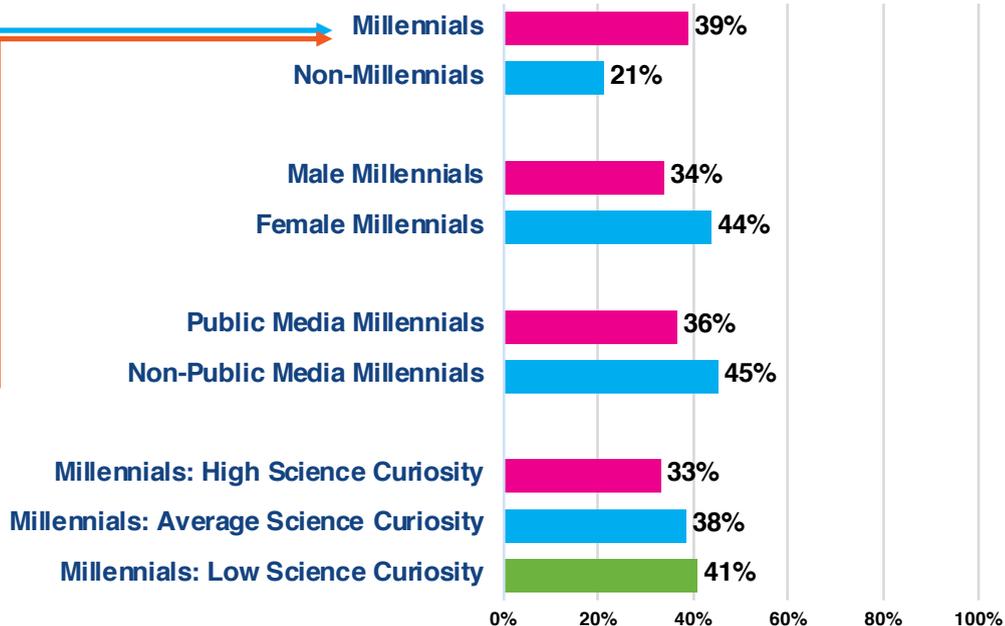


# ONLINE VIDEO STREAMING

# Many Millennials, Particularly Females, Have Cut the Pay TV Cord or Have Never Been a Subscriber

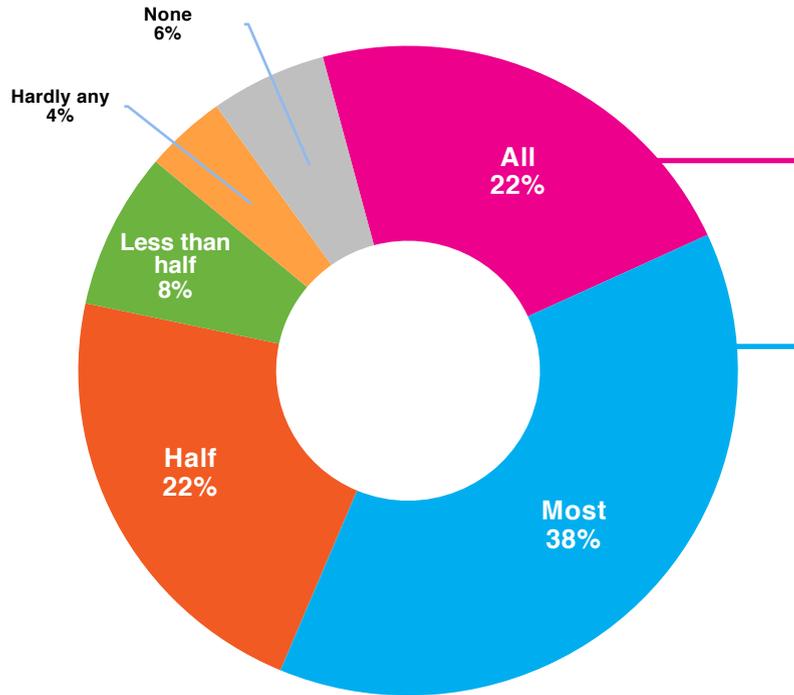


% Who Do Not Subscribe to Pay Television (Cord Cutter or Never Subscribed)

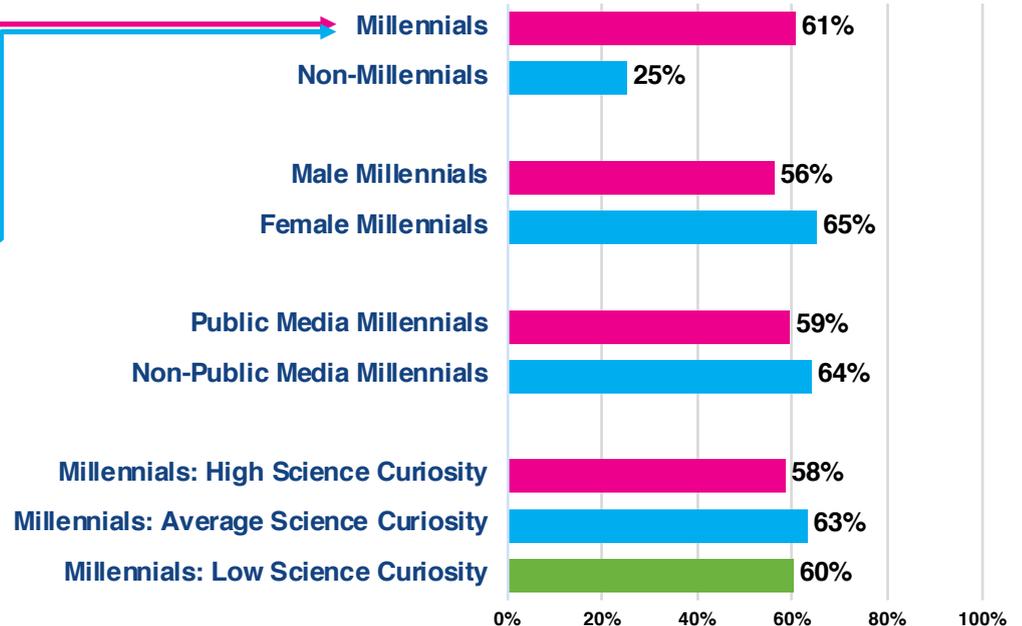


Base: National Panel Sample

# Six in Ten Millennials Say All or Most of Their TV/Video Viewing Is On-Demand; More Than Twice That of Non-Millennials

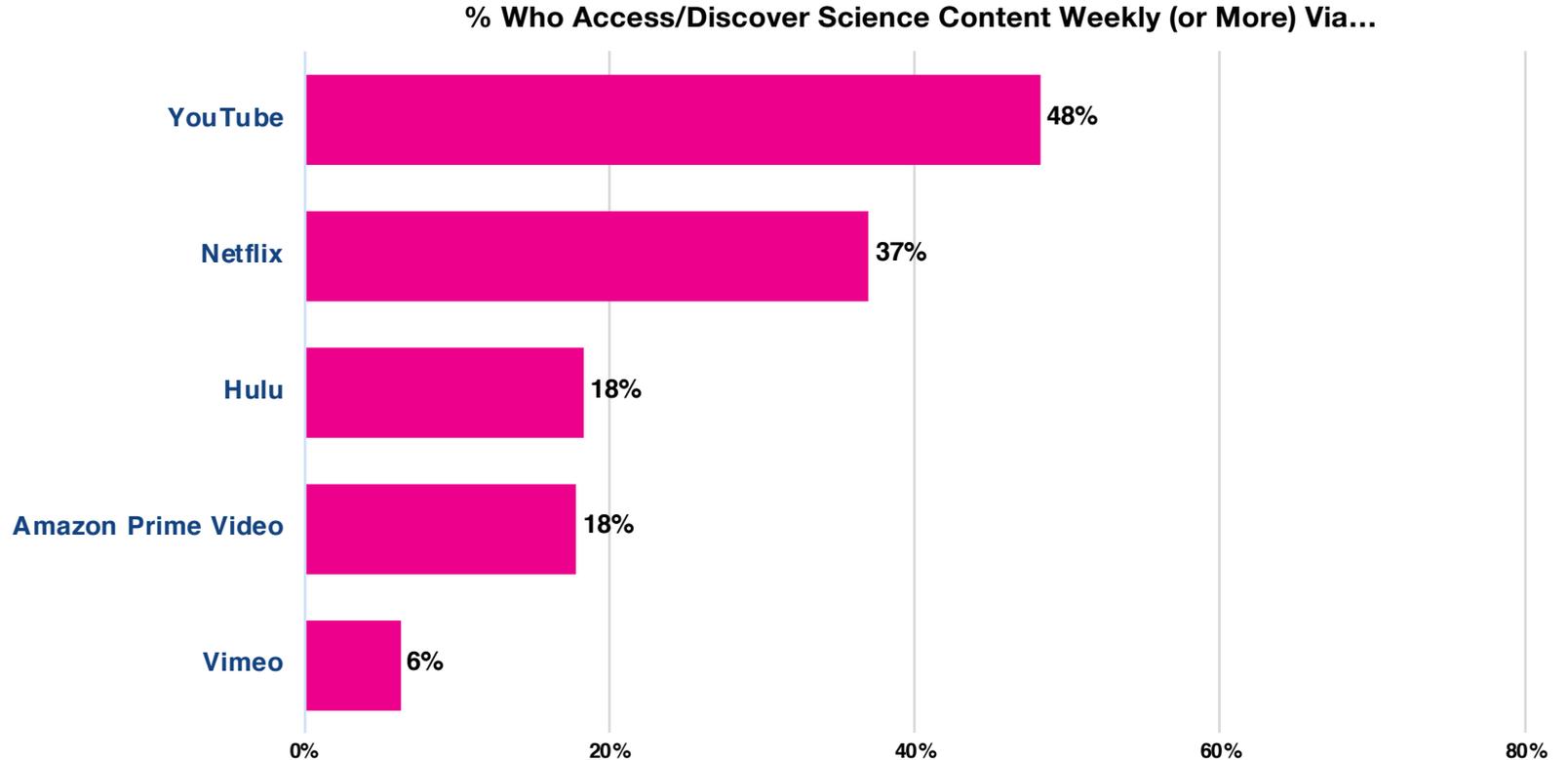


% Saying “All” or “Most” TV/Video Viewing Is On-Demand



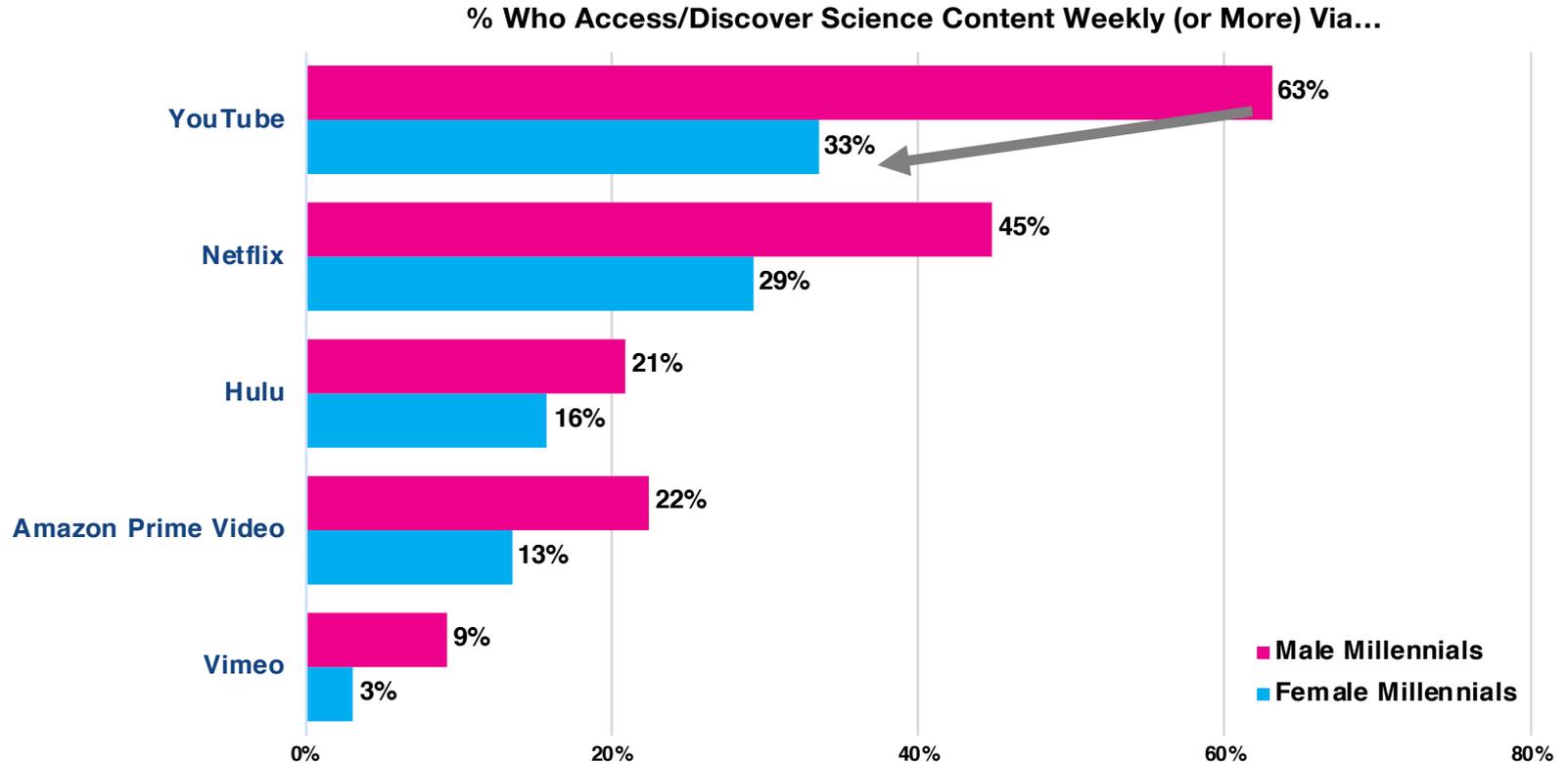
*“What percentage of your overall TV or other video viewing takes place on-demand – using a DVR, on-demand video, or a service like Netflix or Hulu?”*

# Nearly Half of Millennials Watch Science Videos on YouTube Weekly; More Than One-Third Use Netflix Weekly to Consume Science Content



Base: National Panel Sample Millennials

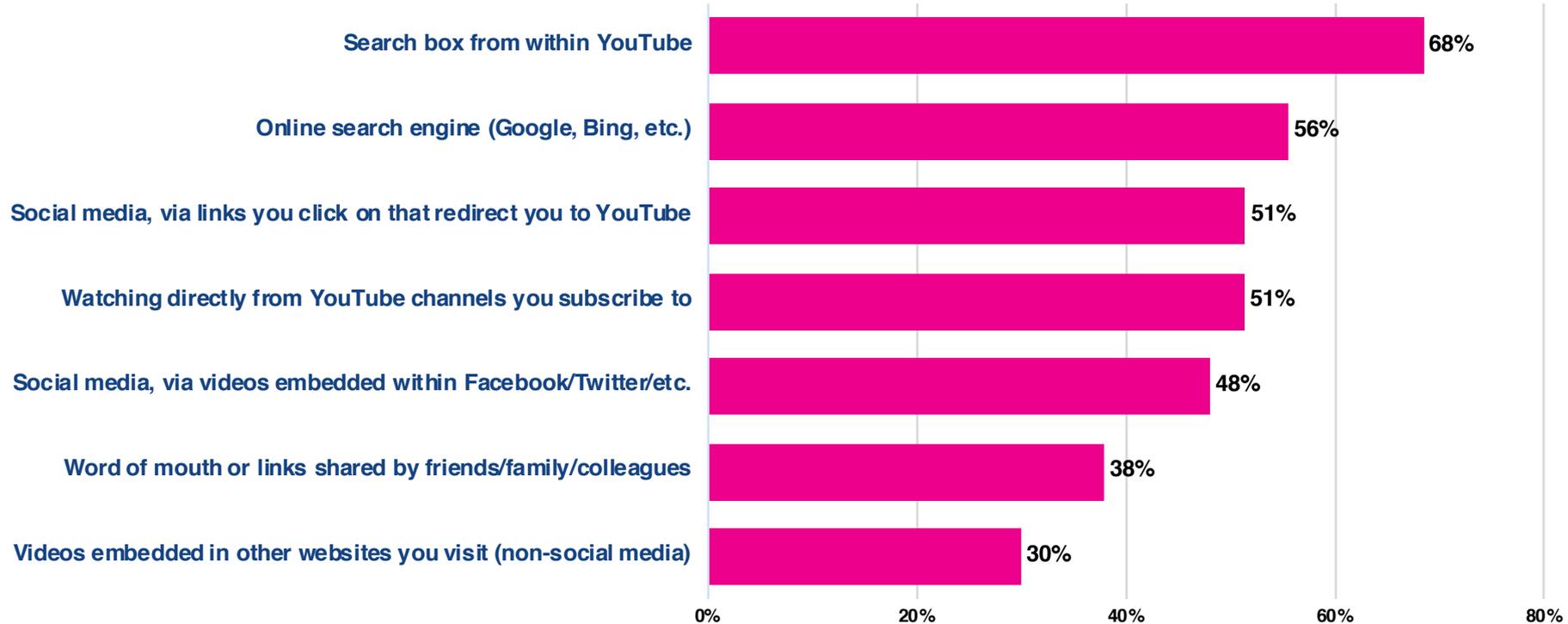
# There Is a Larger Millennial Gender Gap for Accessing Science Videos Weekly Via YouTube Than for Any Other Online Video Platform



Base: National Panel Sample

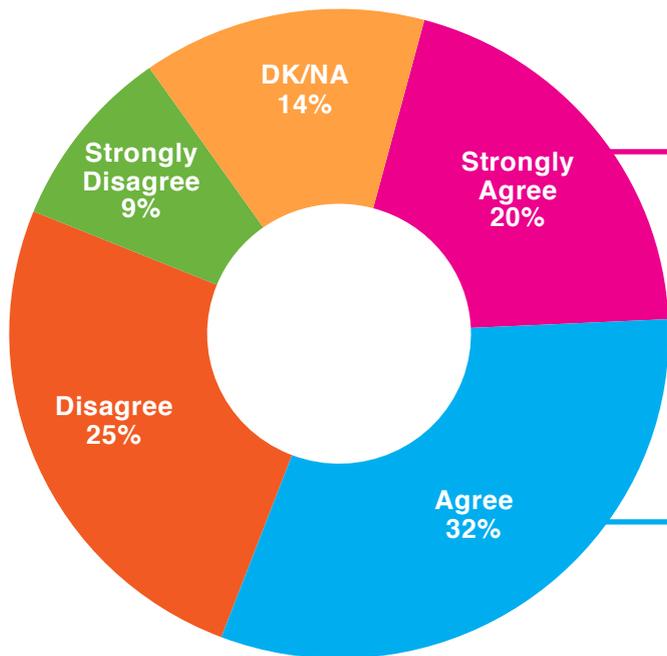
# The Most Regularly Used Method Millennials Use to Find Science Content From YouTube Is Its Search Box

Among Those Who Watch Science Videos From YouTube Monthly,  
% Who Regularly Access the Science Content Via...



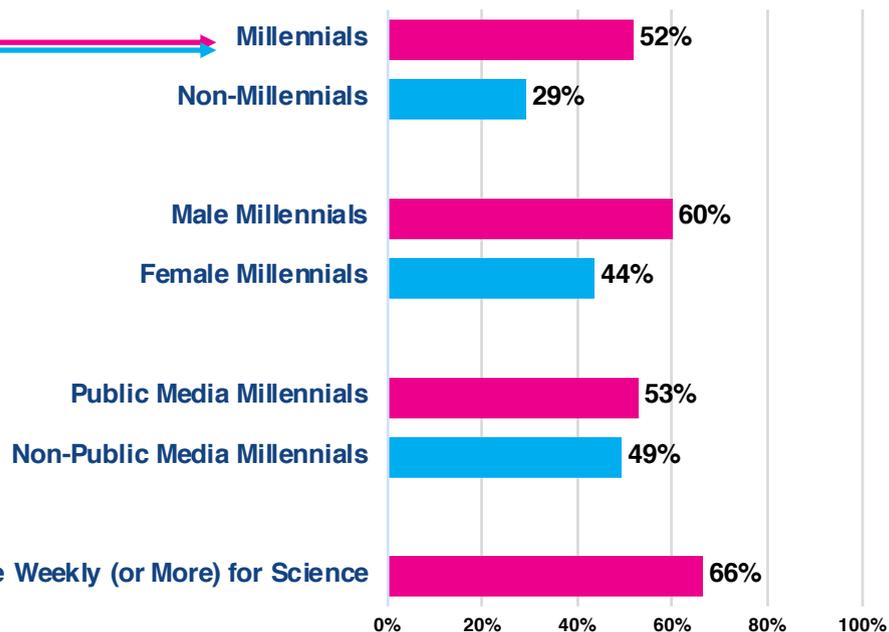
Base: National Panel Sample Millennials

# Millennials Mostly Prefer User-Created YouTube Videos Over Those From Media Organizations, Particularly Males



*"I prefer to watch YouTube videos that are created by users themselves, rather than those from media organizations like CNN, PBS, or Fox News"*

% Agreement (Strongly Agree + Agree)

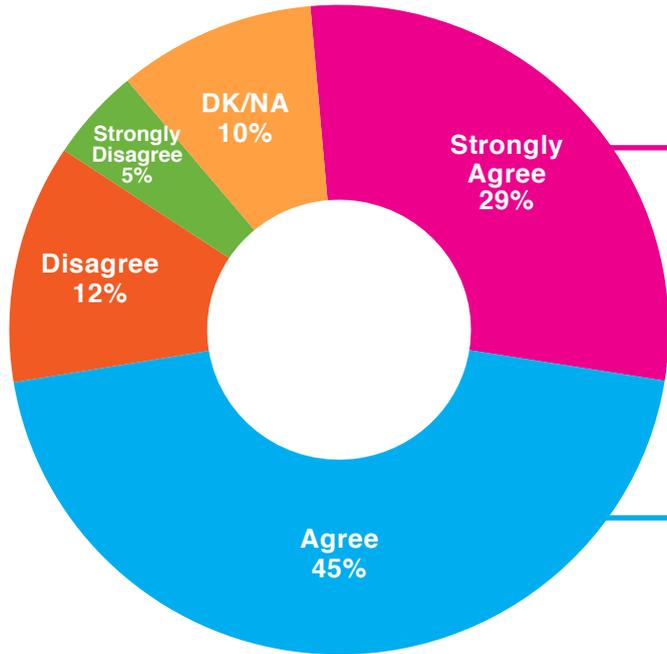


Use YouTube Weekly (or More) for Science



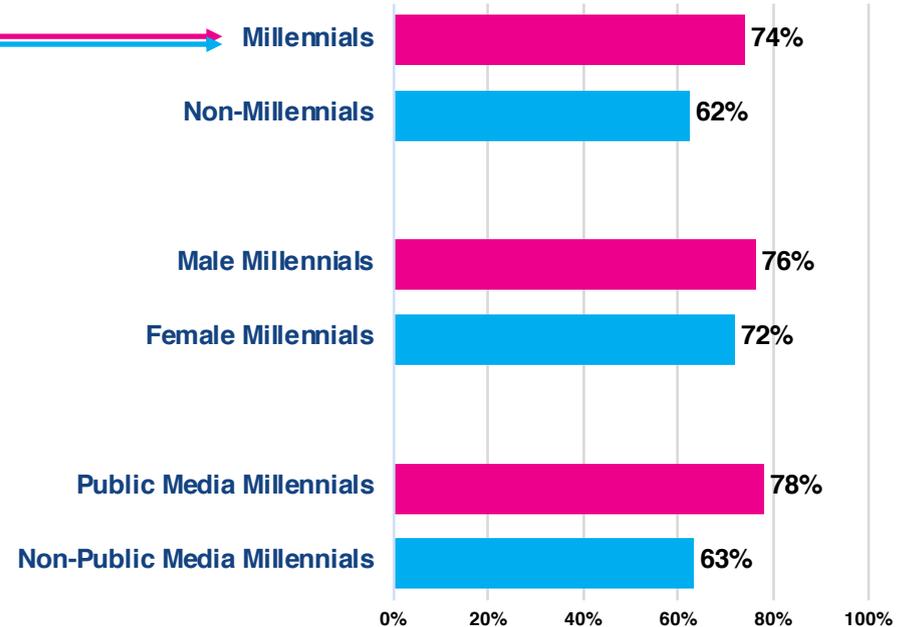
# SCIENCE DISCOVERY & SOURCE CREDIBILITY

# Three-Fourths of Millennials Find the Source of a Science Article to Be Important

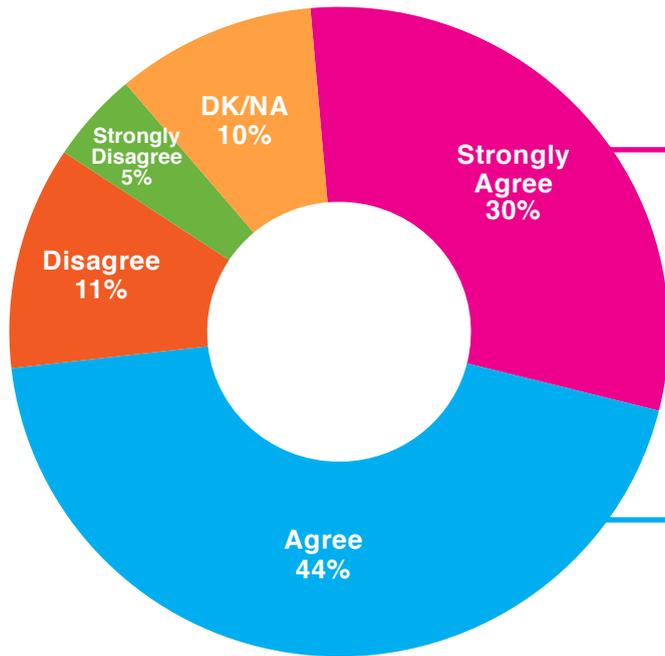


*"The source of a science article that I see online or in social media is important to me"*

% Agreement (Strongly Agree + Agree)

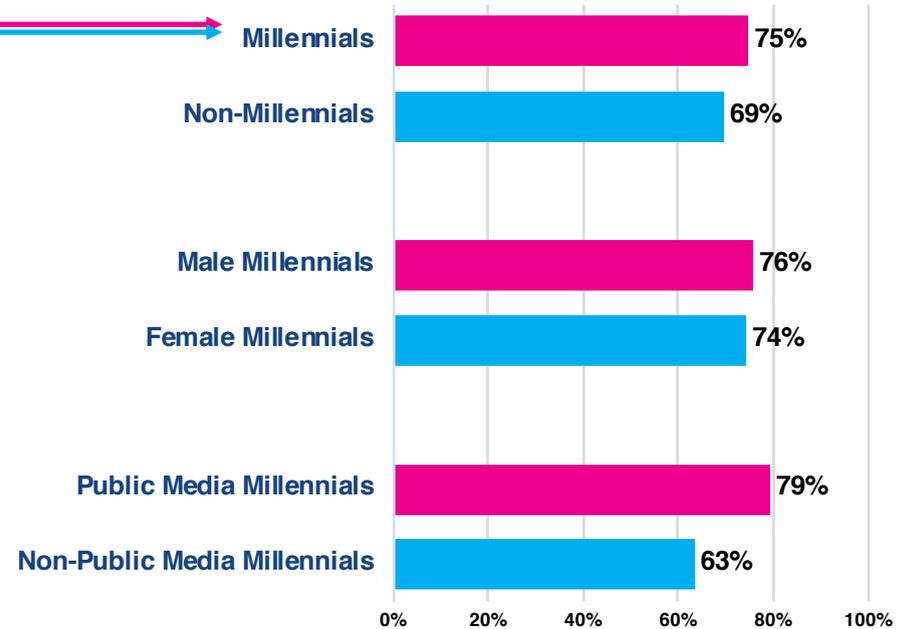


# Three in Four Millennials Say the Source of a Science Video/Program Is Important to Them



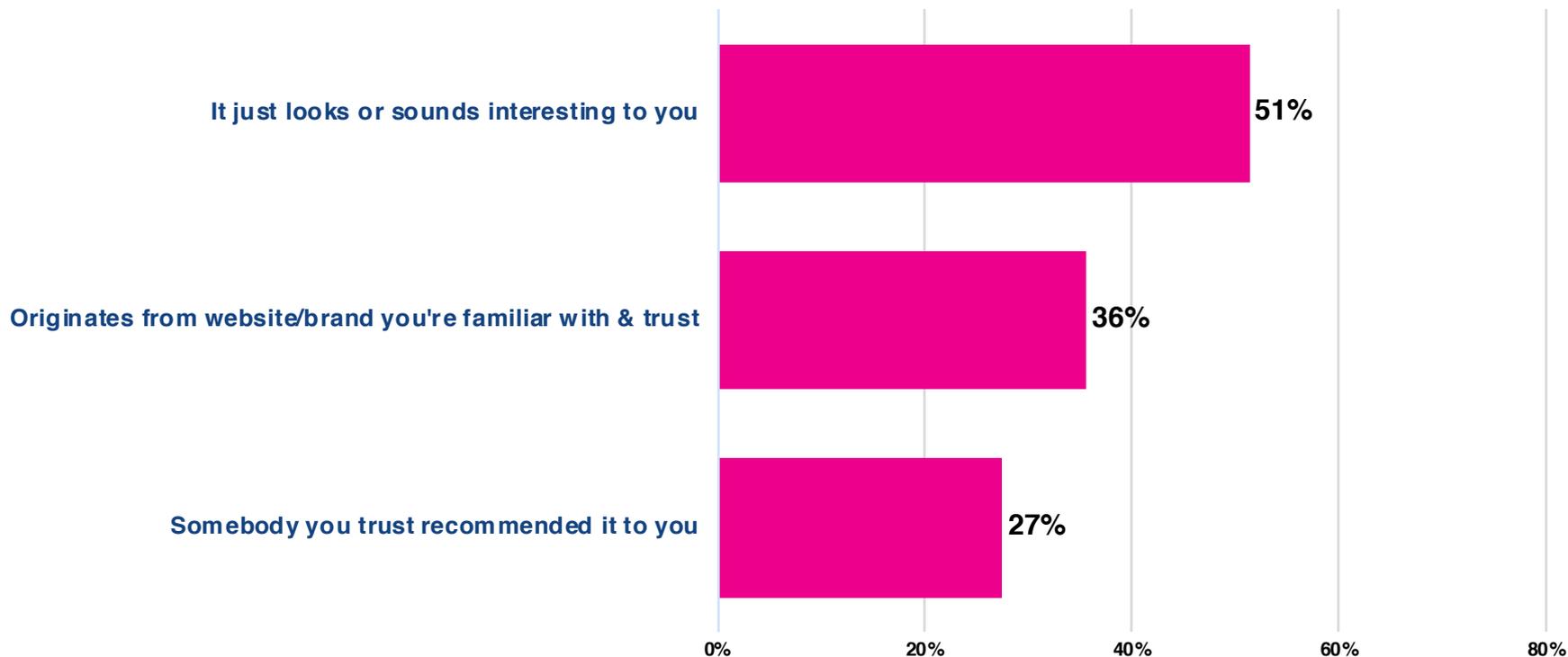
*"The source of a science video or program is important to me"*

% Agreement (Strongly Agree + Agree)



# Millennials Are Most Likely to Rely on Their Instincts for Science Content Access/Discovery

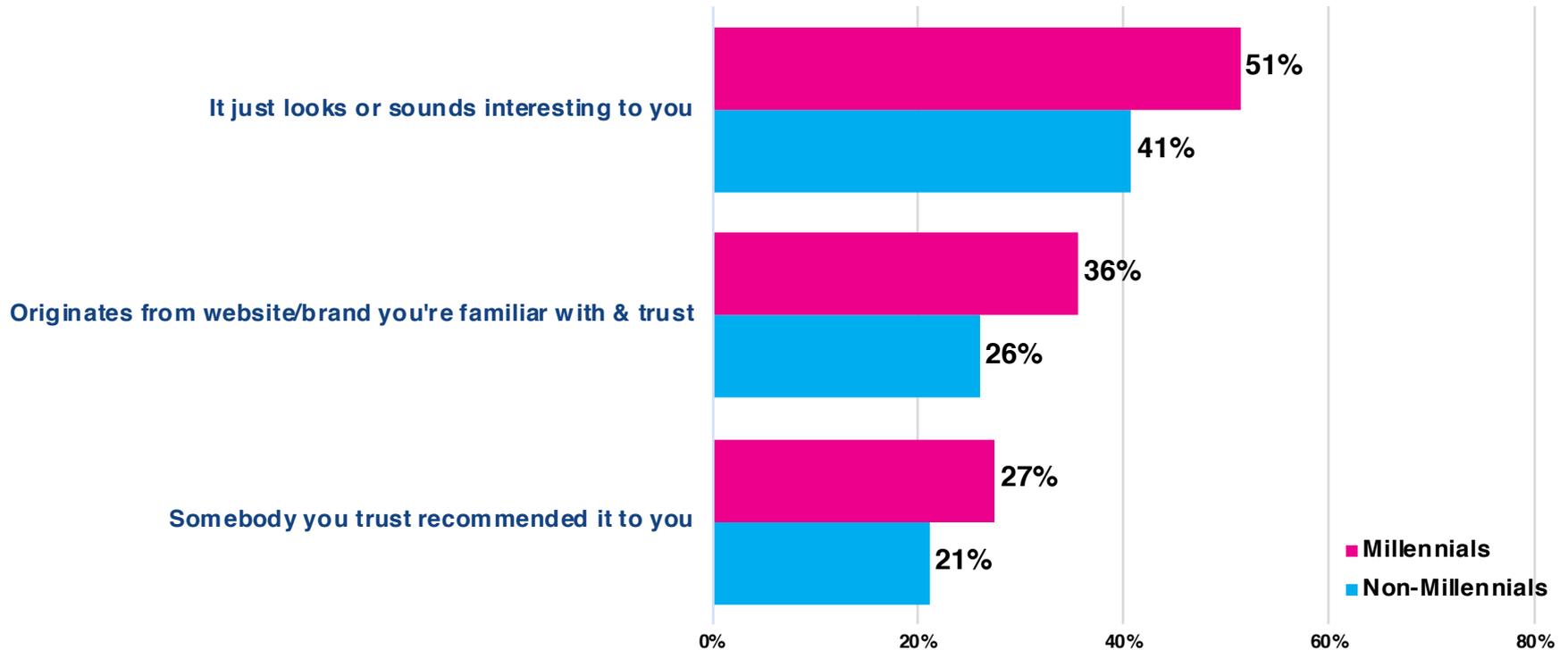
% Who Say (Item) Is "Very" Important When Accessing Science Content



Base: National Panel Sample Millennials

# Millennials More Than Non-Millennials Rely on Instinct, Trusted Brands and Recommendations When Accessing Science Content

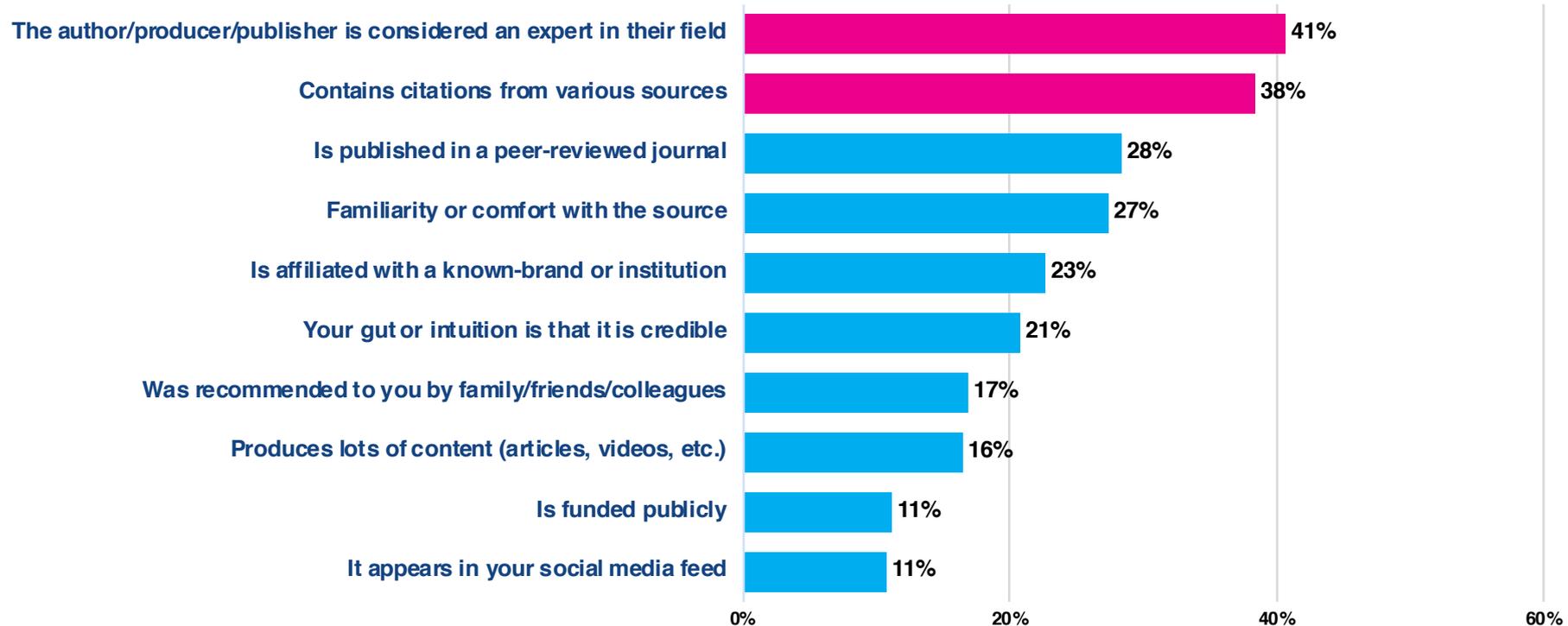
% Who Say (Item) Is "Very" Important When Accessing Science Content



Base: National Panel Sample Millennials

# Expertise in the Field and Multiple Citations Are Most Important to Millennials in Determining Science Content Credibility

% Who Say Item Is “Very” Important to Science Content Credibility



Base: National Panel Sample Millennials

# Millennials Are Especially More Likely To Value Multiple Citations and Being Published in a Peer-Reviewed Journal to Determine Science Credibility

% Who Say Item Is "Very" Important to Science Content Credibility



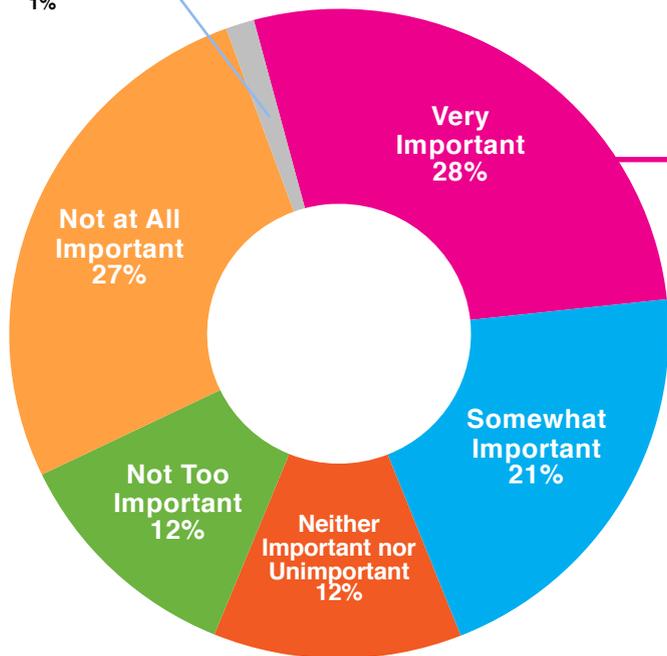
Base: National Panel Sample



# **SCIENCE: RELIGION, FAITH AND SPIRITUALITY**

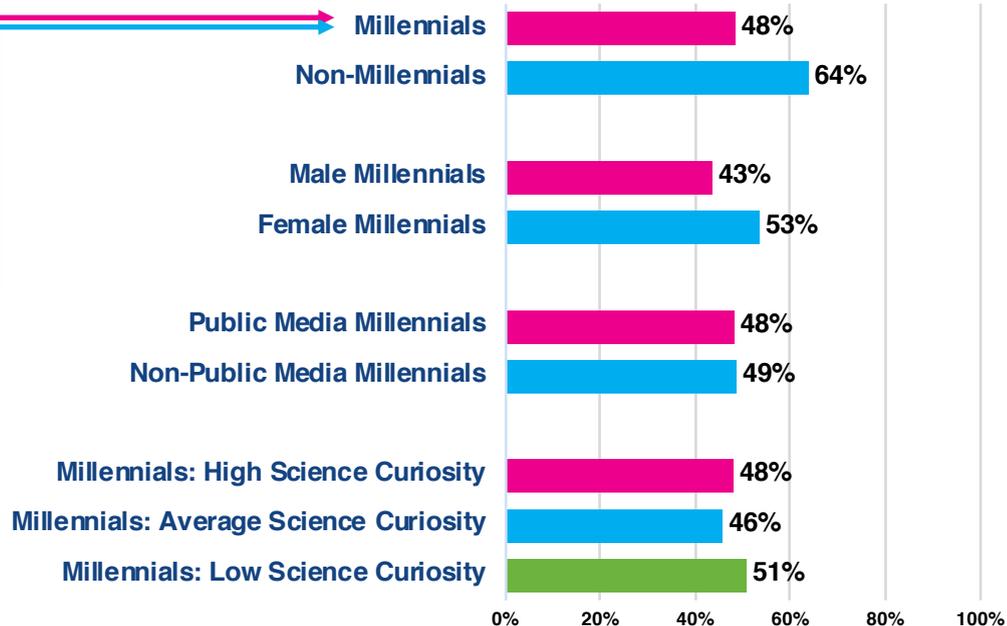
# About Half of Millennials Find Religion and Faith to Be Important to Their Everyday Lives, Led by Females

Prefer Not to Answer  
1%

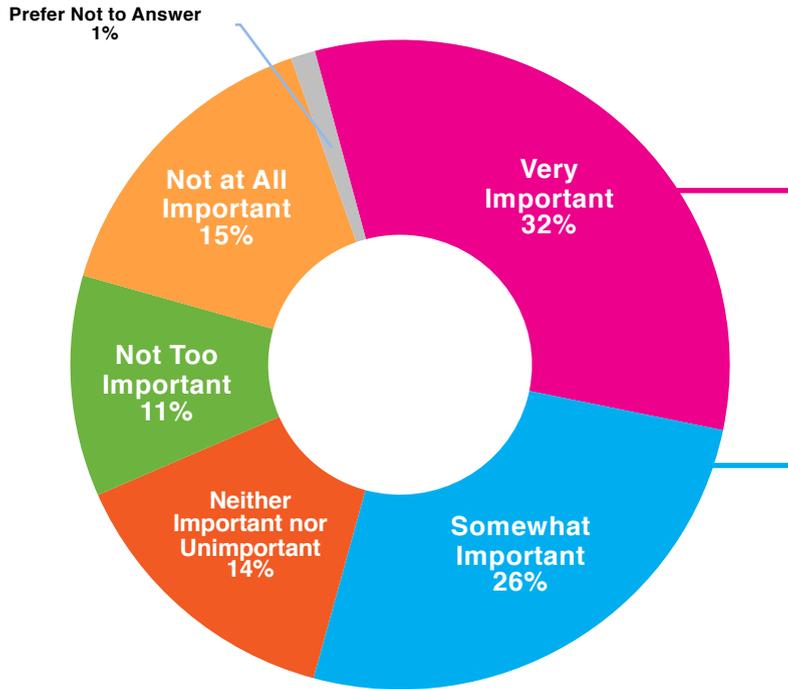


“How important is religion and faith in your everyday life?”

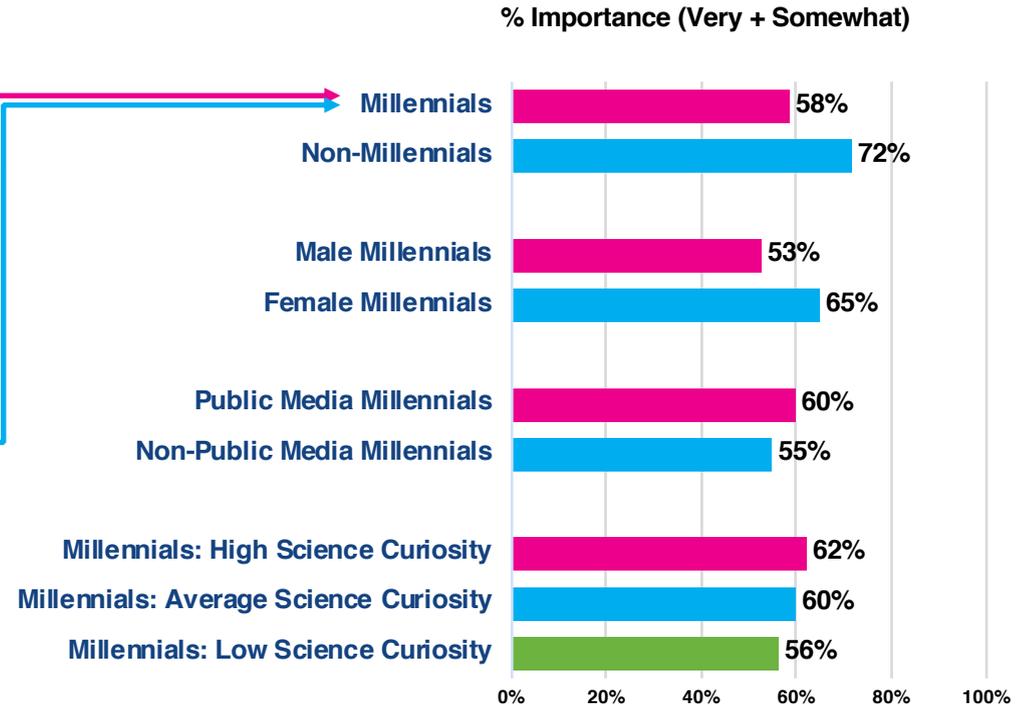
% Importance (Very + Somewhat)



# More Than Half of Millennials Find Spirituality to Be Important in Their Lives; Higher Than Religion and Faith

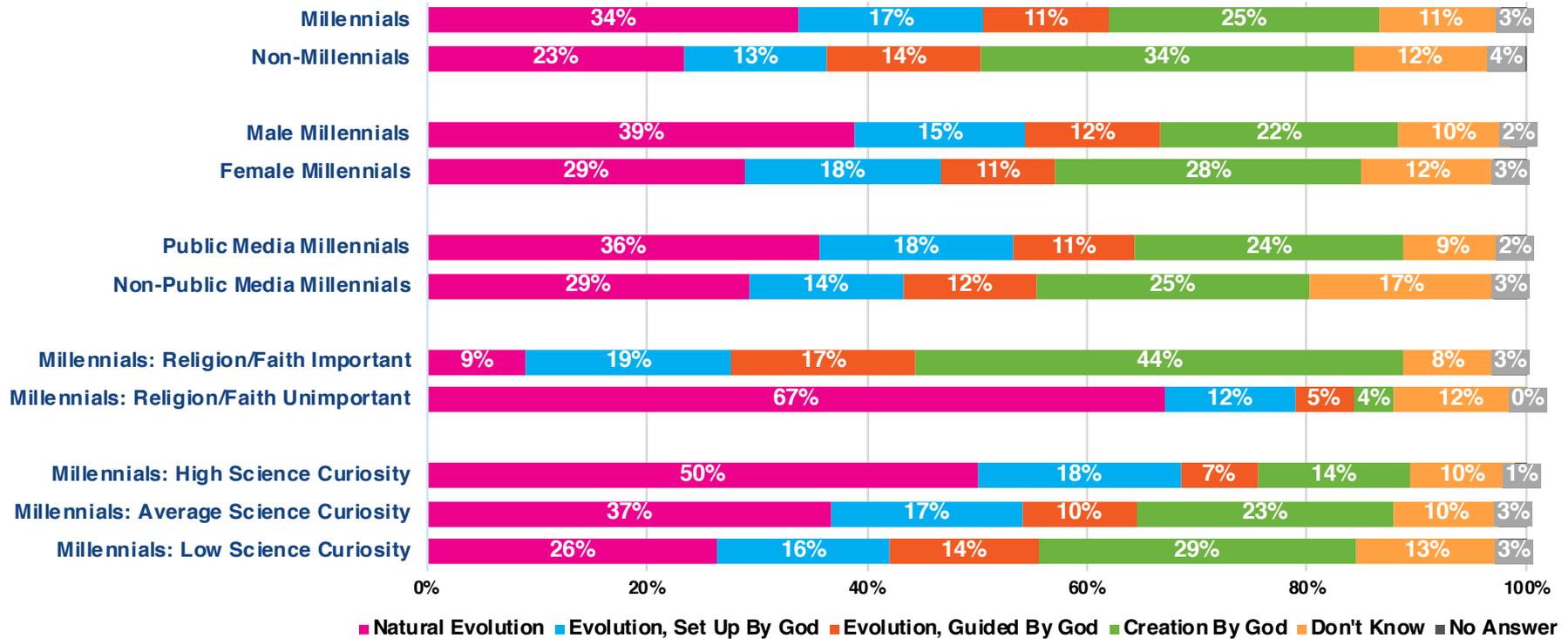


"How important is spirituality in your everyday life?"



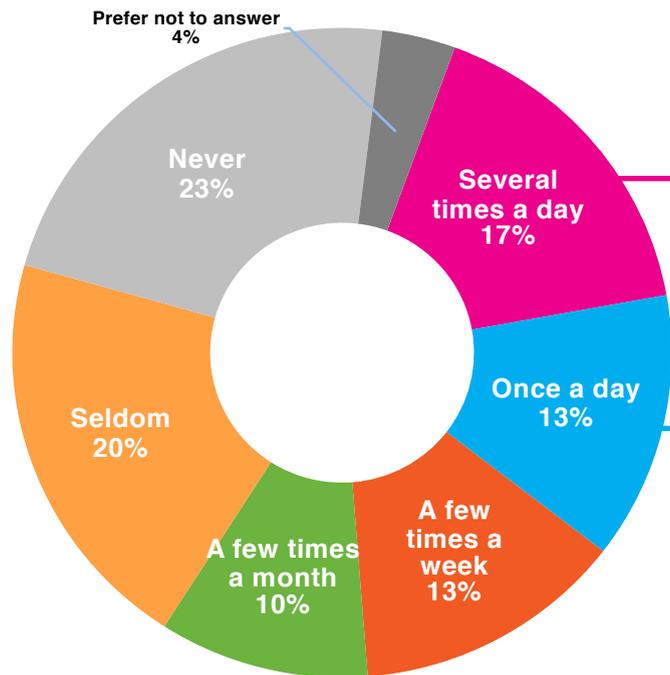
# There Is a Wide Range of Beliefs About the Existence of Human; Millennials are More Apt to Believe in Evolution

% Who Personally Believe Humans Came to Exist on Earth Through...

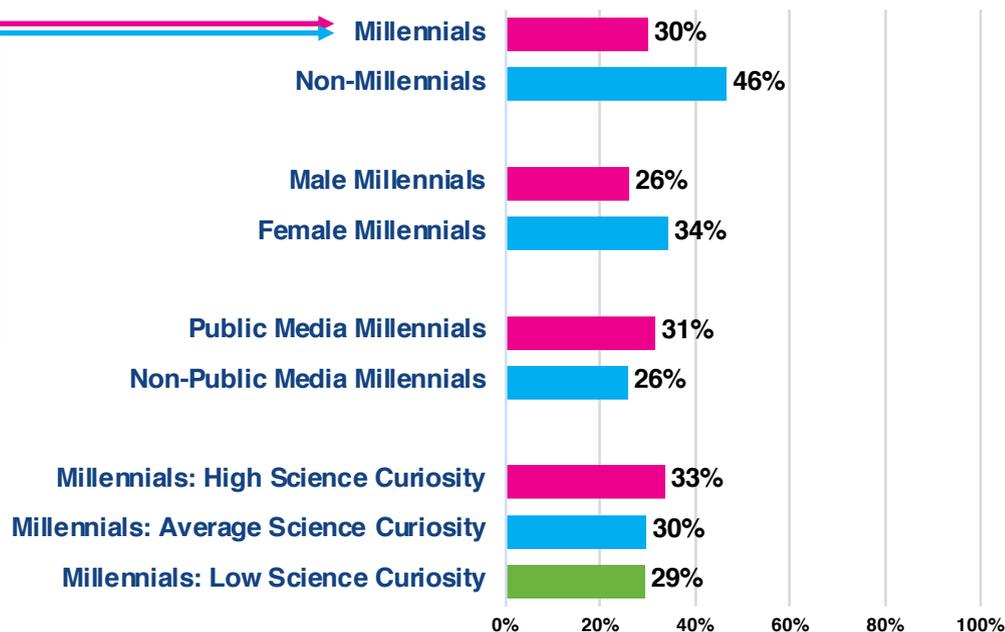


■ Natural Evolution ■ Evolution, Set Up By God ■ Evolution, Guided By God ■ Creation By God ■ Don't Know ■ No Answer

# Three in Ten Millennials Pray Daily, But Nearly One-Fourth Never Pray

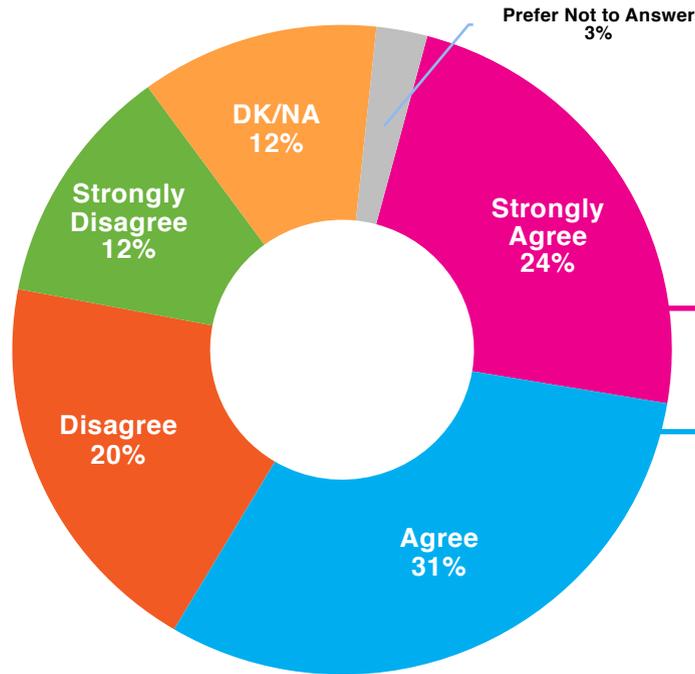


% Who Pray Daily (Several Times + Once)

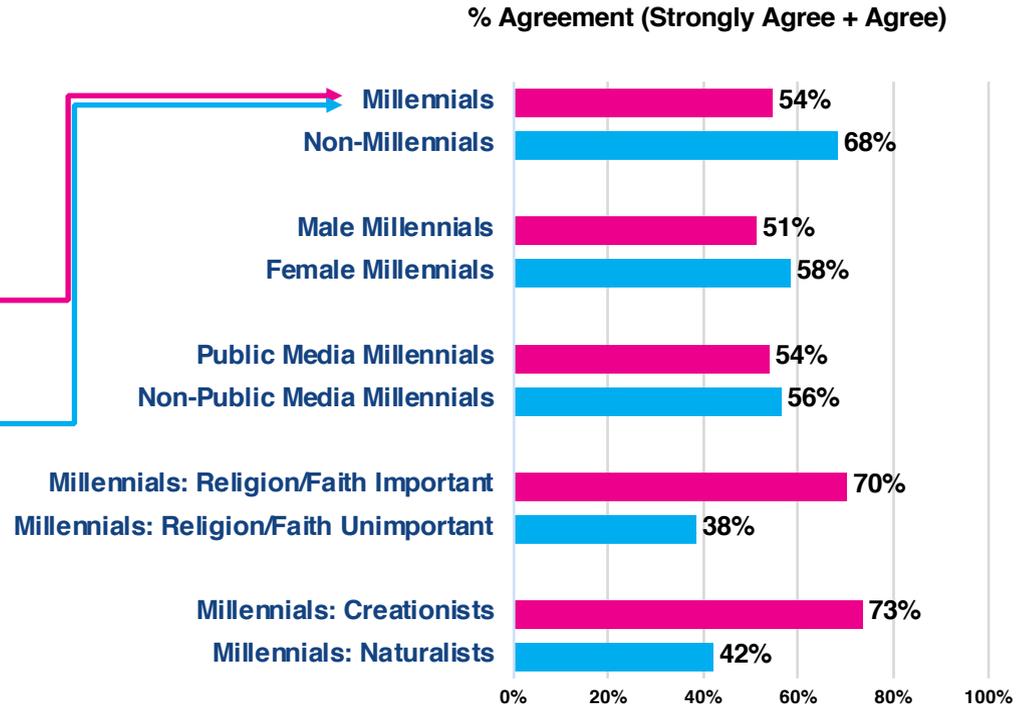


*“People practice their religion in different ways. Outside of attending religious services, do you pray:”*

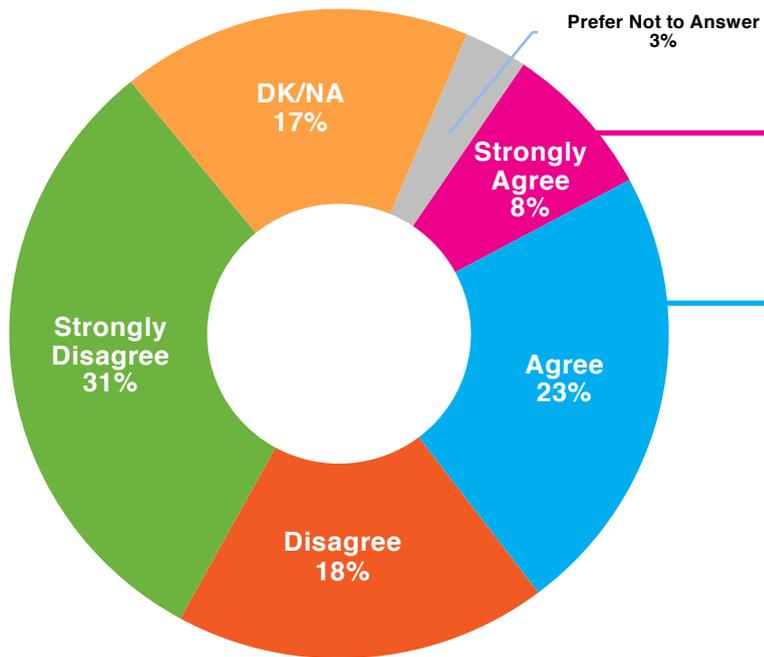
# More Than Half of Millennials Say Their Personal Religious Beliefs Have Not Changed Over Time



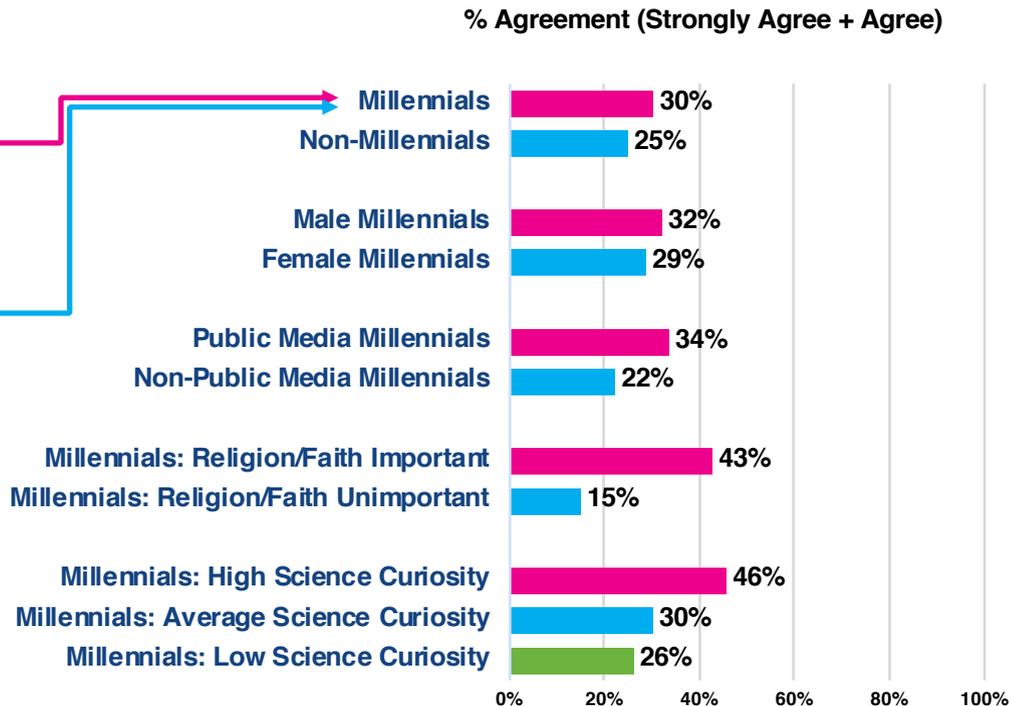
*"My personal religious beliefs have generally remained unchanged over time"*



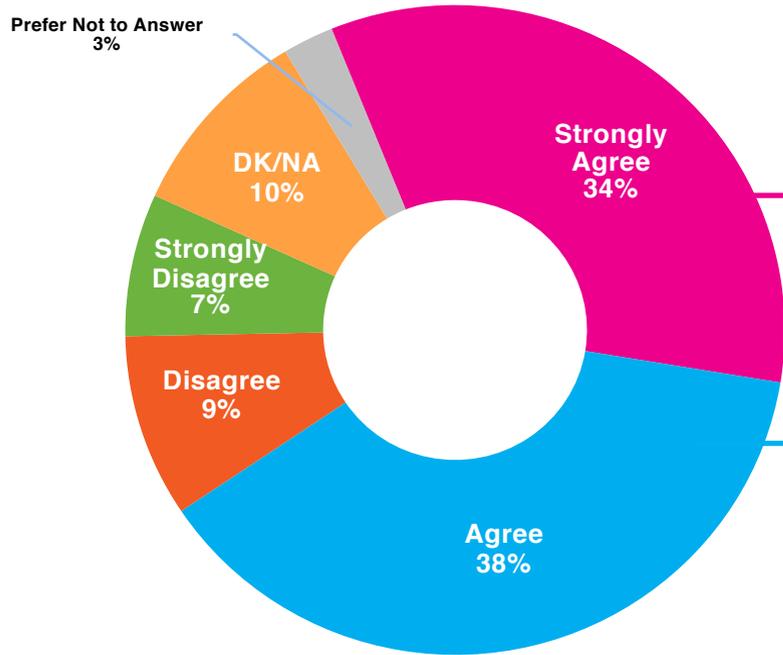
# Three in Ten Millennials Say Their Personal Religious Beliefs Sometimes Clash With Their Acceptance of Scientific Facts



*"Sometimes my acceptance of scientific facts is at odds with my personal religious beliefs"*

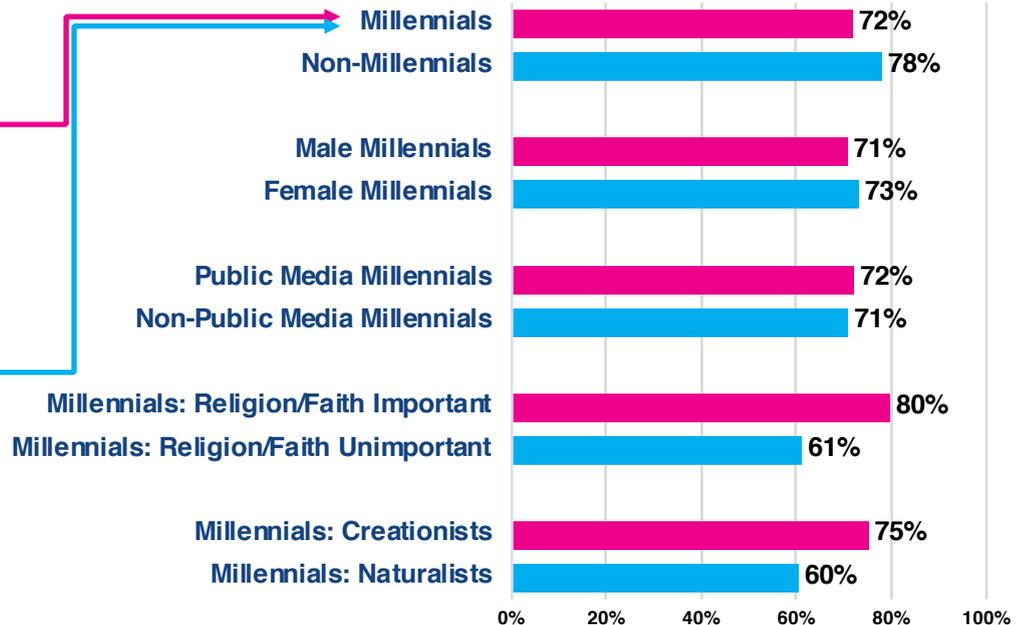


# Most Millennials Agree That Religion and Science Can Coexist; Religiosity Is a Key Factor

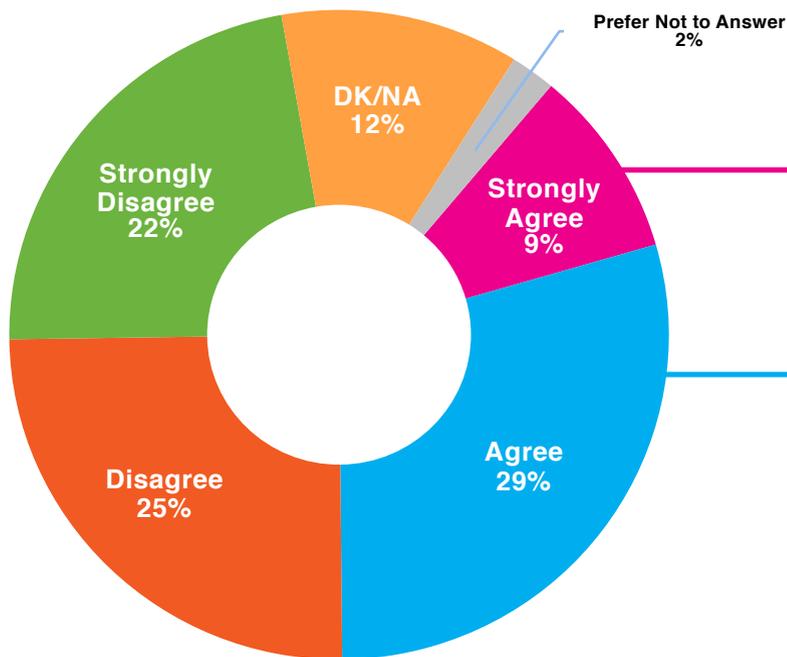


*"Religion and science can coexist; one does not necessarily have to explain the other"*

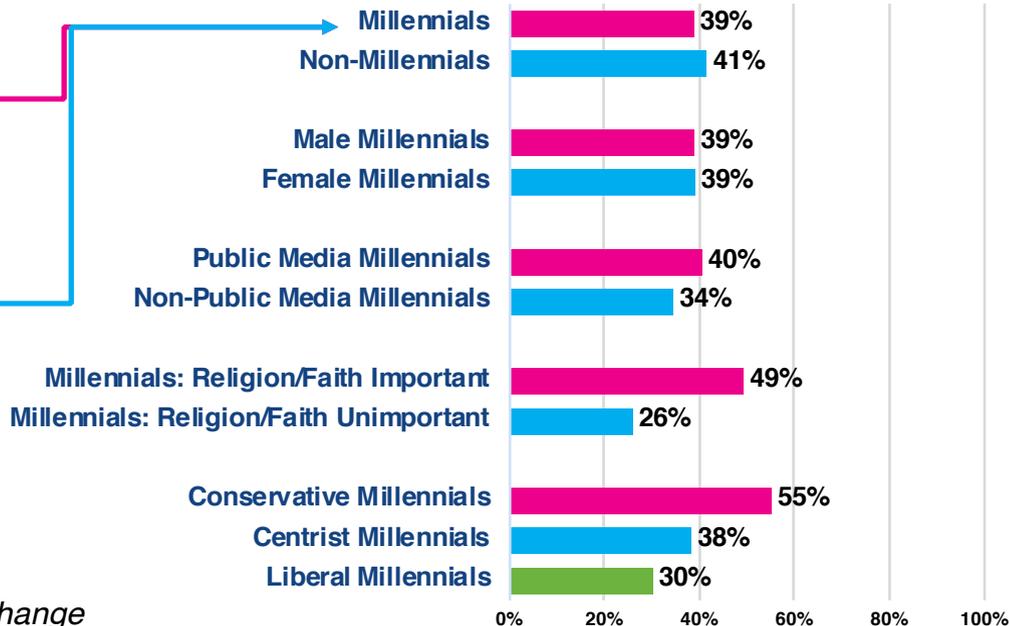
% Agreement (Strongly Agree + Agree)



# Four in Ten Millennials Say Their Personal Views Can Affect Their Science Beliefs; Religiosity and Political Beliefs Play a Role

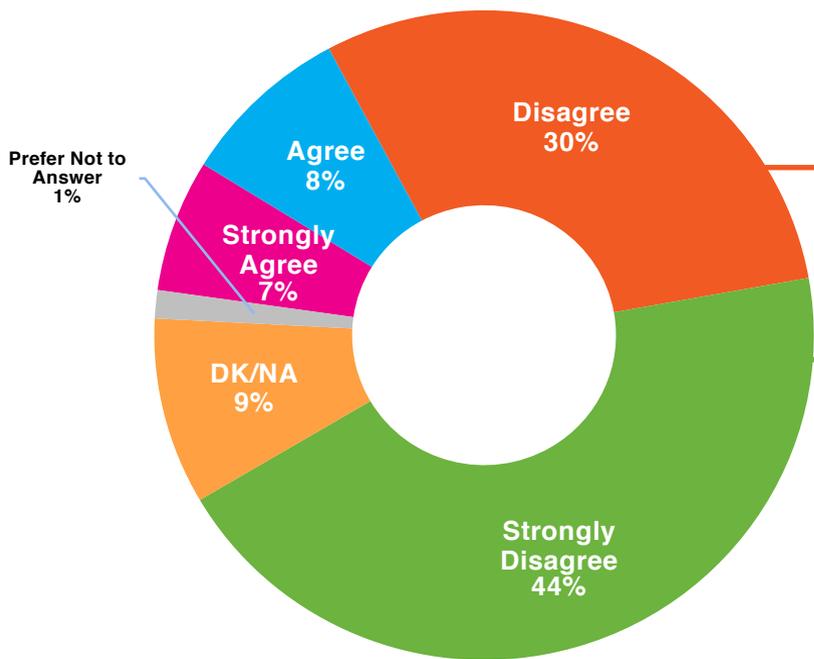


% Agreement (Strongly Agree + Agree)



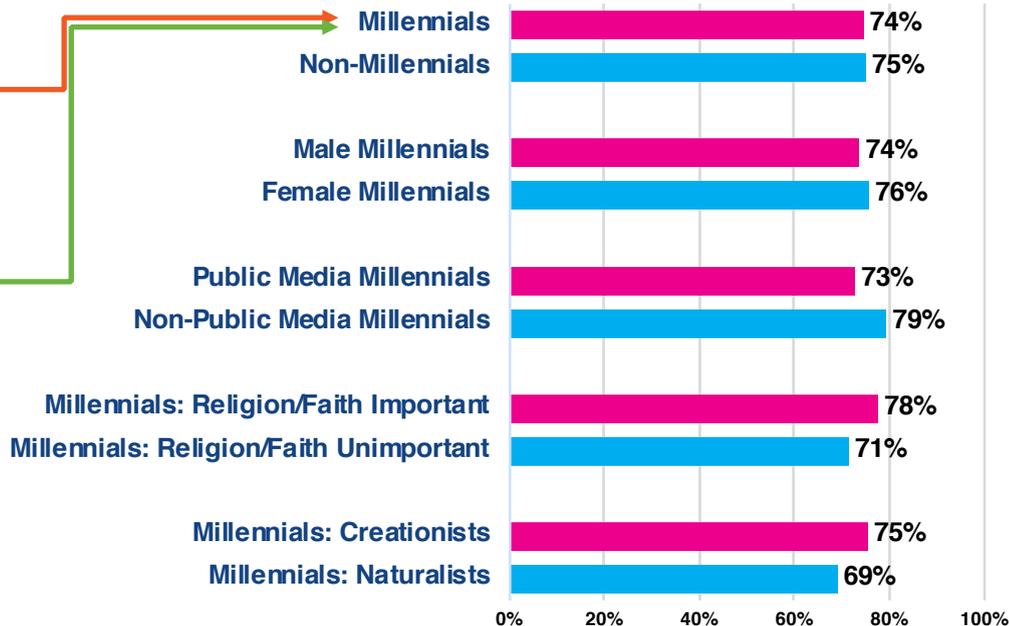
*“Sometimes my belief in a science-relevant topic, like climate change or evolution, is based on personal views and not on facts alone”*

# Most Millennials Agree it Is Possible to Be Both a Person of Religion and Science



*"It's not possible to be a religious person but also a science person"*

% Disagreement (Strongly Disagree + Disagree)



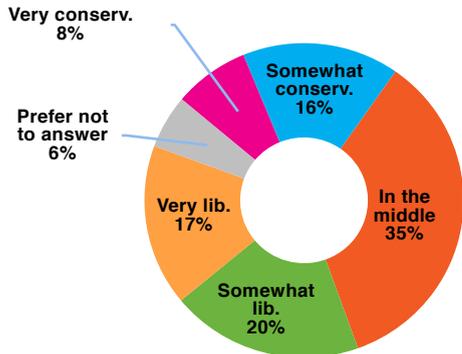
A satellite-style map of the Arctic region, showing the Arctic Ocean and surrounding landmasses. A black horizontal banner is overlaid across the middle of the image, containing the text "SCIENCE & POLITICS" in white, bold, sans-serif font. The map shows the intricate patterns of the Arctic coastline and the surrounding landmasses, including parts of North America, Europe, and Asia.

# SCIENCE & POLITICS

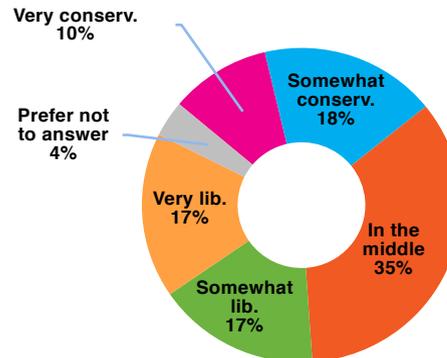
# Millennials Are the Most Liberal of the Generations

*“Politically speaking, do you consider yourself to be:”*

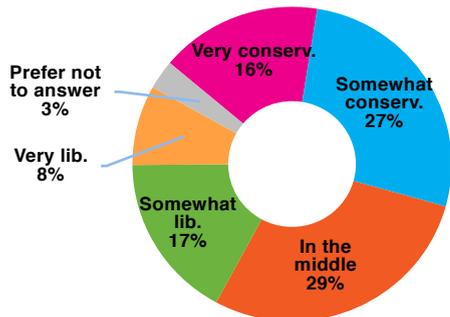
**Millennials**



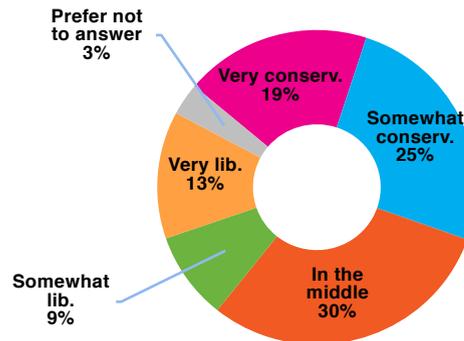
**Generation X**



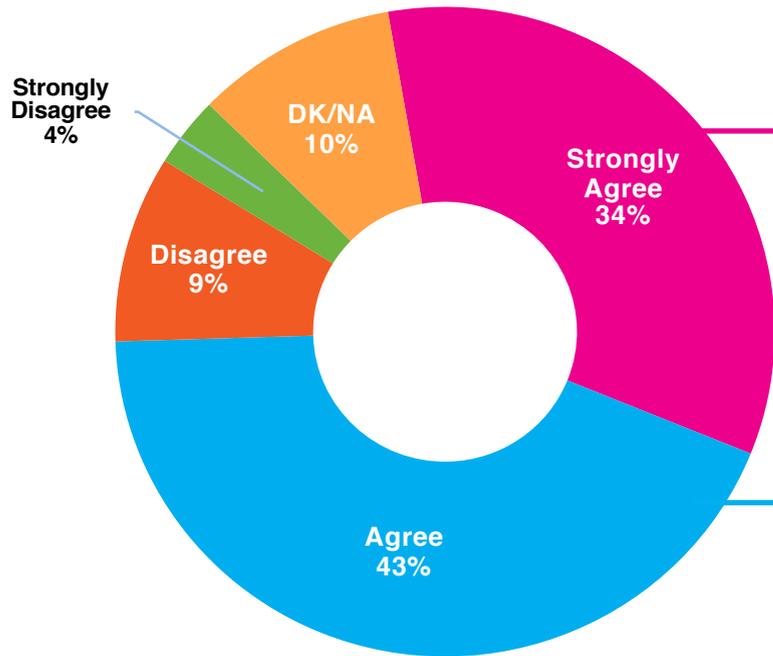
**Baby Boomers**



**Silent**

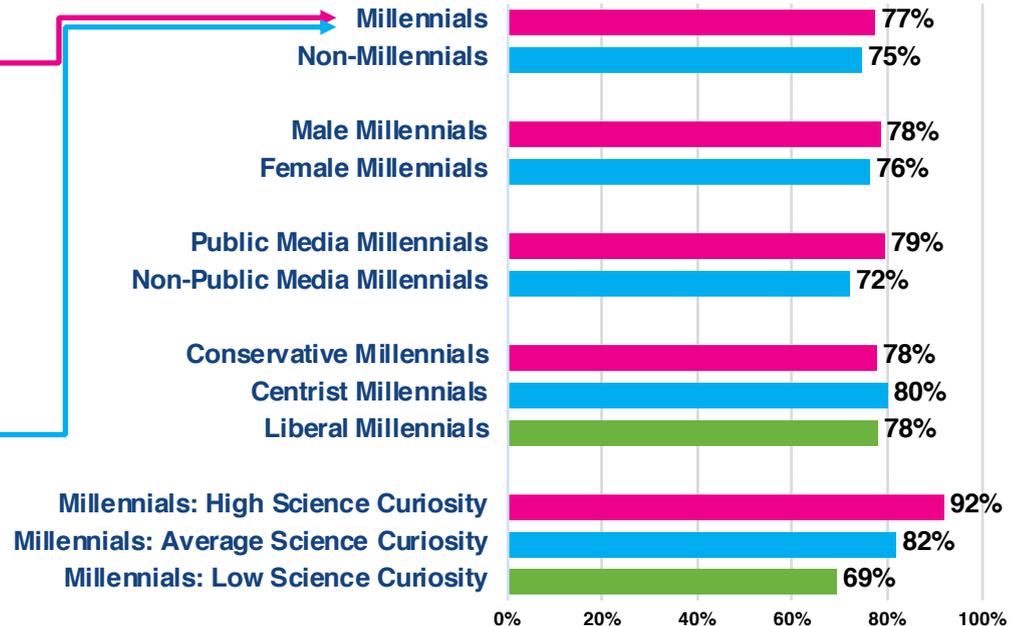


# Most Millennials Say They Can Separate Their Personal Political Views From Their Opinions on Science

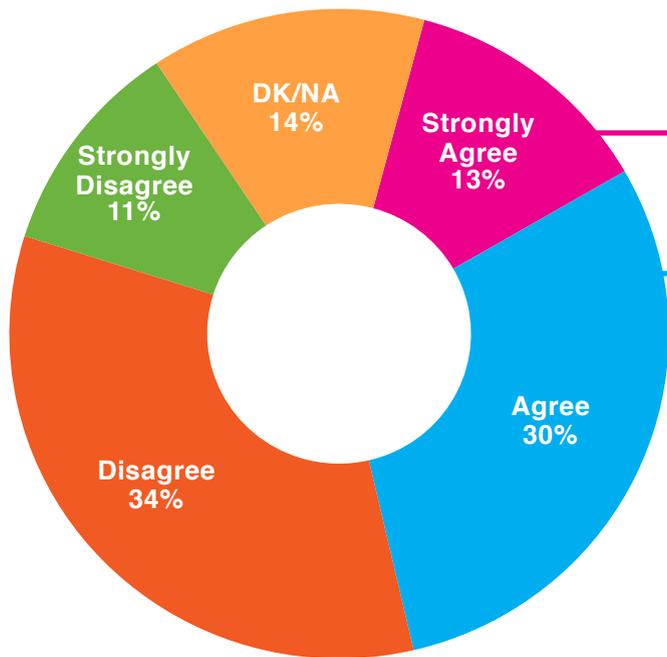


*"I find myself able to separate my personal political views with my opinions on science"*

% Agreement (Strongly Agree + Agree)

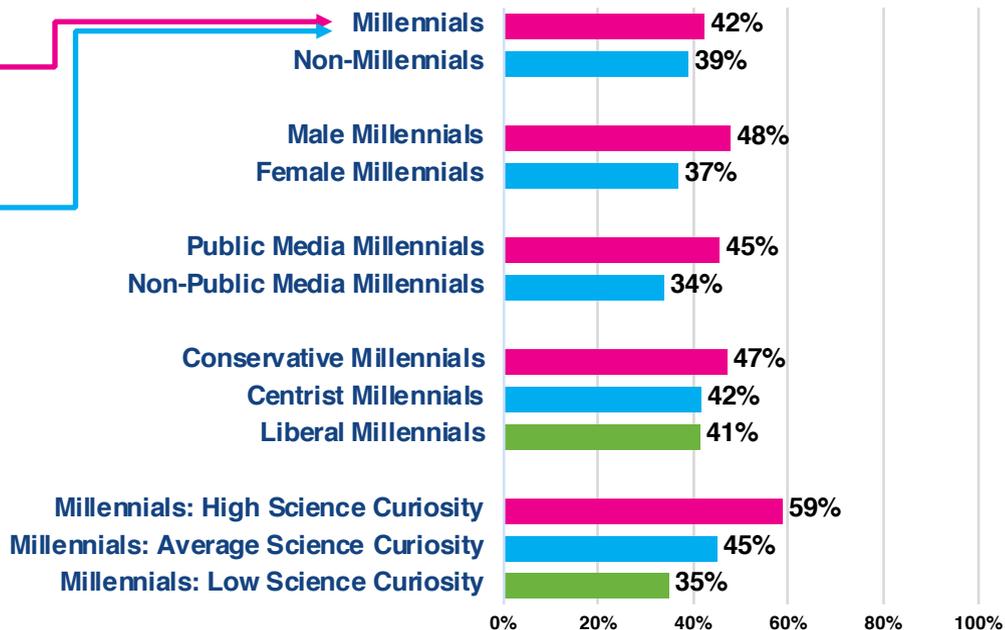


# There Is Nearly Equal Agreement and Disagreement About the Efficacy of Science and Scientific Facts

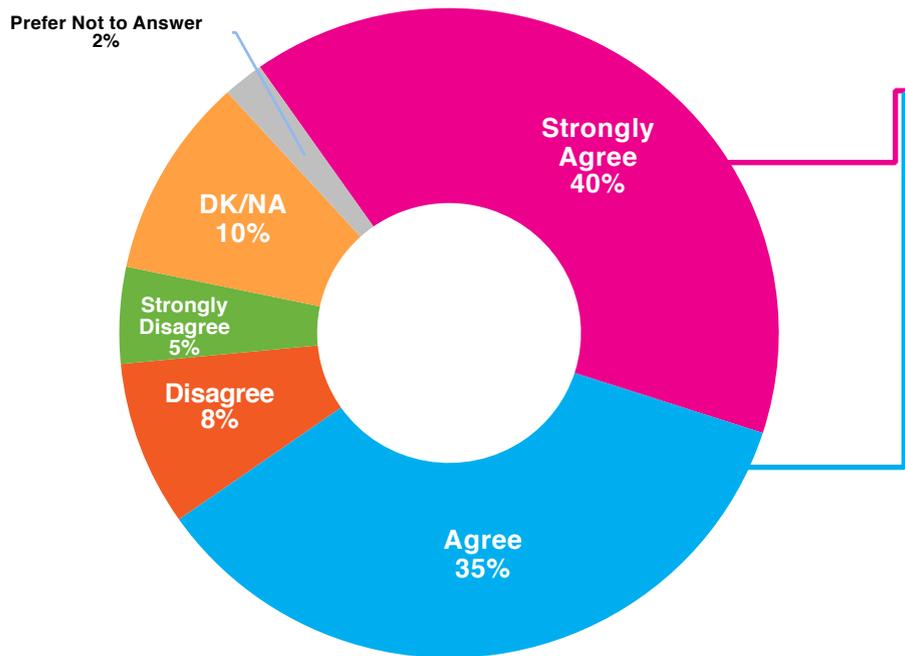


*“Science and scientific facts are trusted as much now as in the past”*

% Agreement (Strongly Agree + Agree)

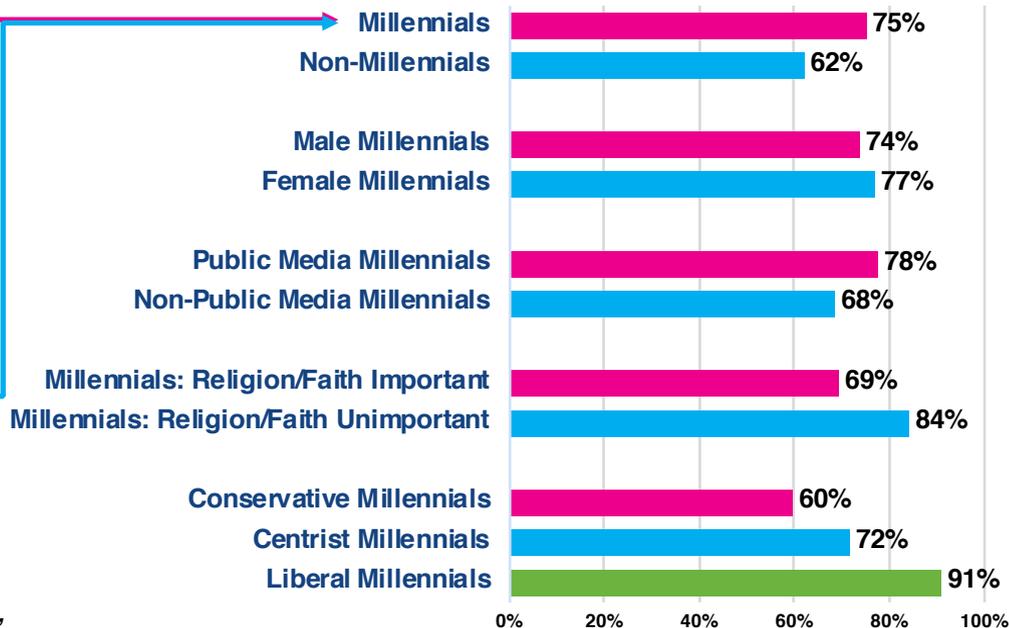


# Three in Four Millennials Believe Climate Change Is Real and Caused by Humans; Political Lean and Religiosity Are Factors

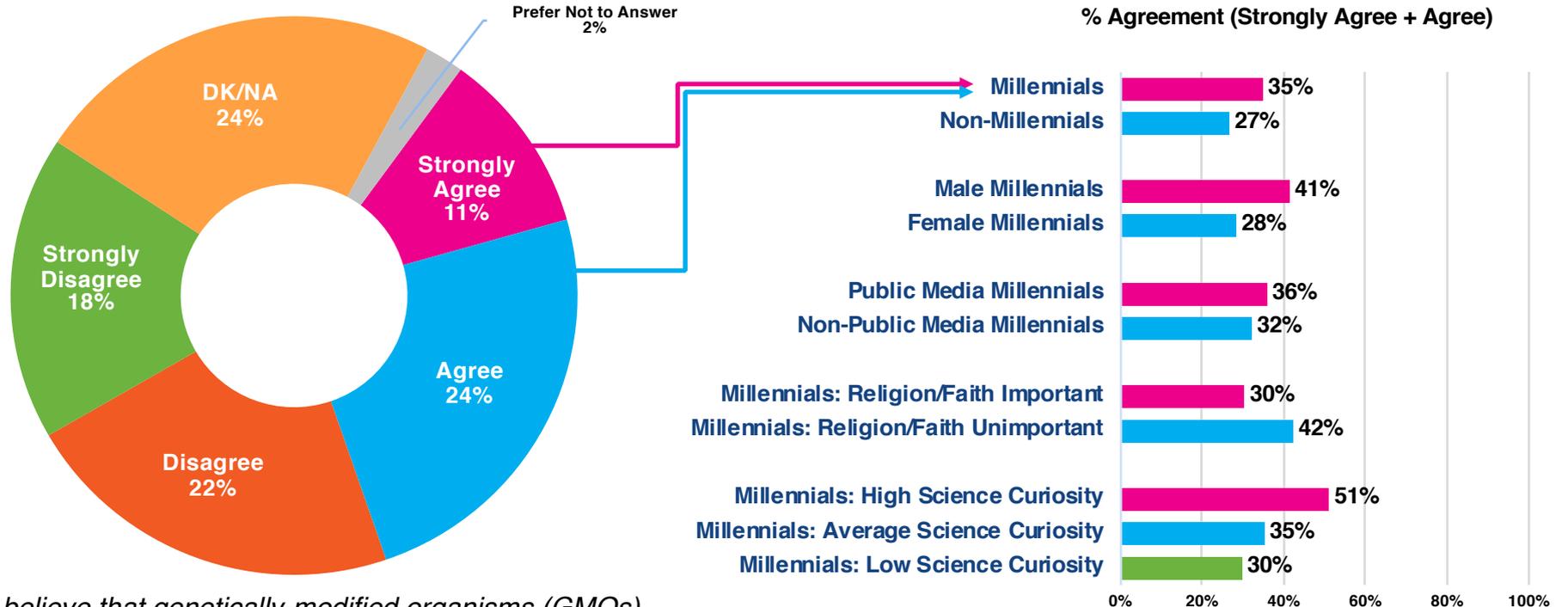


*"I believe that climate change is real and caused by humans"*

% Agreement (Strongly Agree + Agree)



# About One in Three Millennials Believes GMOs are Safe For Humans to Eat; Females Are More Skeptical Than Males



*"I believe that genetically-modified organisms (GMOs) are safe for human consumption"*

# TAKEAWAYS & OPPORTUNITIES



# Takeaways & Opportunities

- A recipe for identifying Millennial perspective, opinions, and belief structures to create science content that resonates with the desired target audience
  - Identifies science disciplines of interest
  - Better understanding of religious, political, and scientific beliefs
- Millennials are more “science curious” than older generations, as are men and public media consumers
- Online video (especially documentaries on YouTube, Netflix) and social media dominate Millennial science consumption
- Search is how they often find desired science content, making SEO relevant and important
- Common thread all Millennials’ interest in science – especially popular science – rather than only focusing on high SCS Millennials
- But when serving the core, science social gatherings are a major opportunity, similar to podcasting events
- While brand trust/credibility and word of mouth matter, media savvy Millennials more often go with their instincts when seeking science content – descriptions matter

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# VERIFICATION SURVEY BY TEXAS TECH UNIVERSITY AND YALE LAW SCHOOL

March 2019

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KQED



TEXAS TECH  
UNIVERSITY.



Yale Law School

# REPORT ON KQED'S 2019 YOUNGOV SURVEY

## **MATT MOTTA**

Postdoctoral Fellow, Annenberg Public Policy Center, University of Pennsylvania  
Cultural Cognition Project, Yale Law School

## **ASHELEY LANDRUM**

Assistant Professor, Science Communication and Cognition Lab, Texas Tech University

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**KQED**



**TEXAS TECH**  
UNIVERSITY.



**Yale Law School**

# OVERVIEW AND OBJECTIVES

## STUDY OBJECTIVES

- To **estimate** the size of the audience and “missing audience” for science content across a number of different media platforms.
- To **profile** the demographic composition of each audience and missing audience.
- To **investigate** whether or not key conclusions from a previous study completed in October 2018 hold in nationally representative data.

# KEY TAKEAWAYS

## KEY TAKEAWAYS

# WHAT WE FOUND: PART I

- **More than a third of Americans consume science-related media at least once a month.** Although the numbers vary by platform (e.g., public television, radio) we think that a substantial number of Americans are part of what we call an engaged science audience.
- **As many as a fifth of Americans are part of a “missing science content audience.”** We estimate that, depending on the platform, somewhere between a tenth and a fifth of Americans are higher than average in science curiosity, but low in science media consumption.
- **Science Curiosity predicts watching science content.** People who are more science curious tend to report consuming more science-related media; validating our decision to use science curiosity as a metric when identifying the “missing science content audience.”

## KEY TAKEAWAYS

# WHAT WE FOUND: PART II

- **Millennials are not the most science curious generation.** But, they are an important part of the “missing science content audience.” We do not find that millennials are more science curious than other age cohorts. However, while many millennials regularly consume science media, there are also many who are high in science curiosity who do not.
- **Women tend to be underrepresented in “engaged science content audience,” and overrepresented in the “missing science content audience.”** Consequently, outreach efforts designed to boost women’s engagement with science content are worth further investigation.
- **Behavioral research is necessary.** Self-reported measures of what people watch/read/listen are not always accurate. We hope to better understand science media consumption by devising laboratory experiments that observe science-content consumption as a behavior.



# DATA & METHODS

## THE DATA

Data for this study come from a nationally representative survey of 2,500 American adults administered from January 19 - February 7, 2019, via YouGov. YouGov originally interviewed 2,701 individuals to take the study from their large, online, opt-in panel, and “matched down” those responses on the basis of known national benchmarks on gender, age, race, and education.

To account for potential remaining deviations between the sample and the population, YouGov then weighted these responses on the basis of age, gender, race, educational attainment, and region, and 2016 presidential vote choice. All analyses presented in this report feature weighted data.

Survey respondents answered questions about the following topics:

- The types of media platforms they watch, listen or read regularly (e.g., public television, public media online, YouTube, public radio)
- The extent to which they watch science-related content on each of those platforms
- The science curiosity scale

# MEASURING SCIENCE MEDIA CONSUMPTION

First, respondents were asked whether or not they watch (read, listen to, etc.) each of the following media either Daily, Weekly, Monthly, Less Often than Monthly, or Never.

- Watch Public TV Programming (e.g., PBS)
- Watch videos on online platforms like YouTube or Facebook Watch
- Watch videos on websites operated by public media companies (e.g., PBS) or their local affiliates
- Watch programs on online subscription channels like Netflix, Hulu, or Prime Video
- Read online news stories from public media companies (e.g., PBS) or their local affiliates
- Listen to podcasts
- Listen to public radio (e.g., NPR) on any device

If respondents indicated that they consume content on any of these platforms (i.e., any response option other than “Never”), they were then asked a follow up question about how often they consumed science related content on that platform (Daily, Weekly, Monthly, Less Often than Monthly, or Never).

# MEASURING SCIENCE CURIOSITY

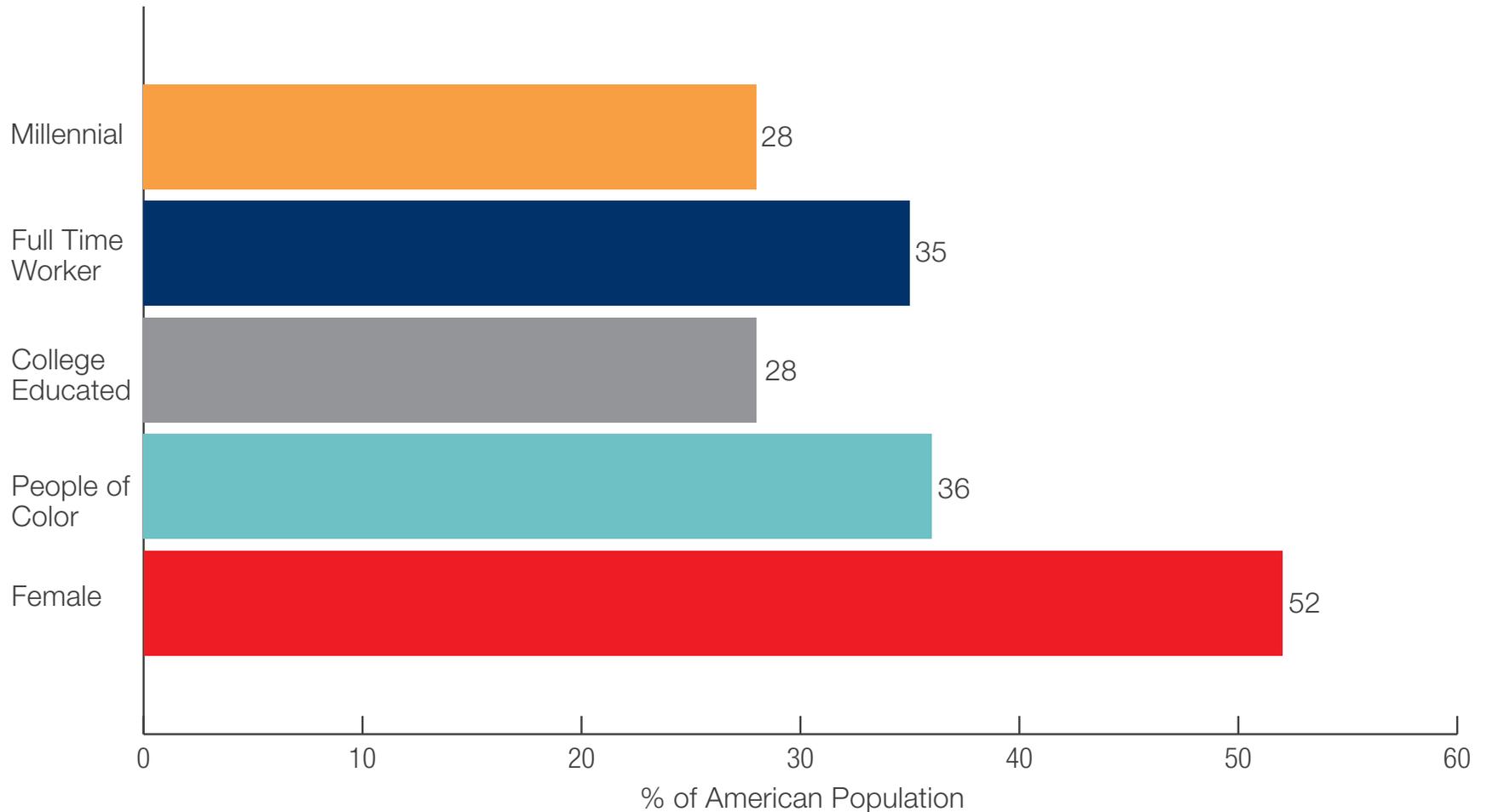
Science curiosity is a measure of the extent to which survey respondents enjoy consuming information related to science. It is measured via a series of about one dozen questions (embedded in a much larger set of questions about unrelated topics, like travel and sports).

One key advantage of the science curiosity scale is that it blends self-reported interest in scientific topics with both self-reported and actual behavioral indicators of interest and curiosity. For example:

- **Self-Reported Interest:** Indicators of how much respondents enjoy consuming news and information about science and technology.
- **Self-Reported Behavior:** Indicators of whether or not respondents read books about science or visited a science museum in the past year.
- **Actual Behavior:** Indicators of whether or not respondents chose to read about science over other topics (entertainment, sports, finance) in a simulated news environment embedded in the survey.

## DATA & METHODS

# SAMPLE SUMMARY STATISTICS





# PROFILE OF THE ENGAGED SCIENCE AUDIENCE

## AUDIENCE PROFILES

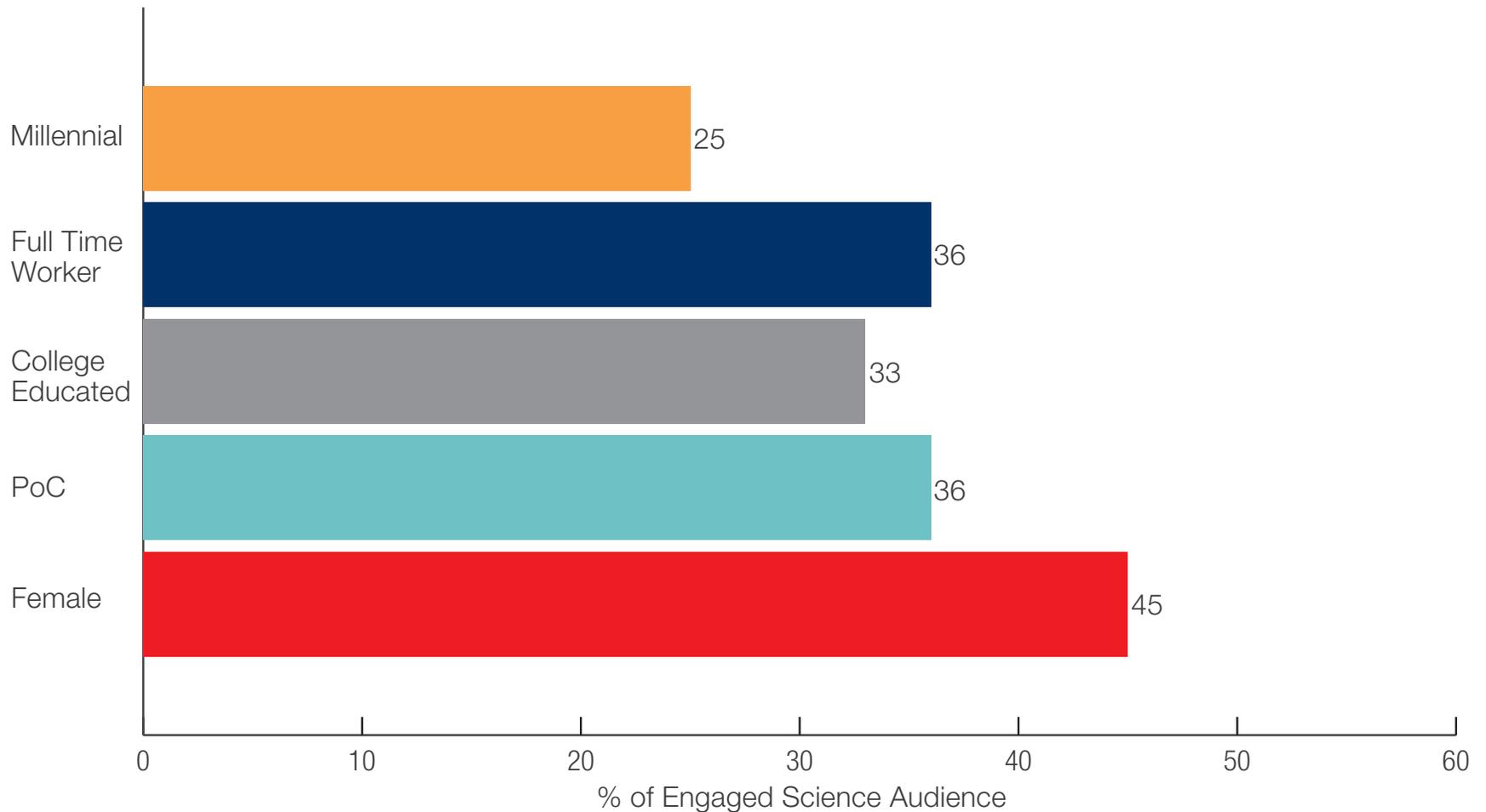
# ENGAGED SCIENCE AUDIENCE SIZE BY PLATFORM

Platform	Example	Size
Public Television	PBS	39%
Free Stream	YouTube, FB Watch	42%
Public Stream	PBS App	30%
Subscription Stream	Hulu, Netflix, Amazon	30%
Public Website	PBS.org	40%
Podcasts	(none listed in prompt)	18%
Public Radio	NPR	21%

Entries correspond to the percentage of the US adult population that consumes science-related content on each platform, at least once a month.

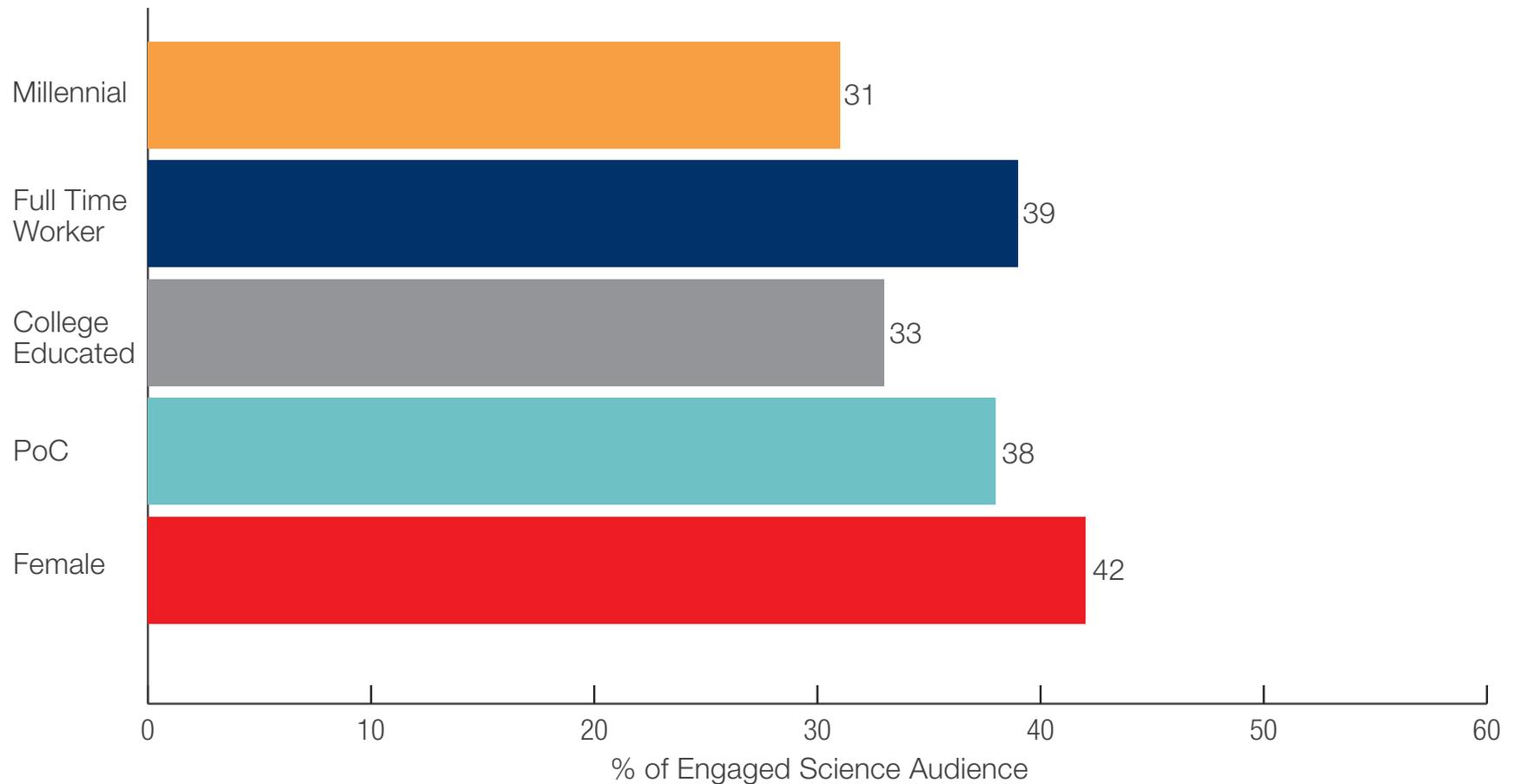
# AUDIENCE PROFILES

## PROFILE OF SCIENCE AUDIENCE ON PUBLIC TELEVISION (E.G., PBS)



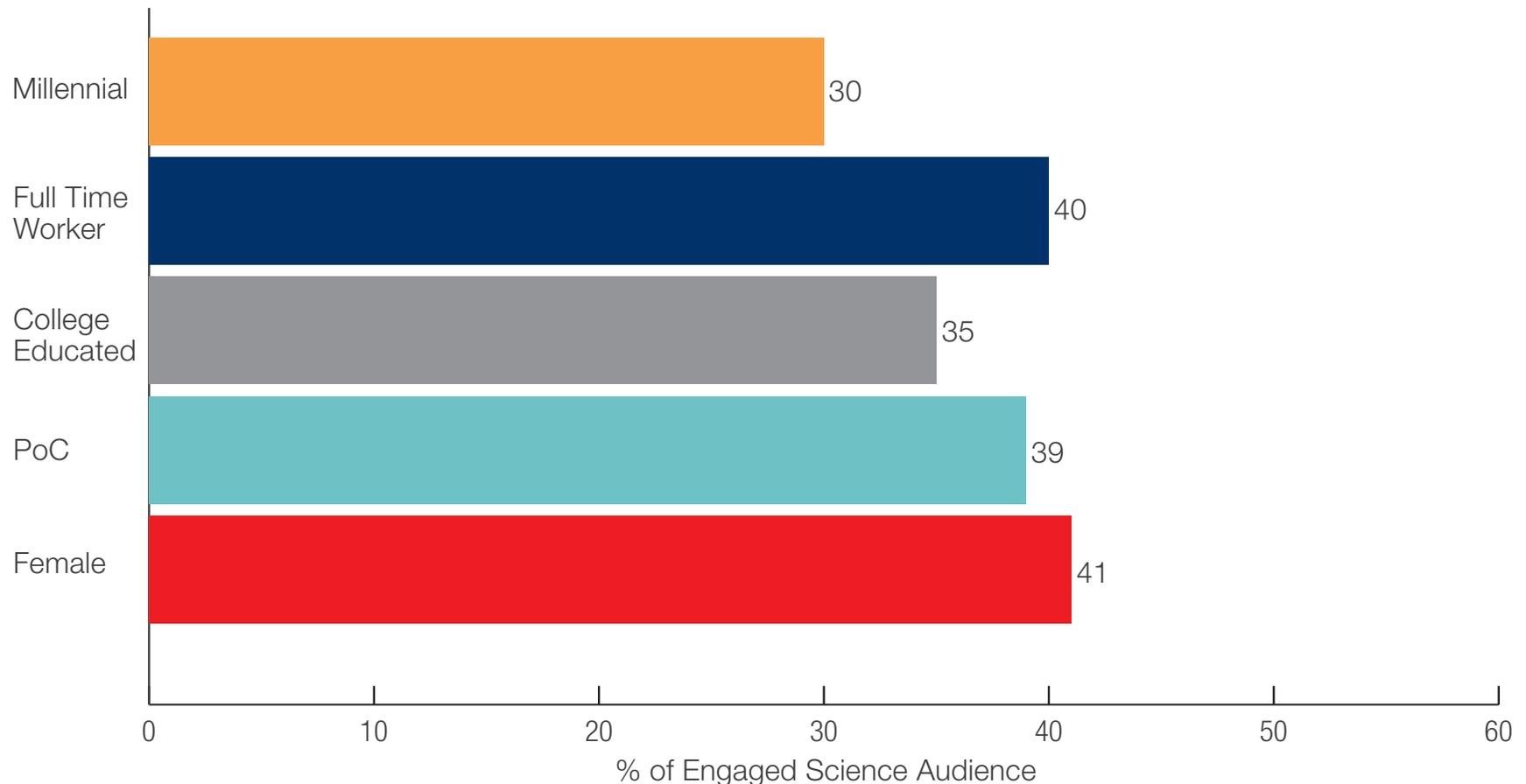
# AUDIENCE PROFILES

## PROFILE OF SCIENCE AUDIENCE ON FREE STREAMING PLATFORMS (E.G., YOUTUBE, FACEBOOK WATCH)



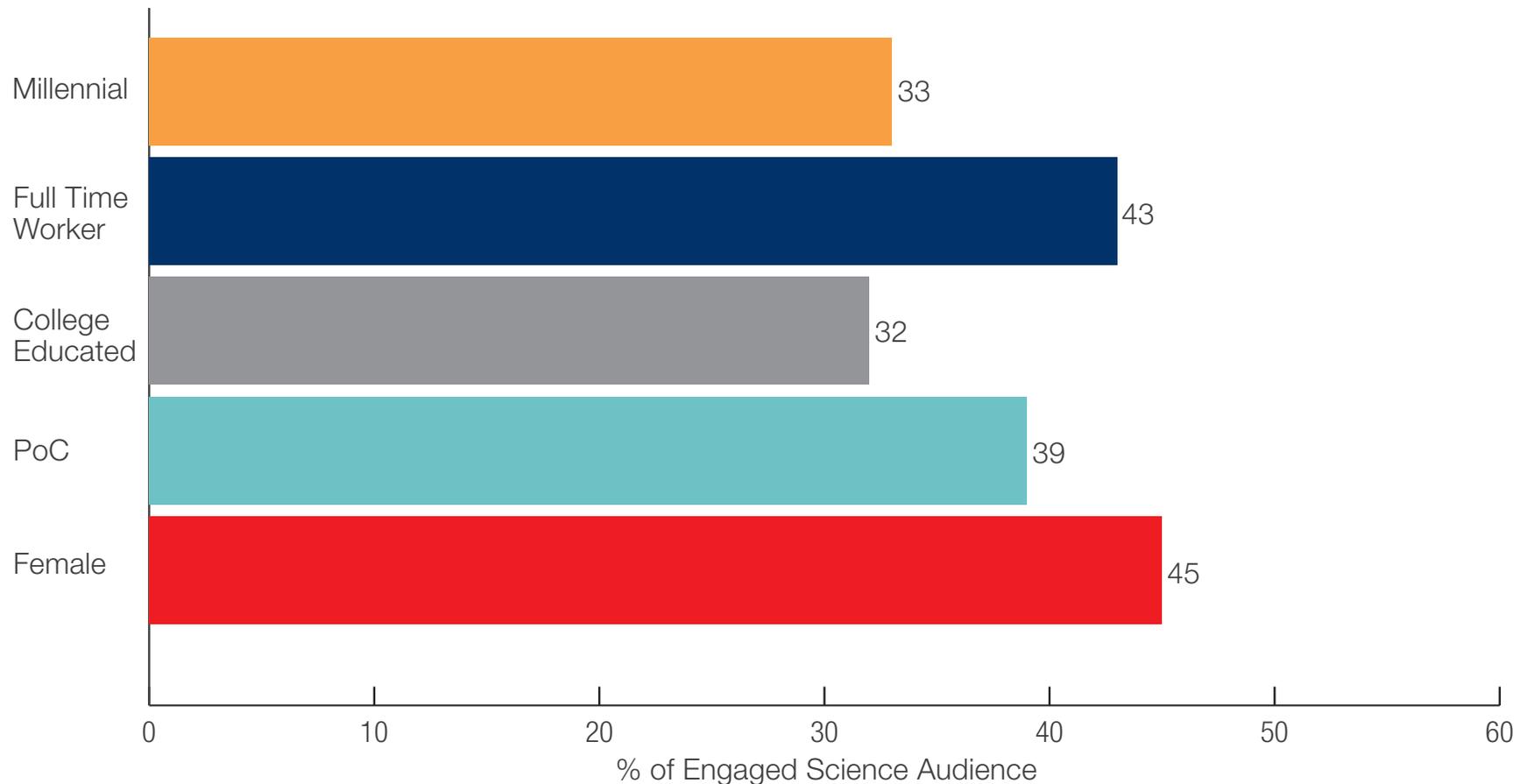
# AUDIENCE PROFILES

## PROFILE OF SCIENCE AUDIENCE ON PUBLIC STREAMING PLATFORMS (E.G., PBS APP)



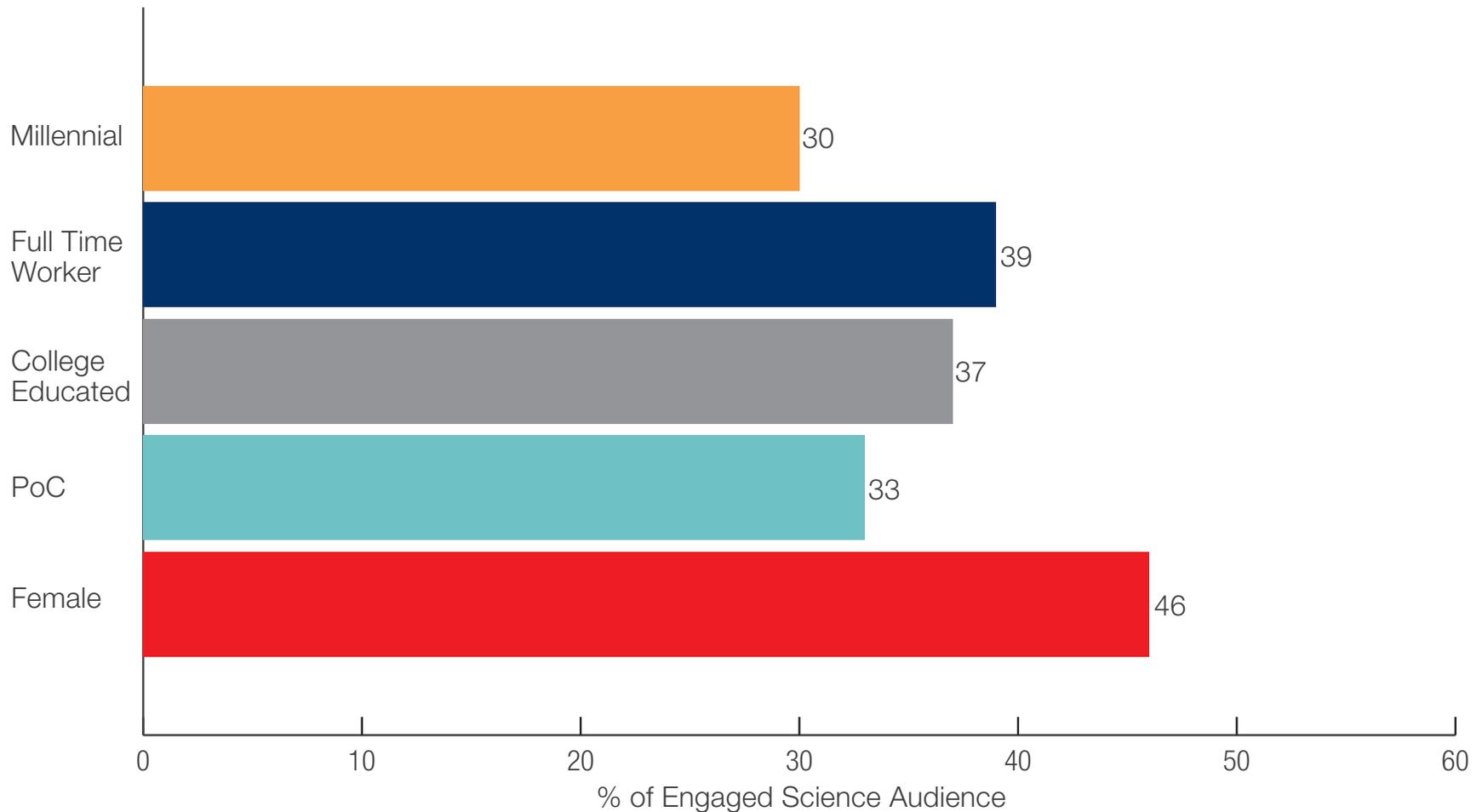
# AUDIENCE PROFILES

## PROFILE OF SCIENCE AUDIENCE ON SUBSCRIPTION STREAMING PLATFORMS (E.G., HULU, NETFLIX, AMAZON)



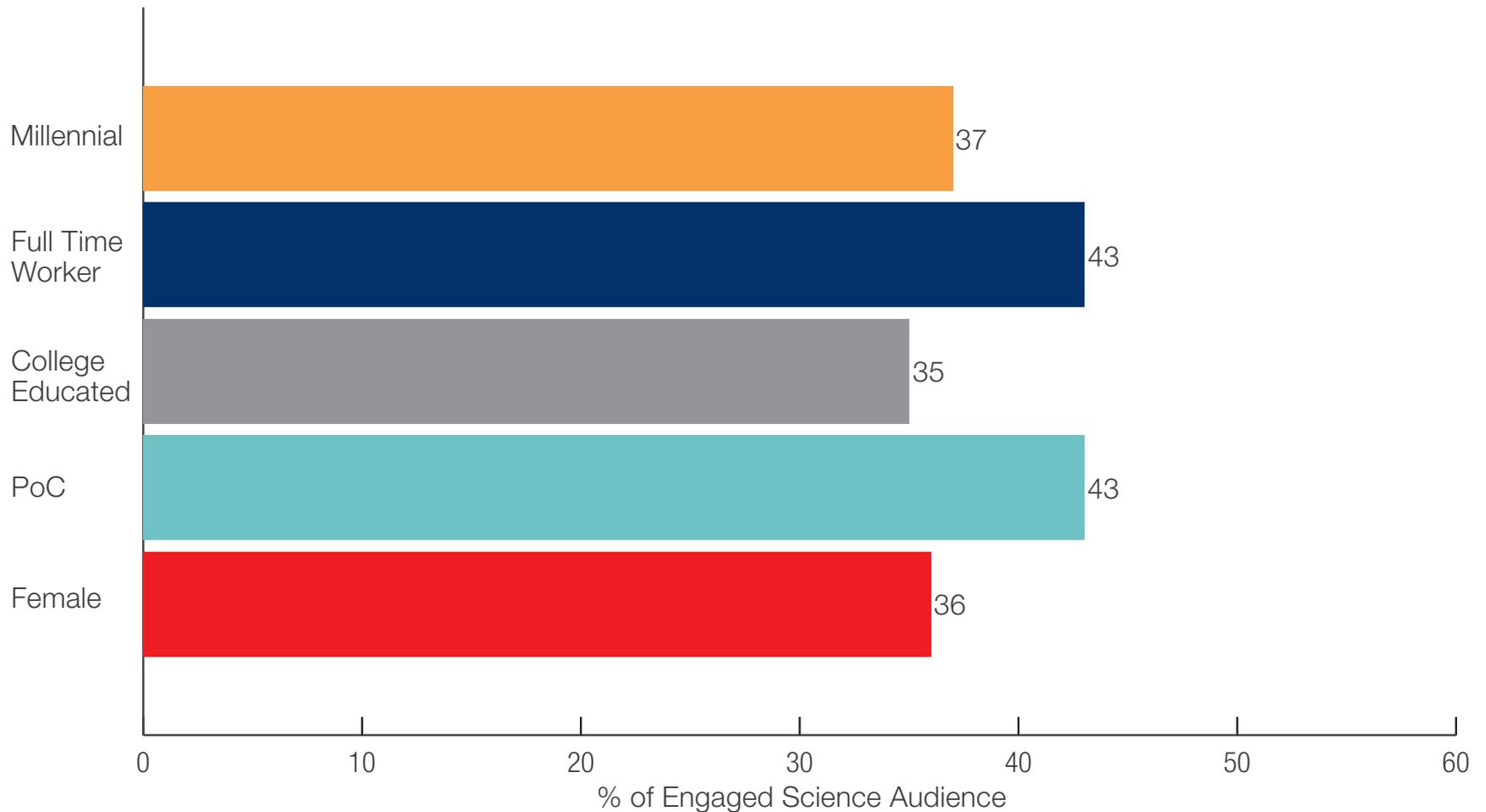
# AUDIENCE PROFILES

## PROFILE OF SCIENCE AUDIENCE ON PUBLIC NEWS WEBSITES (E.G., PBS.ORG)



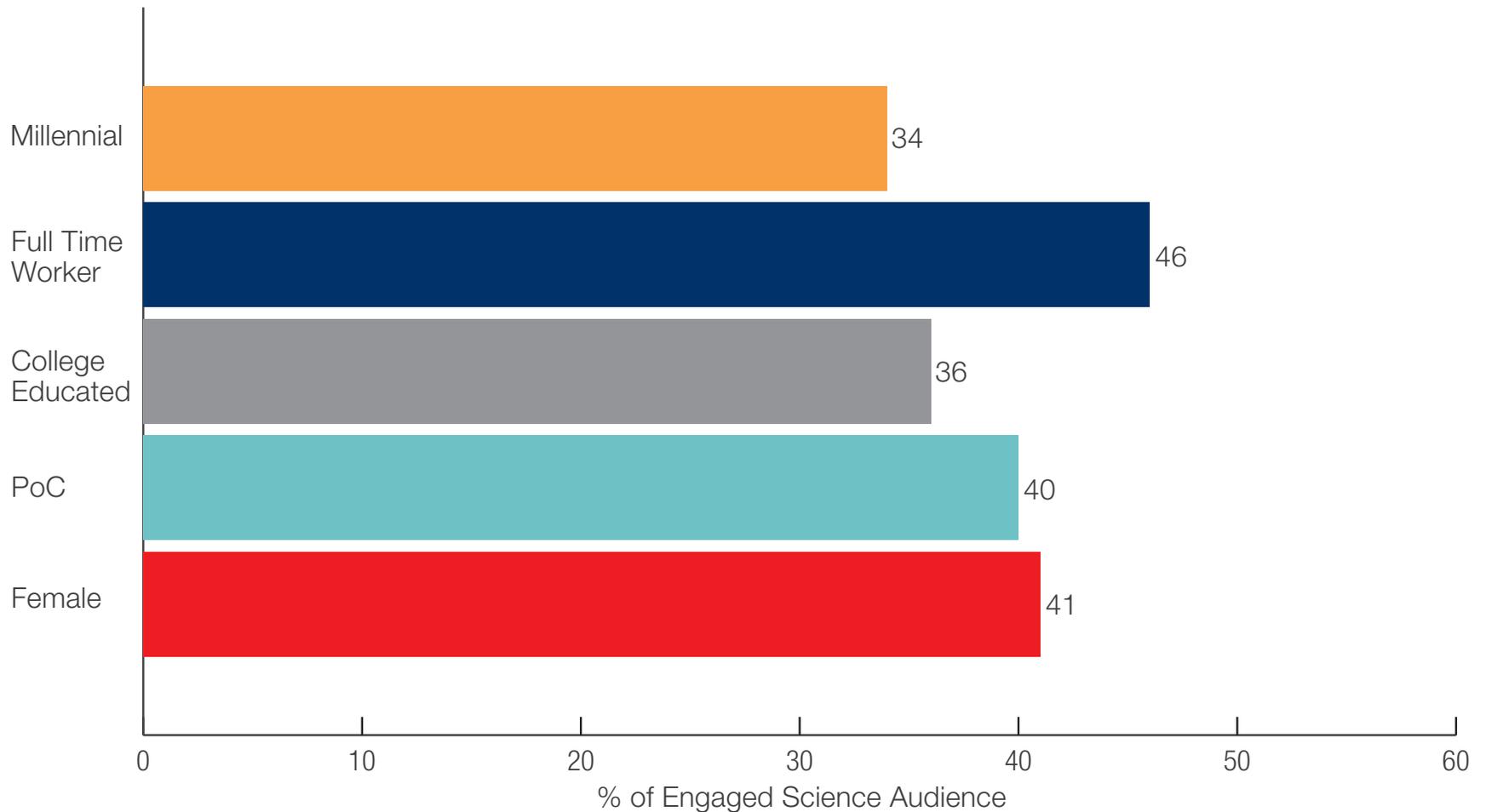
# AUDIENCE PROFILES

## PROFILE OF SCIENCE AUDIENCE ON PODCASTS



# AUDIENCE PROFILES

## PROFILE OF SCIENCE AUDIENCE ON PUBLIC RADIO (E.G., NPR)



## KEY TAKEAWAYS: AUDIENCE PROFILE

- 1** More than a third of Americans report consuming science content at least once a month on public television, free streaming platforms (like YouTube), or reading about it on sites like PBS.org. Fewer Americans regularly consume science content via podcasts and public radio.
- 2** Millennials make up between a quarter and a third of the science-engaged audience across platforms. This means that Millennials are represented in the science-engaged audience fairly well; relative to their total size of the U.S. population.
- 3** College educated individuals and people of color are also major constituencies of the science engaged audience, and are well-represented in the science-engaged audience.
- 4** Women make up less than half of the science-engaged audience; meaning that while they are major consumers of scientific content across platforms, they are fairly underrepresented relative to their population size.

## WORDS OF CAUTION

These analyses rely on self-reported measures of media consumption. From previous research, we know that self-reports can be inaccurate for two reasons. First, self-reports of media consumption habits are difficult questions to answer. People may misremember their media consumption habits, or may make errors mapping their behavior onto available survey question response options (e.g., rounding or estimation errors). Second, we know from previous research that respondents tend to overestimate the extent to which they actually consume media on various platforms.

Behavioral measures of science media consumption can help circumvent this issue, because they do not require that respondents tell us anything about their media consumption habits. Behavioral consumption measures instead give people the opportunity to consume science-related content over other types of content, on different platforms. We can then observe/record whether or not they do. These measures take more effort to administer in public opinion surveys, but are less likely to be subject to problems listed above.

Consequently, we caution that the results observed here likely overestimate the total size of the science-engaged audience on each platform. While we do not think that our analyses regarding the composition of each platform's science audience would be any different if we were to rely on behavioral (vs. self-reported) consumption measures, we do think that it would be important to replicate the findings presented here with behavioral measures of science media consumption.



# MISSING SCIENCE AUDIENCE PROFILES

# MISSING AUDIENCE PROFILES

## DEFINING THE MISSING SCIENCE AUDIENCE

In theory, identifying who is in the “missing science audience” is simple – who is highly science curious, but missing out on consuming science related content on platforms they regularly use? In practice, however, measuring membership in the missing audience can be tricky. We scored survey respondents as being in the missing science audience if respondents report that they:

- 1** USE a particular media platform to consume content of any kind
- 2** BUT, do not regularly consume science content on that platform (i.e., “less than monthly” or “never”)
- 3** AND, are high in science curiosity (i.e., above the mean)

Based on this definition, we were able to estimate the size of the missing science audience on each platform.

## AUDIENCE PROFILES

# MISSING SCIENCE AUDIENCE SIZE BY PLATFORM

Platform	Example	Size
Public Television	PBS	10%
Free Stream	YouTube, FB Watch	11%
Public Stream	PBS App	10%
Subscription Stream	Hulu, Netflix, Amazon	14%
Public Website	PBS.org	9%
Podcasts	(none listed in prompt)	12%
Public Radio	NPR	17%

Entries correspond to the percentage of the US adult population that consumes science-related content on each platform, at least once a month.

## MISSING AUDIENCE PROFILES

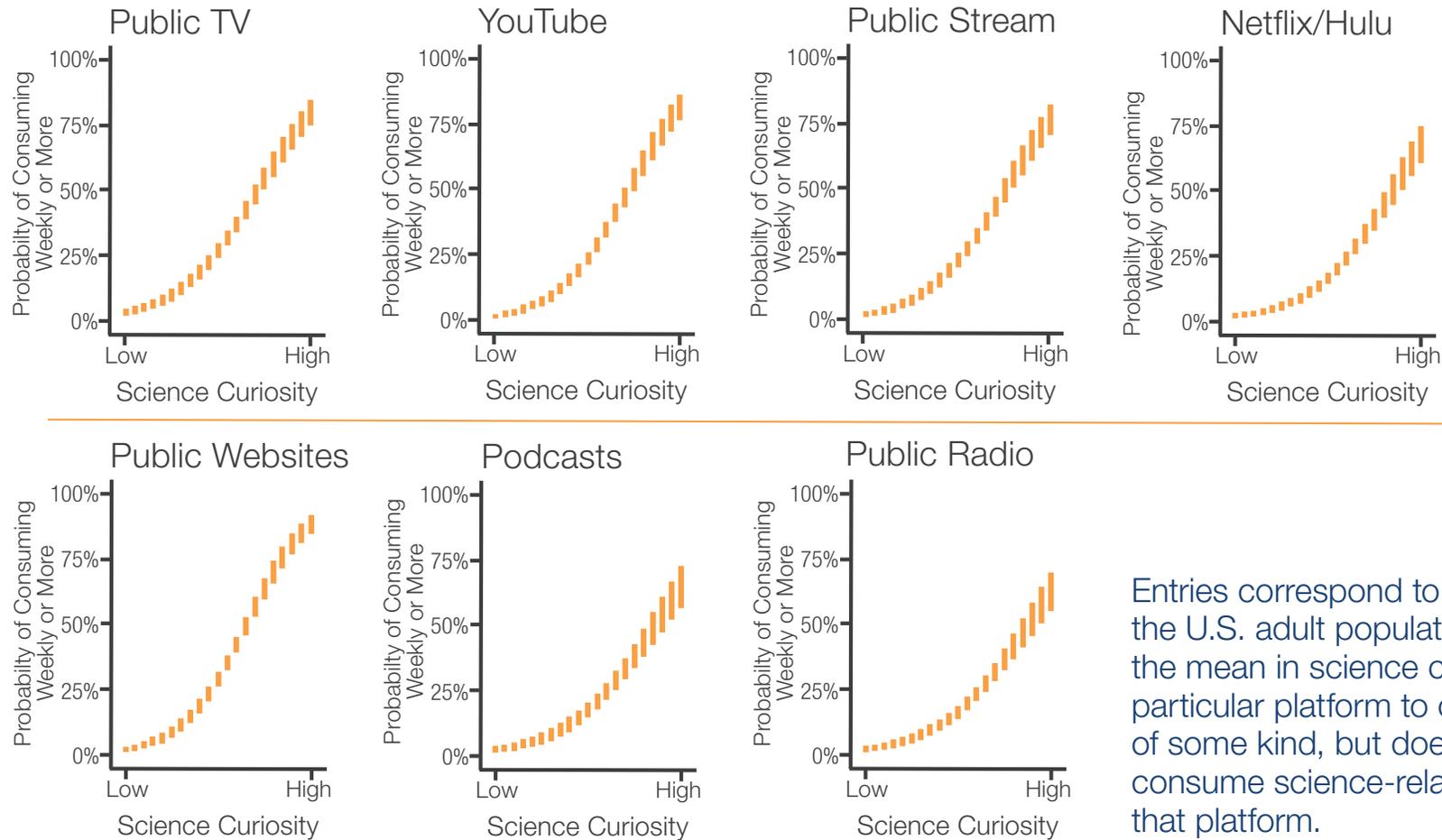
# INVESTIGATING THE LINK BETWEEN SCIENCE CURIOSITY AND SCIENCE MEDIA CONSUMPTION

Before investigating the composition of each missing audience, we first verify that science curiosity is, in fact, associated with increased consumption of science-related content on various media platforms. This is important, because science curiosity is a key element in defining our missing science content audience.

When we say that highly science curious individuals – who do not regularly consume science content – are a “missing” audience, we are essentially saying that these individuals ought to be consuming science content (because they find it more interesting than the average person), but are not doing so currently. For this to be true, science curiosity should be linked to increased science content consumption, for most people.

# MISSING AUDIENCE PROFILES

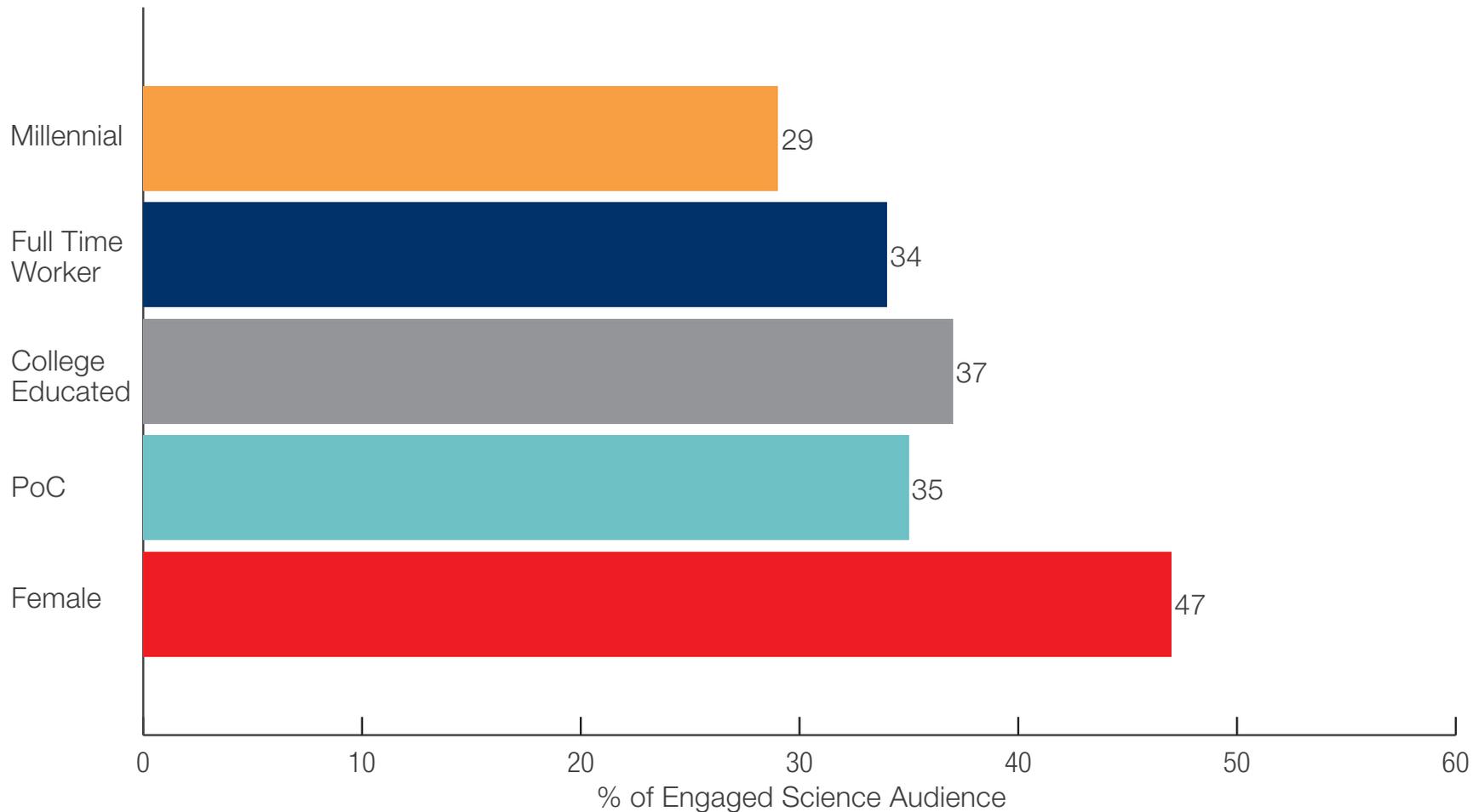
## SCIENCE CURIOSITY IS ASSOCIATED WITH INCREASED SCIENCE-CONTENT CONSUMPTION



Entries correspond to the proportion of the U.S. adult population that is above the mean in science curiosity, uses a particular platform to consume content of some kind, but does not regularly consume science-related content on that platform.

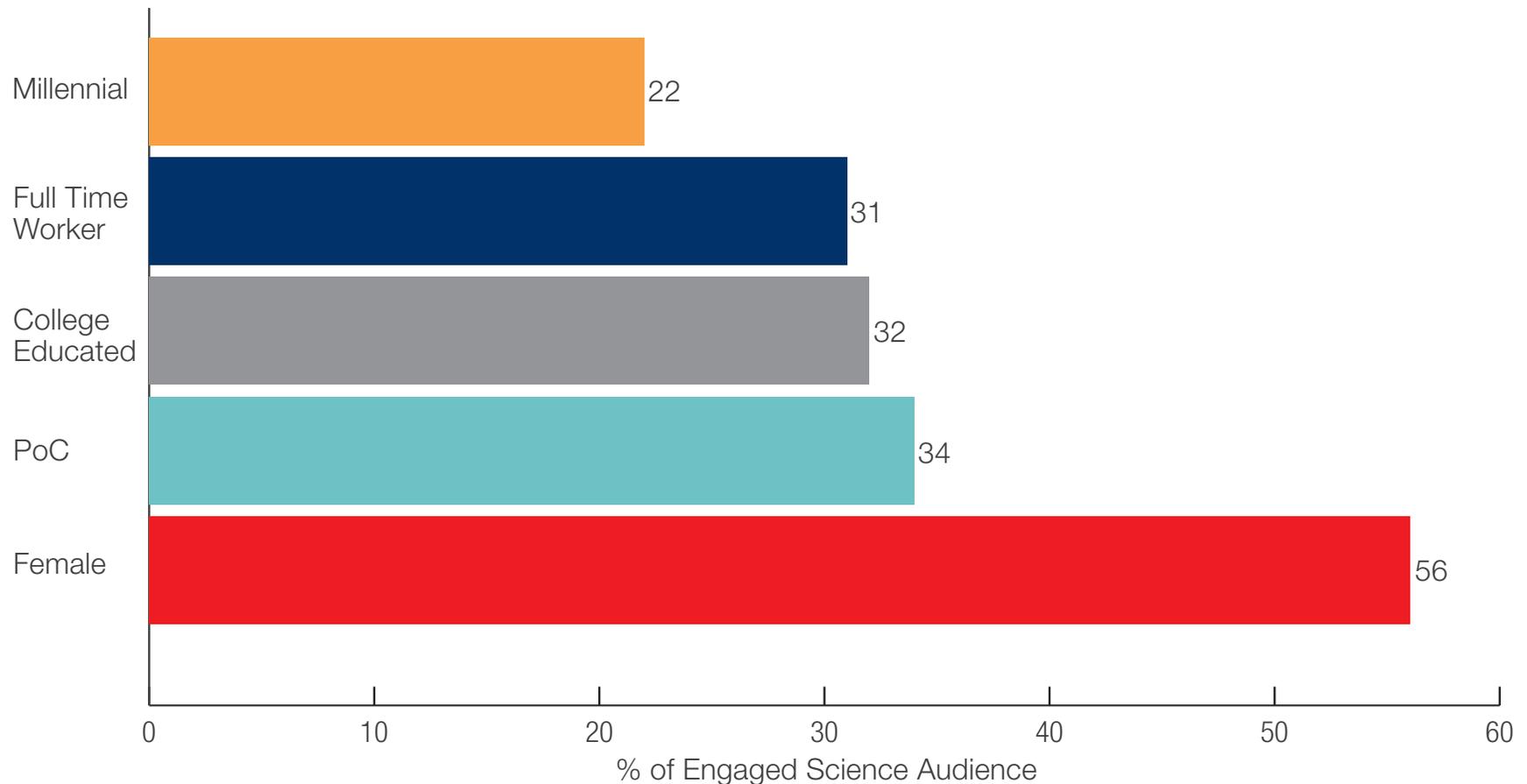
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## PROFILE OF MISSING SCIENCE AUDIENCE ON PUBLIC TELEVISION (E.G., PBS)



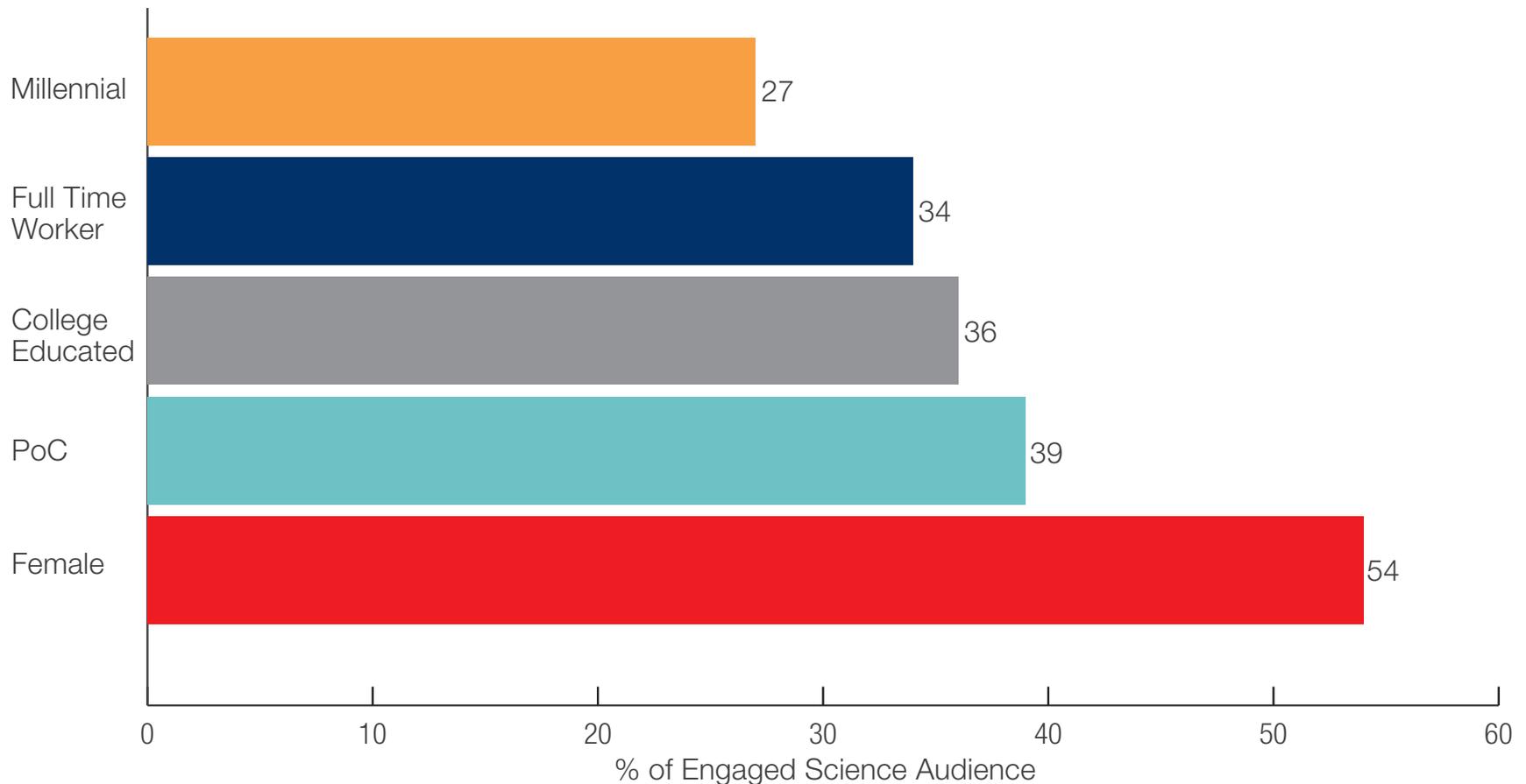
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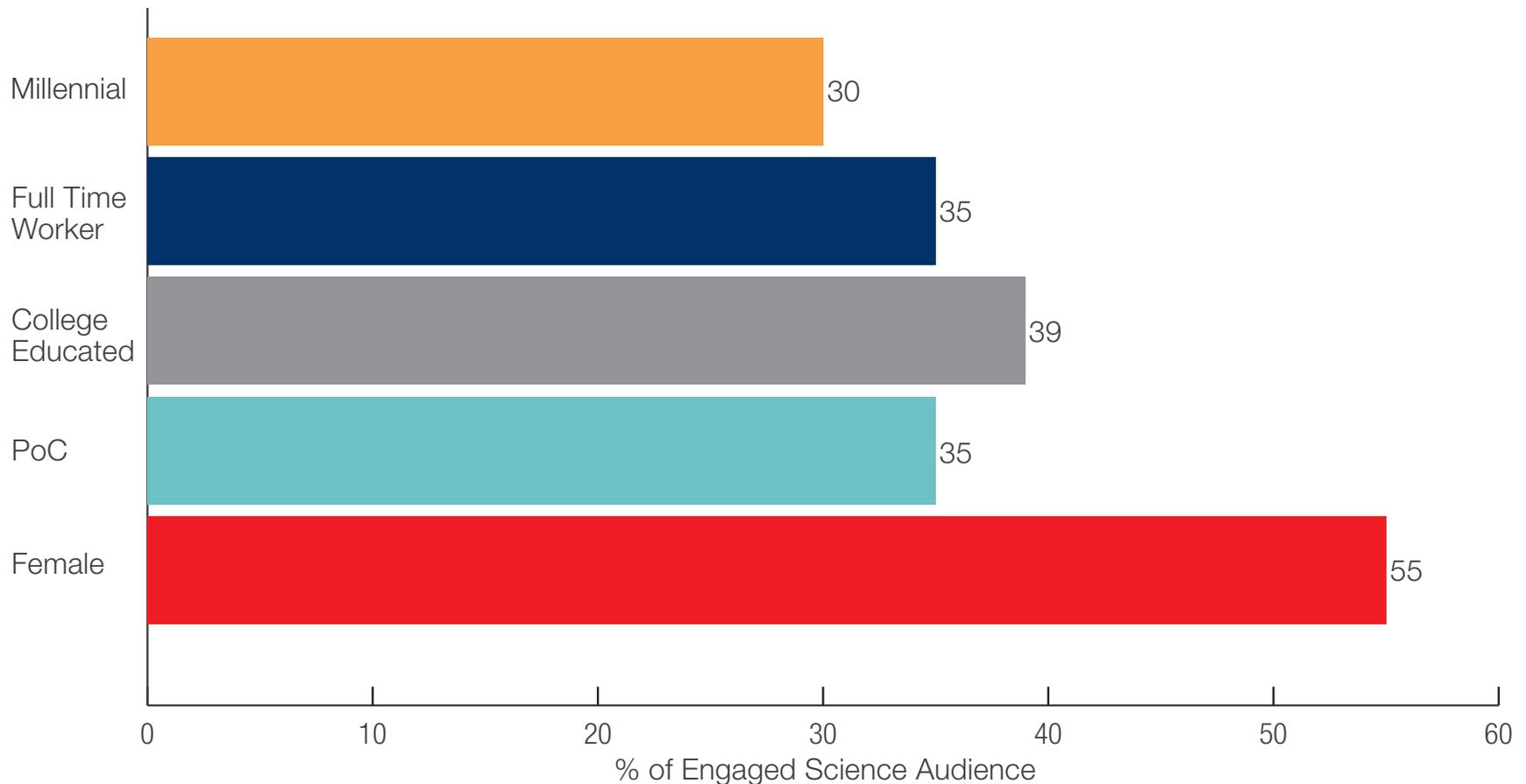
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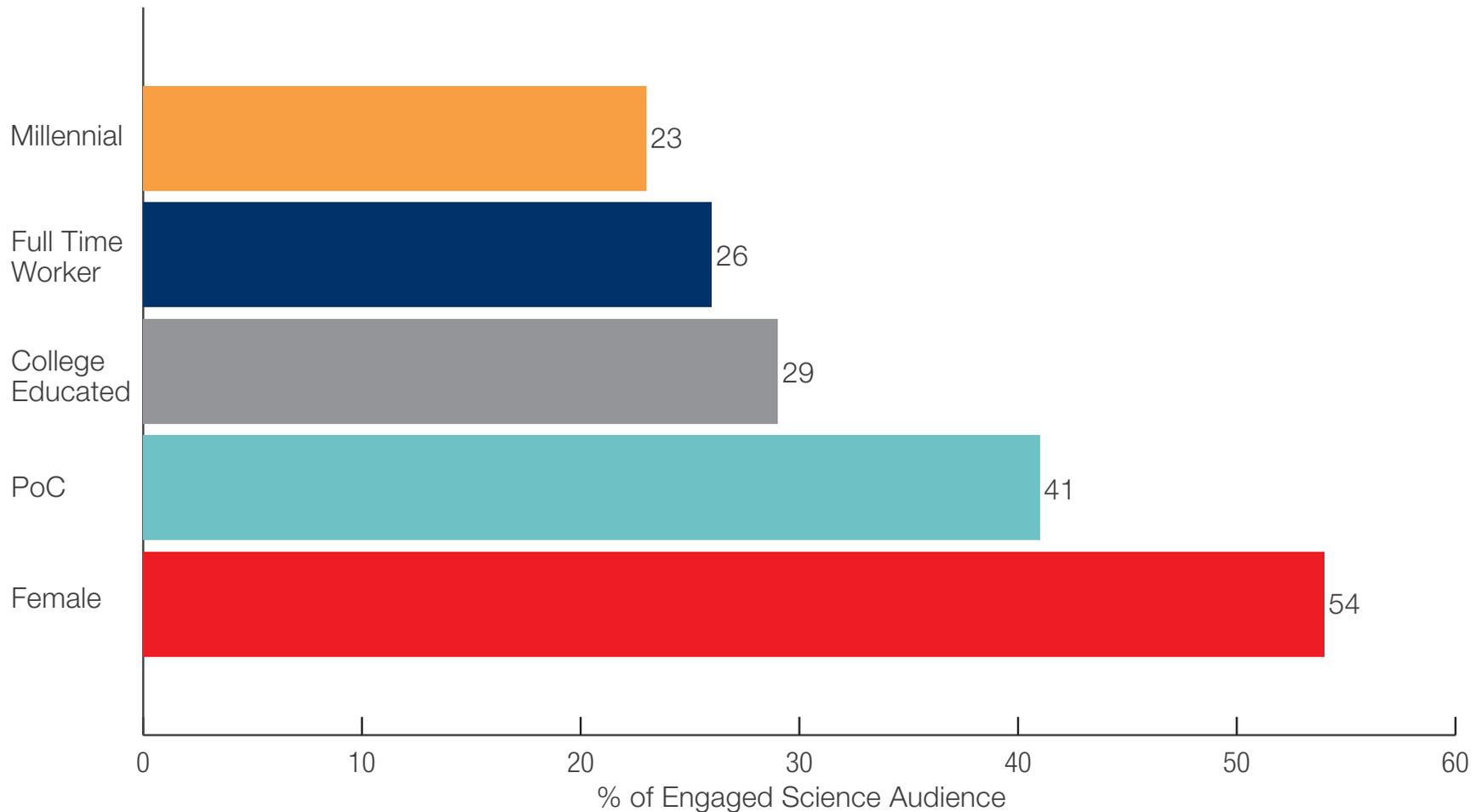
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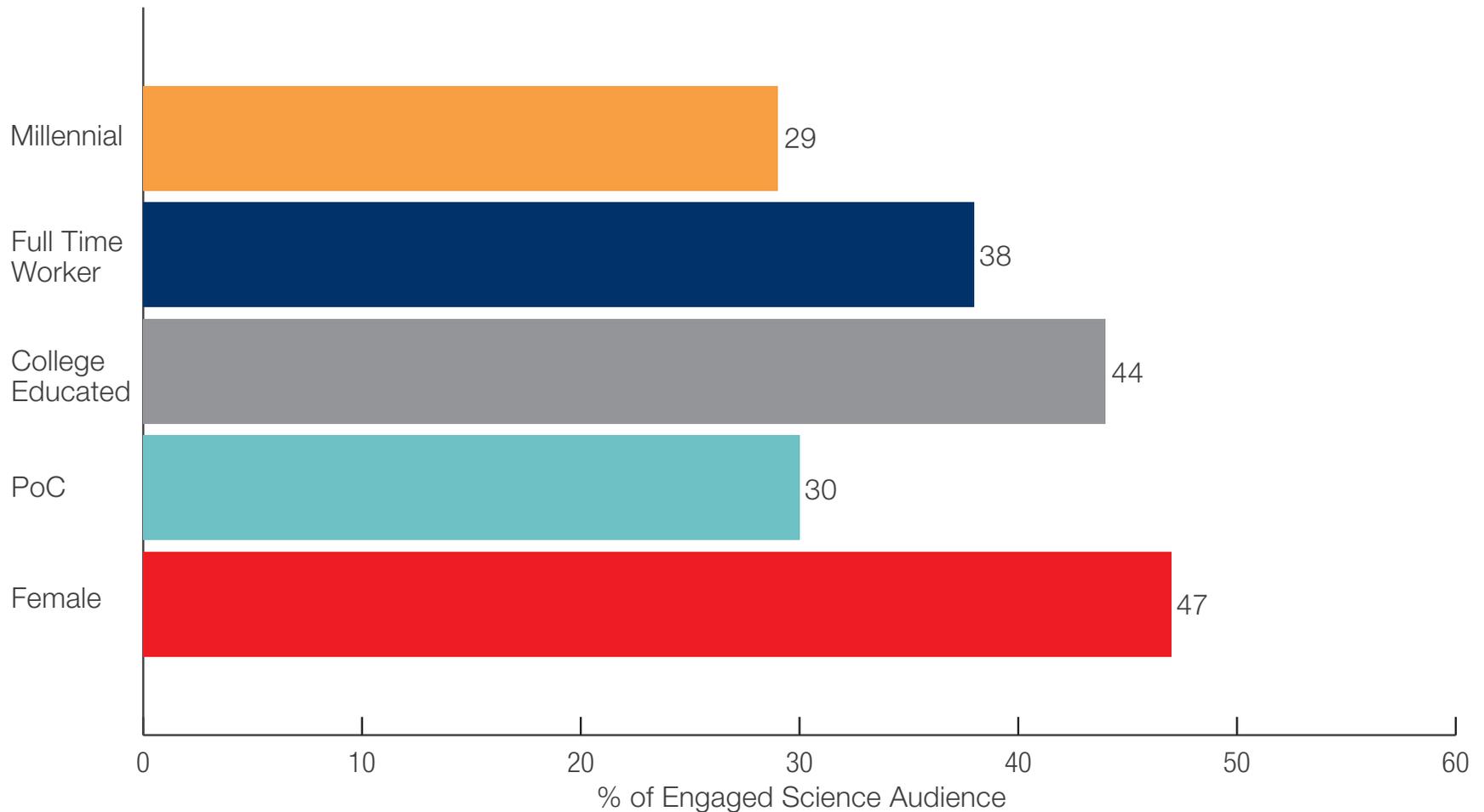
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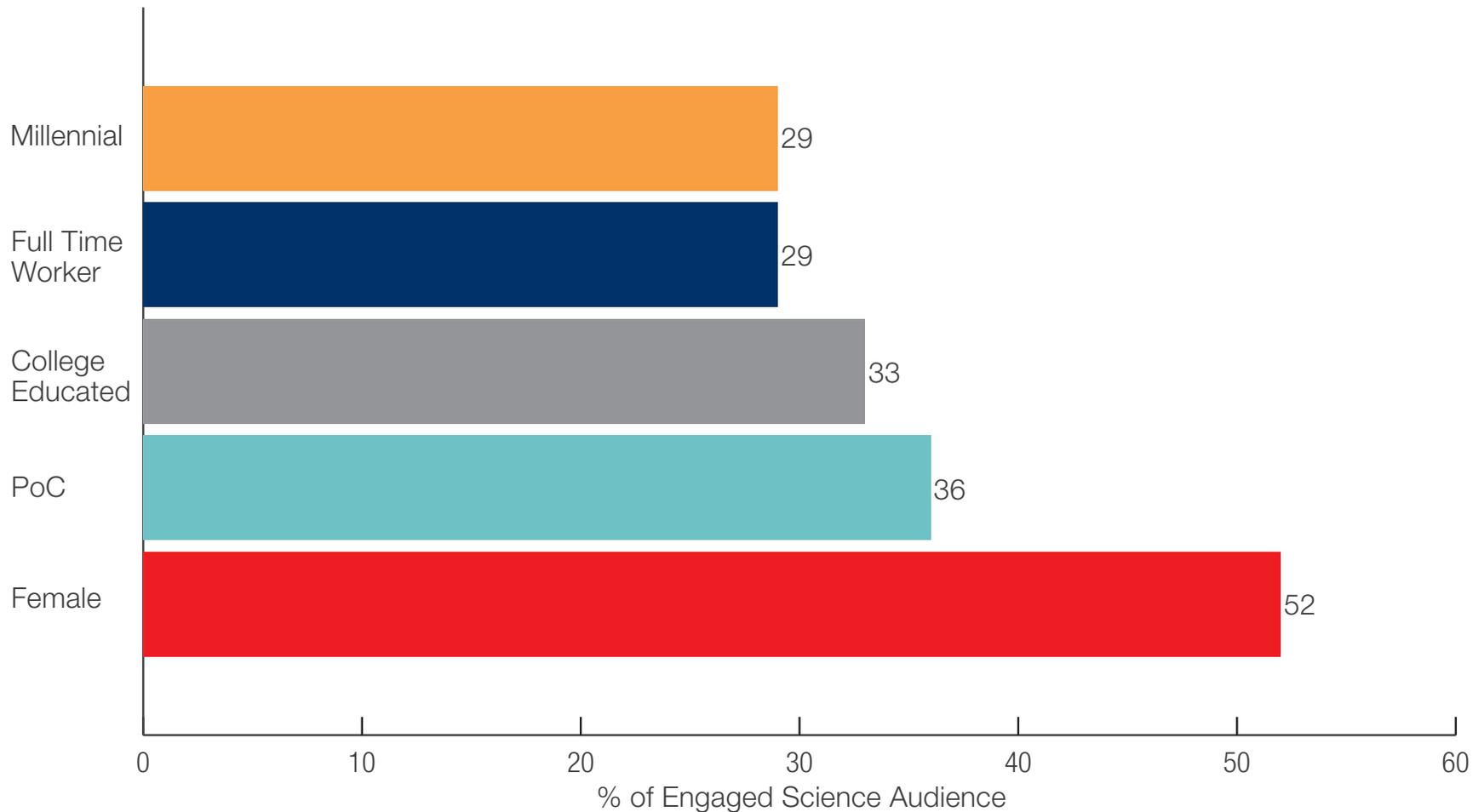
# MISSING AUDIENCE PROFILES

## PROFILE OF MISSING SCIENCE AUDIENCE ON PODCASTS



# MISSING AUDIENCE PROFILES

## PROFILE OF MISSING SCIENCE AUDIENCE ON PUBLIC RADIO (E.G., NPR)



# MISSING AUDIENCE PROFILES

## KEY TAKEAWAYS

- 1** Science curiosity is a strong predictor of whether or not Americans report consuming science content across many different platforms.
- 2** Somewhere between a tenth and fifth of Americans belong to the “missing science content audience,” depending on platform.
- 3** Millennials make up about a quarter to a third of the missing audience, depending on platform; meaning that they are represented in the missing audience in a way that is roughly proportional to their size of the U.S. population. The same seems to be true for people of color.
- 4** College educated individuals and especially women are overrepresented in the missing audience relative to their size of the U.S. population.

# MISSING AUDIENCE PROFILES

## WORDS OF CAUTION

Again, we note that these analyses rely on self-reports of science media consumption, which are likely to overestimate the total size of the missing audience. We also note that the correlation between self-reported media use and science curiosity is also likely inflated. Because science curiosity asks people questions about the extent to which they enjoy consuming science-related news and other content, it would be surprising if science curiosity and science media consumption were not tightly linked.

Again, we think that behavioral measures of who chooses to watch science content over other types of content in a laboratory setting would provide more accurate estimates of who is in the missing audience on each platform.



# REMARKS ON JACOBS REPLICATION

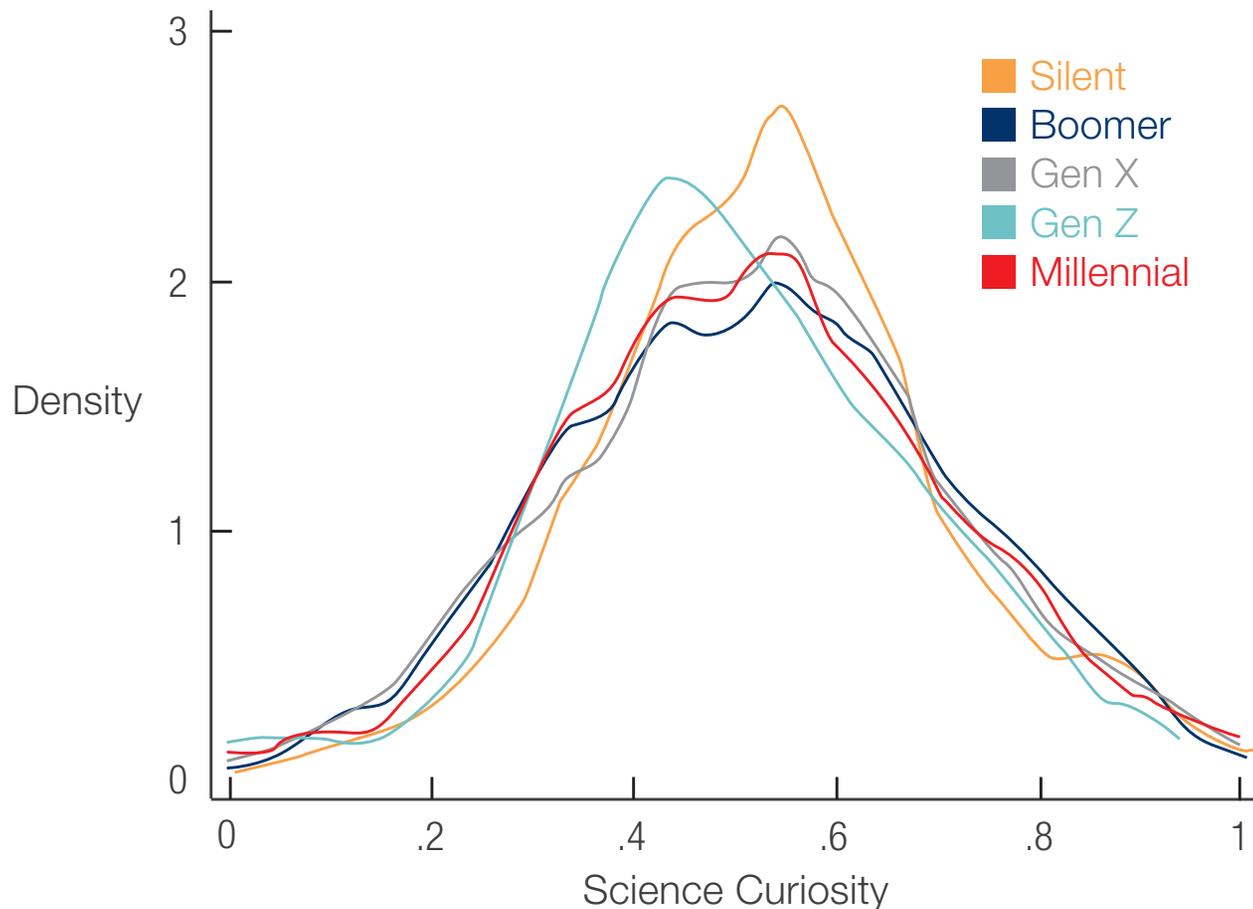
## REMARKS ON JACOBS REPLICATION

# ARE MILLENNIALS MORE SCIENCE CURIOUS?

Millennials were substantially more science curious than other age cohorts. We attempted to replicate this finding, using nationally representative data (the previous report relied on data that were not formally representative). We do not uncover the same pattern of results.

## REMARKS ON JACOBS REPLICATION

# THE DISTRIBUTION OF SCIENCE CURIOSITY AMONGST MILLENNIALS MIRRORS THAT OF OTHER AGE COHORTS



This figure displays the proportion of the sample (y axis) that earns different scores on the science curiosity scale (x axis) across different age cohorts (colored density lines). All five lines produce highly similar distributions of science curiosity – indicating that no one group is more or less science curious than another.

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# PARTNERS

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