



Bridging the Gap Between Scientists and the Public

Why are facts not enough?



Ardon Shorr



Public
Communication
FOR Researchers

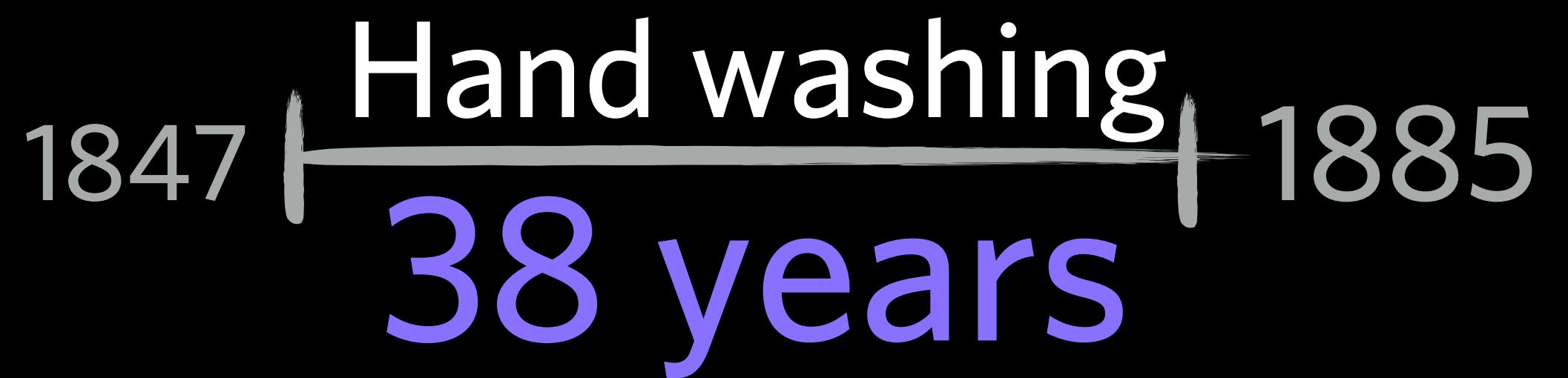
How we saw the problem



“The saddest aspect of life
is that
science gathers knowledge
faster than
society gathers wisdom”

Isaac Asimov

There's a gap from when we know something & accept it



1847 | Hand washing
38 years | 1885

1912 | Smoking
89 years | 2001

Vaccines
146 years? ...

1988 | Global warming
28 years? ...

There's a large gap between the public and scientists

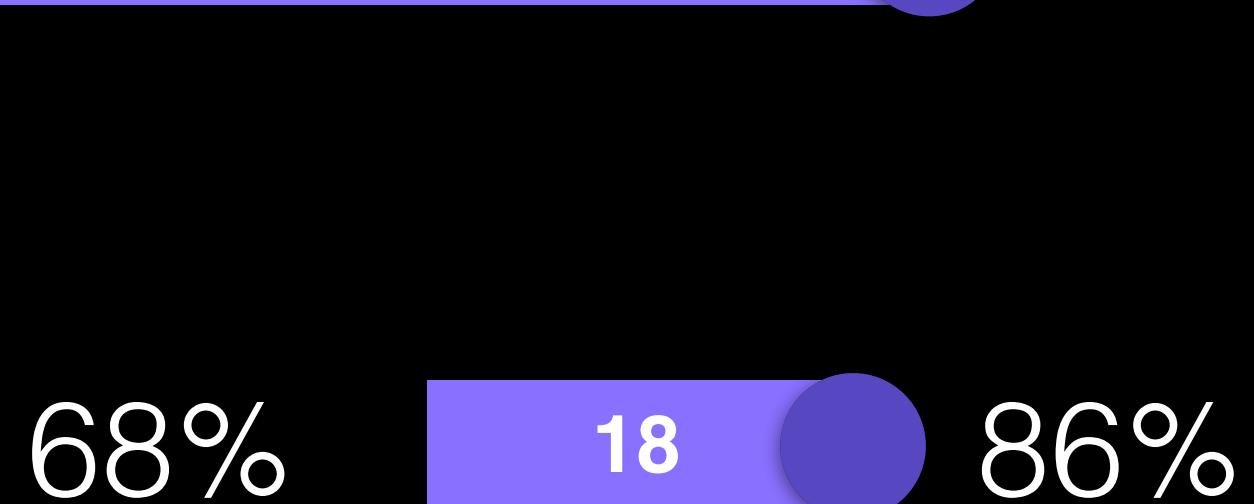
Climate change is mostly due to human activity



Safe to eat genetically modified foods



Childhood vaccines such as MMR should be required



CARNEGIE MELLON U



It is not enough
to do good work
without
persuading
people
that it
MATTERS.

How we saw the problem

Educate, inform, get out there and be clear



How we saw the problem
How we tried to answer it



We created a communication curriculum



Clear thinking
made **visual**

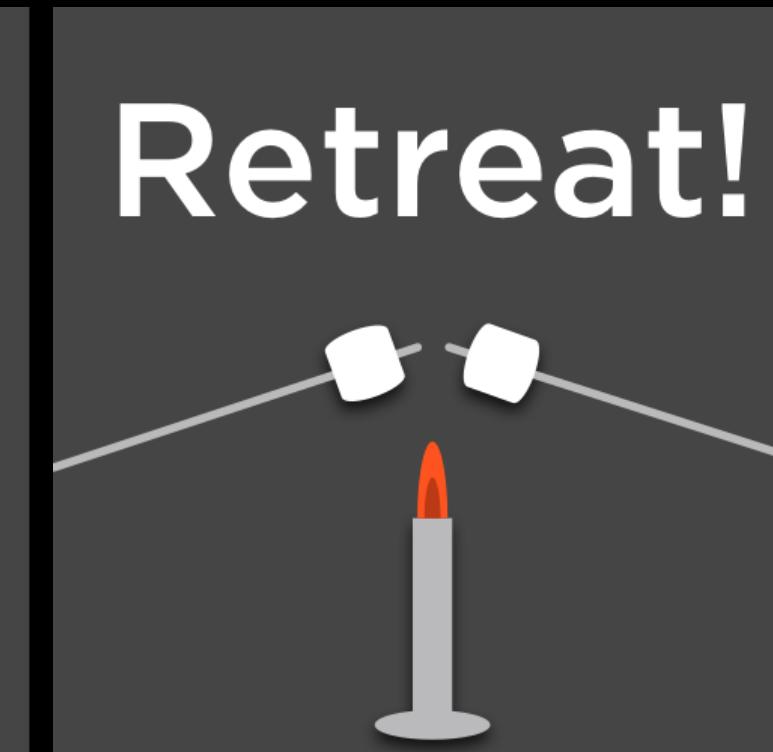


Storytelling
workshop
WITH
THE STORY
COLLIDER
STORIES ABOUT SCIENCE



TALKING TO THE
Media

3 Minute
Thesis
Workshop



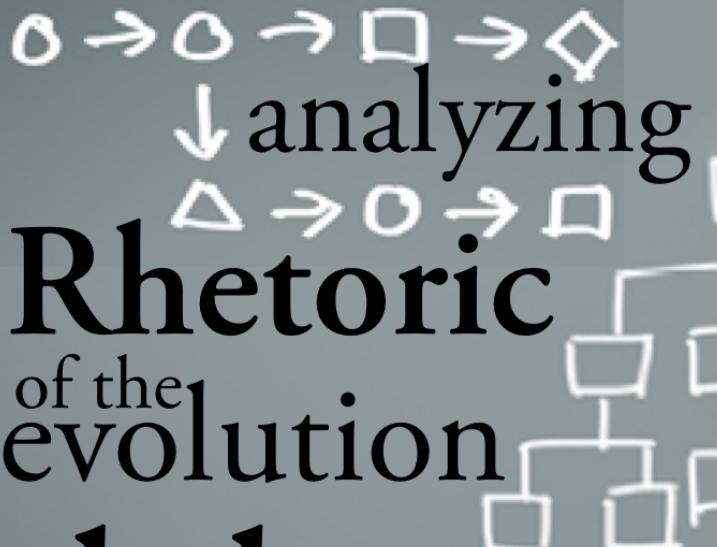
Speakeasy
Science


SCIENCE
NON
FICTION

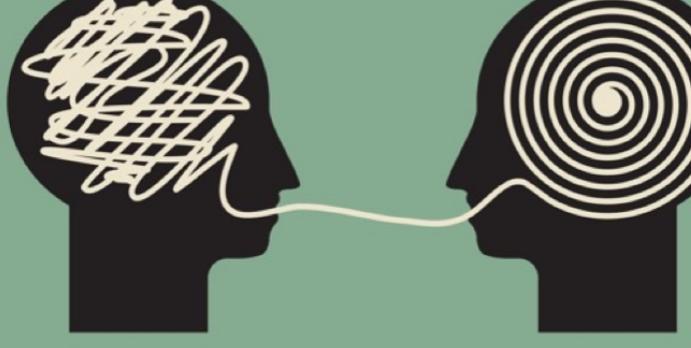

The
Landscape
of
Science
Communication



improv!

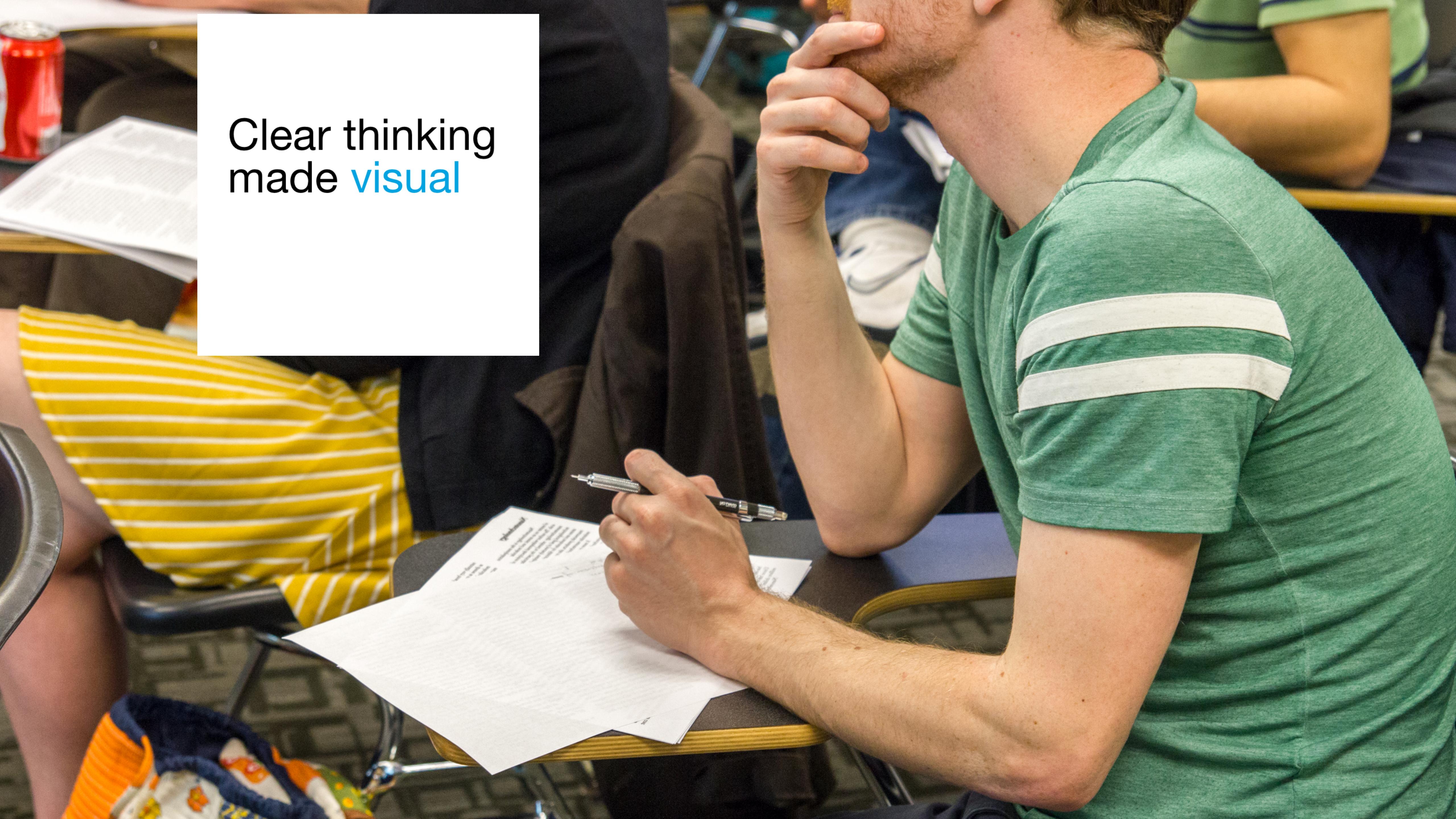

analyzing
Rhetoric
of the evolution
debate


Why are facts
not enough?

UNDERSTANDING
MISUNDERSTANDING




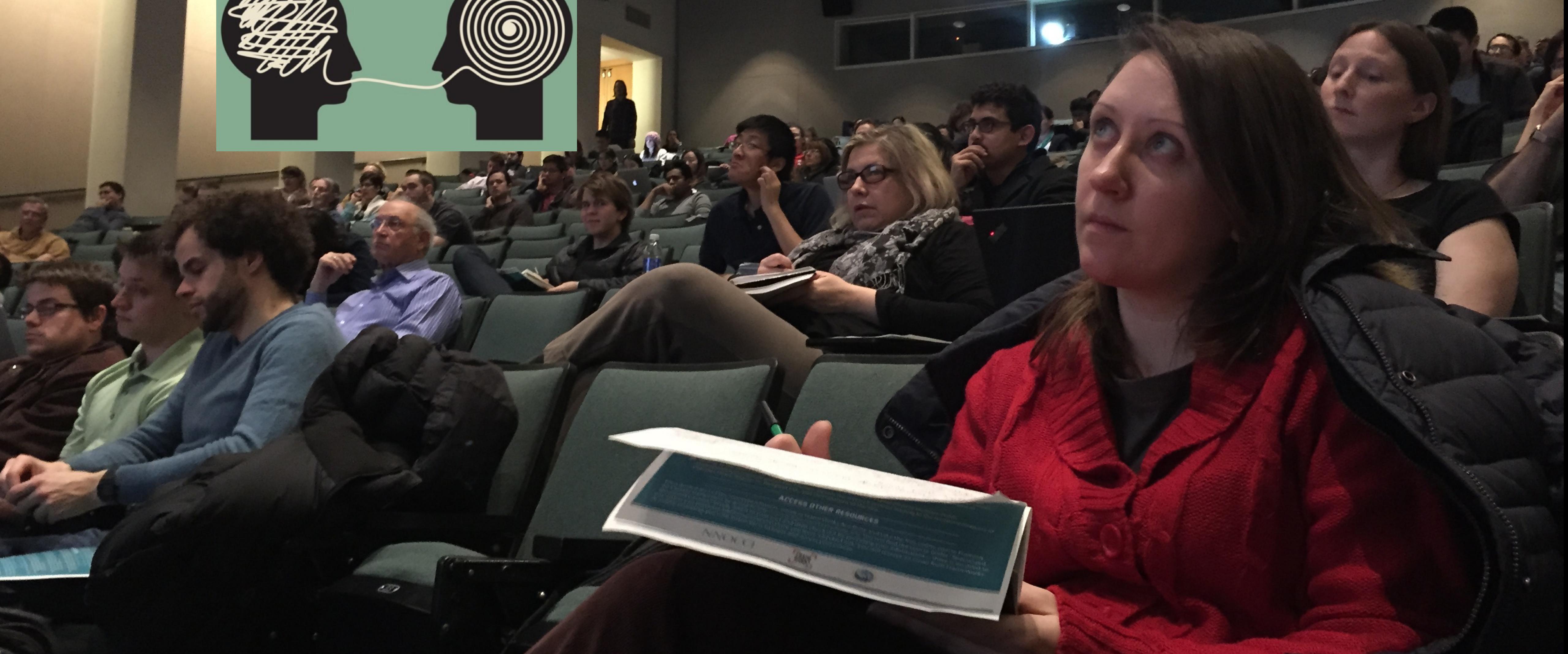
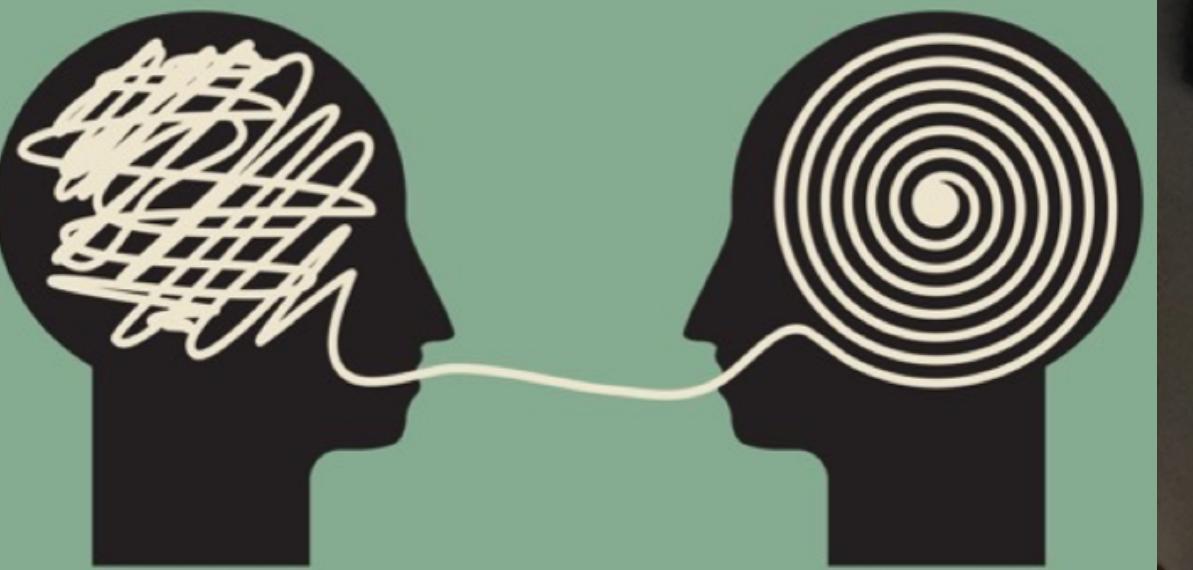
BRIDGING THE GAP



Clear thinking
made **visual**



UNDERSTANDING MISUNDERSTANDING



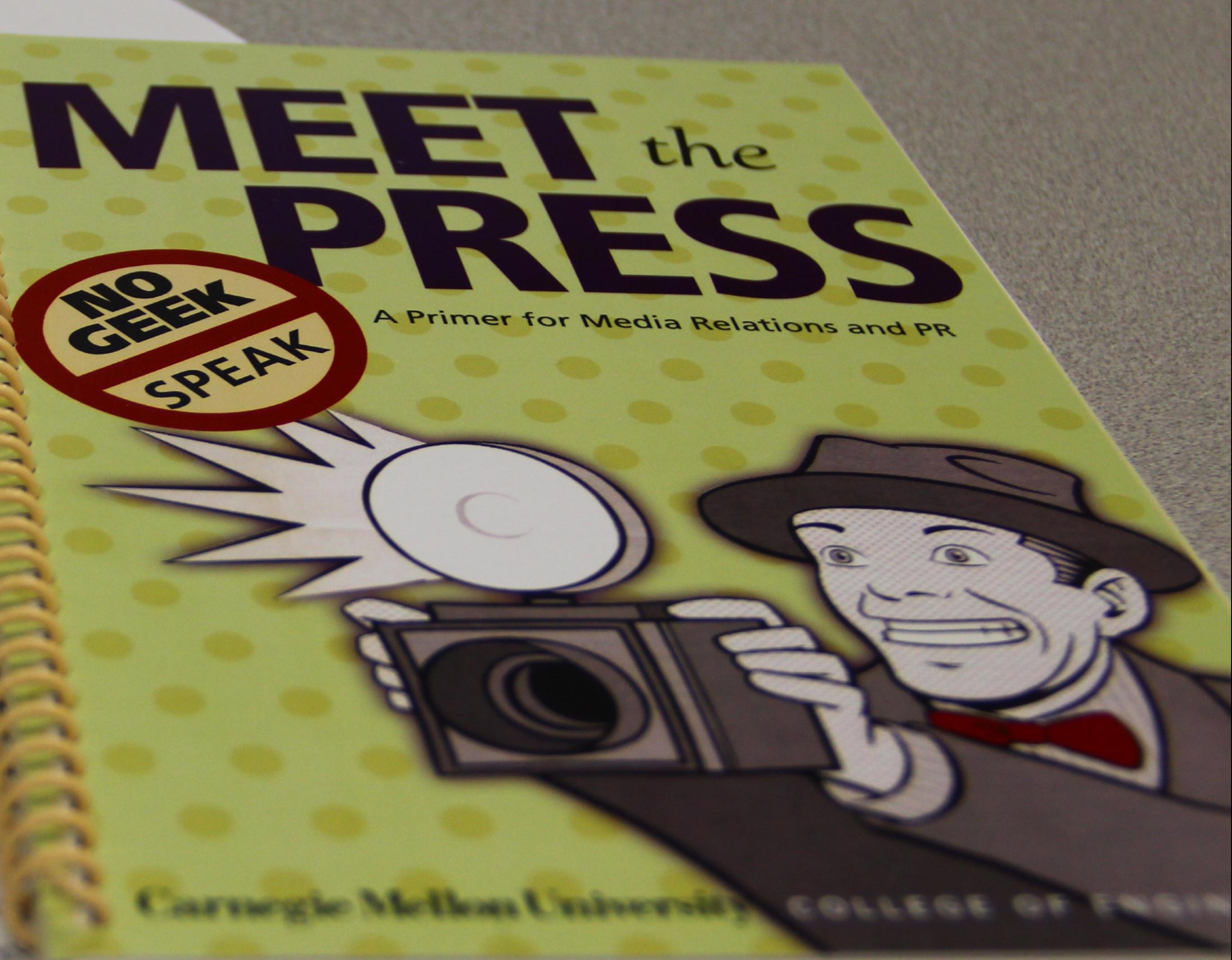
TALKING To The Media

Distill your message
Decide on 1-3 main points you want
to get across, and think about how
you will present them. Know clearly
what those are before you start the
interview.

Identify your story
What's surprising, exciting, difficult
or upsetting about your subject?

During the interview

Be conversational
Treat the interview like a conversation with the interviewer.
Show enthusiasm, avoid jargon,
slow down if you need to, and repeat
yourself if necessary.



SCIENCE
NON
FICTION



BEHIND

SCIENCE

THERE'S A
STORY

Storytelling workshop



How we saw the problem
How we tried to answer it



How we saw the problem
How we tried to answer it
Does that work?



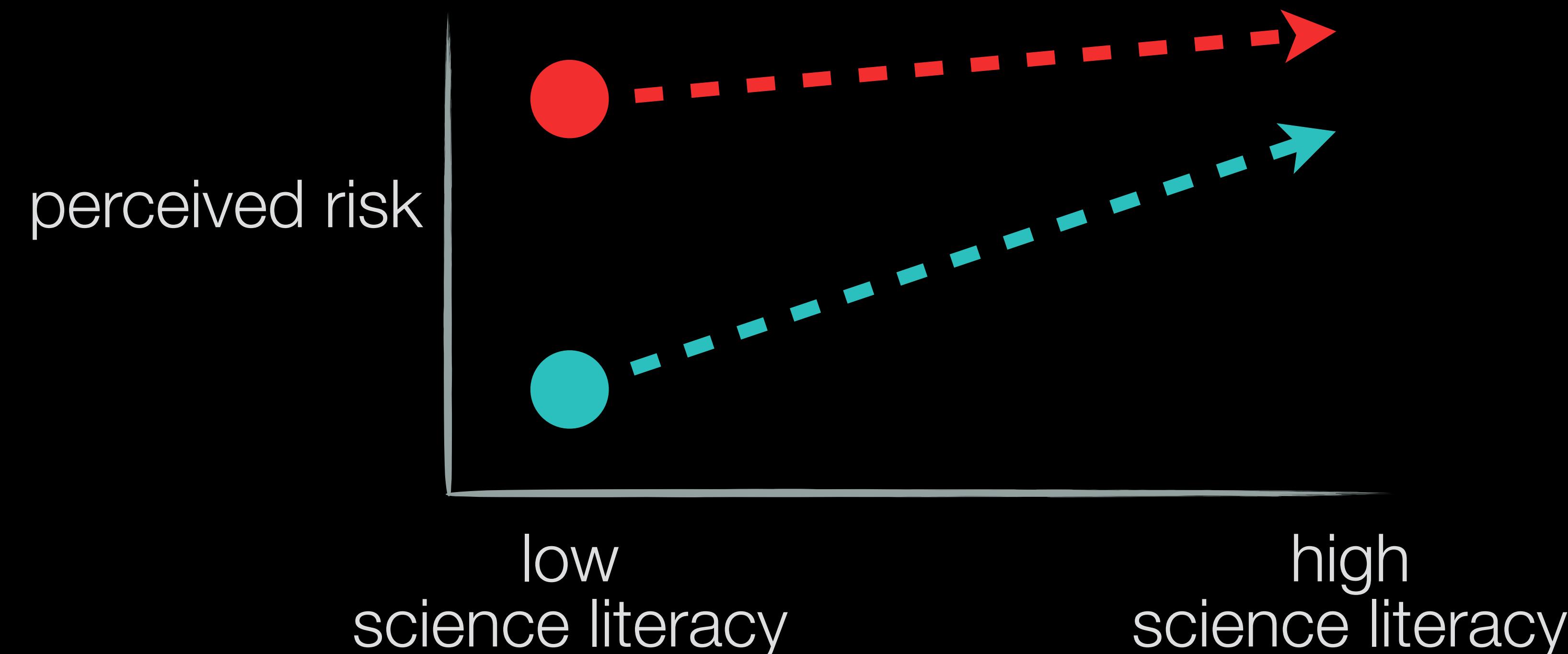
More information
is not the problem

“How much risk do you think
climate change poses?”



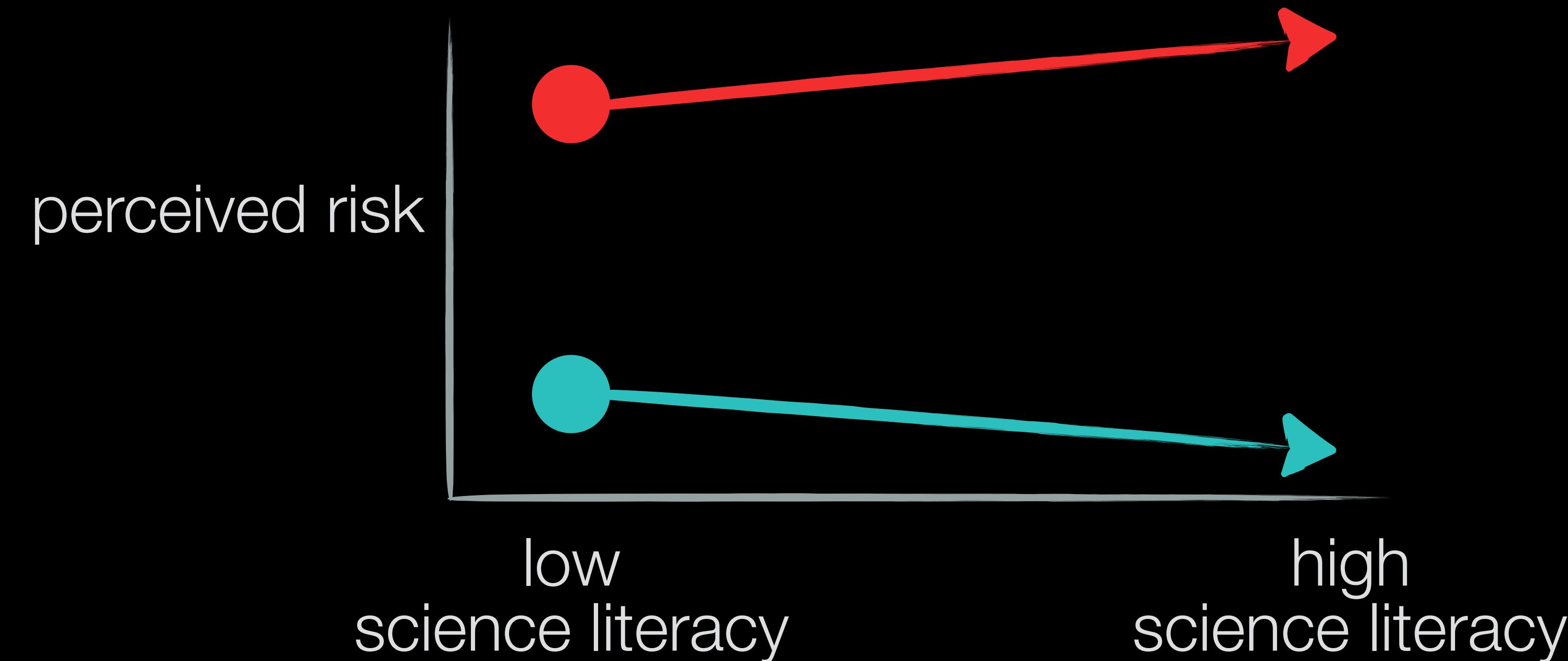
We expect information to persuade people

“How much risk do you think climate change poses?”



But sometimes information polarizes people

“How much risk do you think climate change poses?”



We filter new information

Confirmatory thinking:

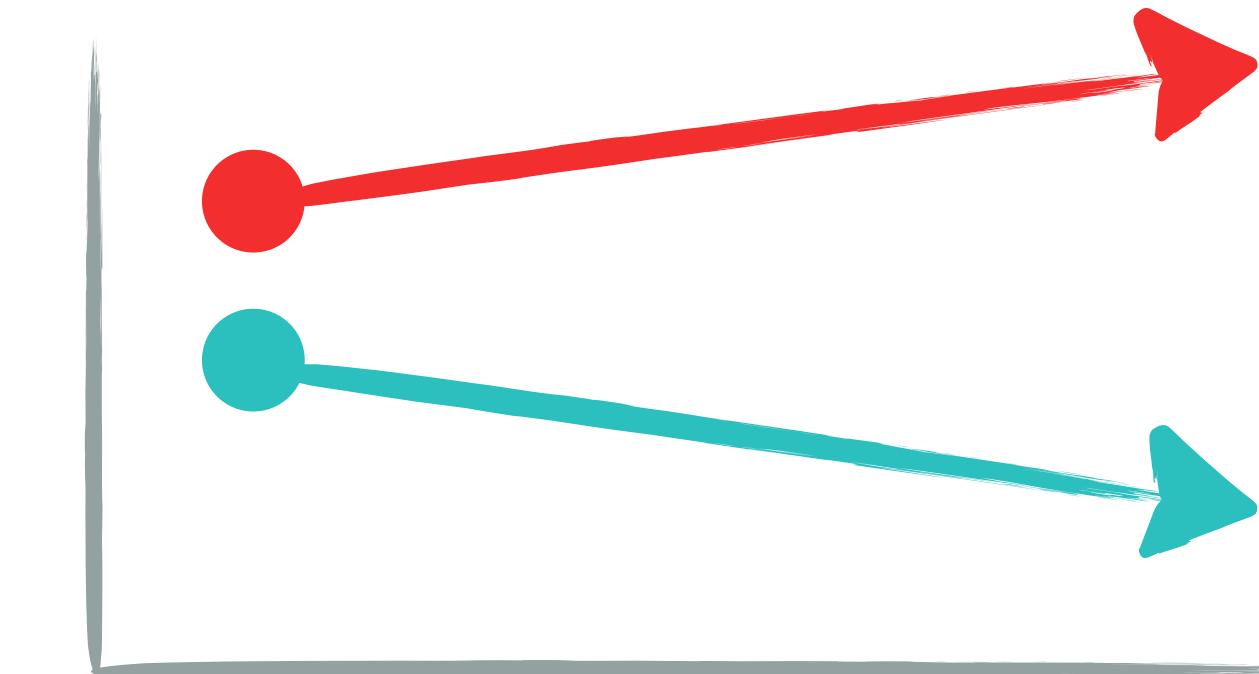
We selectively look for
arguments we agree with

Disconfirmatory thinking:

We apply a harsher standard
to arguments we don't like

We ALL filter new information

regardless of our
level of education



or political affiliation



Why do we **filter** new information ?!

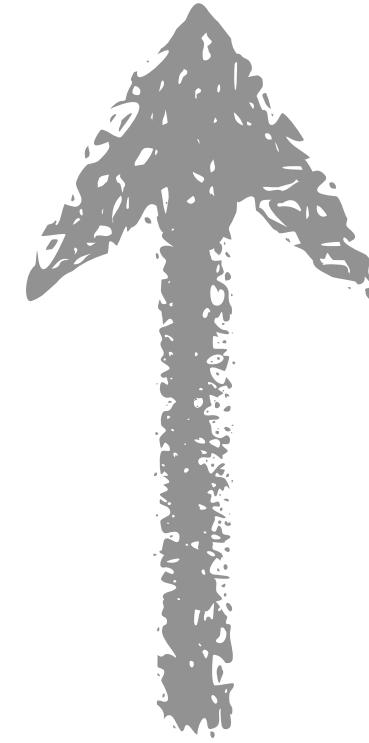
it's not dishonesty
it's not (quite) irrationality

Motivated reasoning
makes sense

given

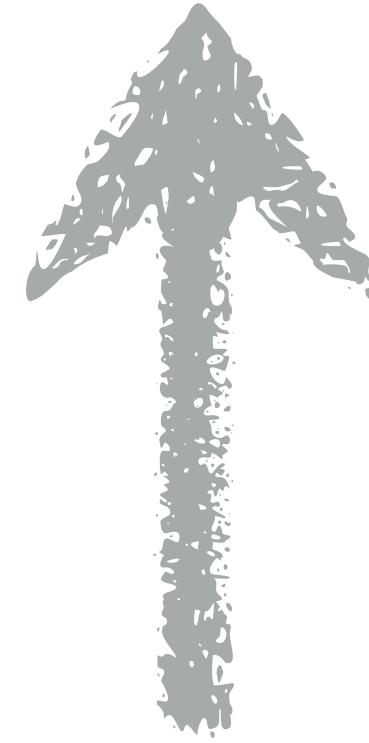
social & emotional factors

We form our beliefs based on
what our social circle believes



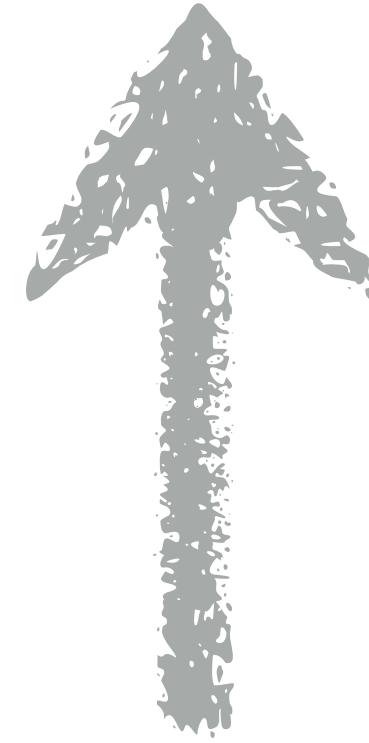
There's a high cost to
going against our social circle

We form our beliefs based on
how we see ourselves



There's a high cost to
rethinking our entire value system

We form our beliefs based on
the consequences of those beliefs



There's a high cost to
living with fear

We (subconsciously) do
motivated reasoning to:

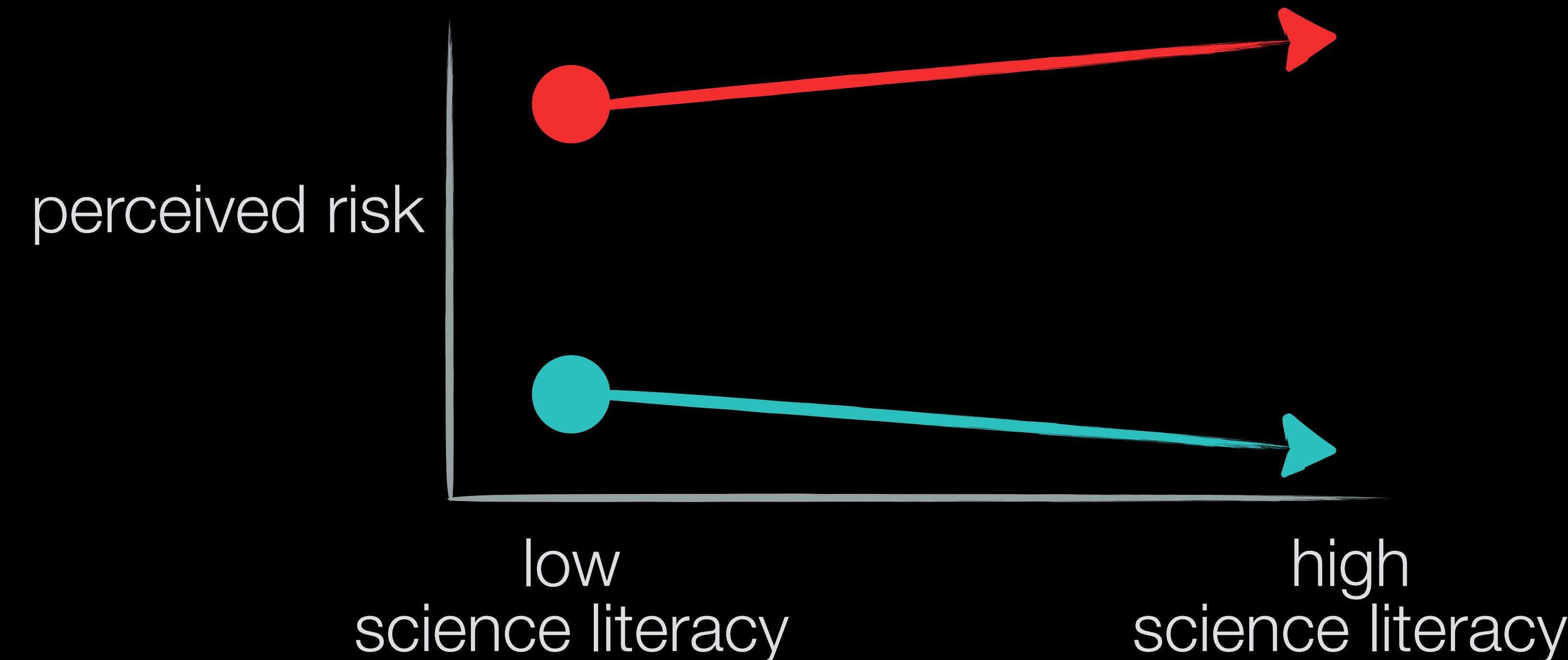
align with our social circle

protect our values

protect ourselves from
perceived consequences

But sometimes information polarizes people

“How much risk do you think climate change poses?”



sometimes

ibe for \$1 a week. »

THE
NEW YORKER

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BOOKS FEBRUARY 27, 2017 ISSUE

WHY FACTS DON'T CHANGE OUR MINDS

New discoveries about the human mind show the limitations of reason.



By Elizabeth Kolbert

Rolling Stone The End of Facts in the Trump Era

The End of Facts in the Trump Era

If you connect with America's anger and paranoia, you can steamroll our most sacred institutions without ever having to tell the truth

SLATE

It's Time to Give Up on Facts

Or at least to temporarily lay them down in favor of a more useful weapon: emotions.



By Joe Zimmerman



This Article Won't Change Your Mind

The facts on why facts alone can't fight false beliefs

Flu Vaccine

Facts & Myths

MYTH “The flu isn’t a serious disease.”

FACTS Influenza (flu) is a serious disease of the nose, throat, and lungs, and it can lead to pneumonia. Each year about 200,000 people in the U.S. are hospitalized and about 36,000 people die because of the flu. Most who die are 65 years and older. But small children less than 2 years old are as likely as those over 65 to have to go to the hospital because of the flu.

MYTH “The flu shot can cause the flu.”

FACTS The flu shot cannot cause the flu. Some people get a little soreness or redness where they get the shot. It goes away in a day or two. Serious problems from the flu shot are very rare.

MYTH “The flu shot does not work.”

FACTS Most of the time the flu shot will prevent the flu. In scientific studies, the effectiveness of the flu shot has ranged from 70% to 90% when there is a good match between circulating viruses and those in the vaccine. Getting the vaccine is your best protection against this disease.

MYTH “The side effects are worse than the flu.”

FACTS The worst side effect you’re likely to get from a shot is a sore arm. The nasal mist flu vaccine

Flu Vaccine

Facts & Myths

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It's not that facts backfire
It's that persuasion is hard

People engage in motivated reasoning
People hold on to their beliefs
Repetition affects belief
Fact checking doesn't always work
Facts are mildly persuasive

Does that work?

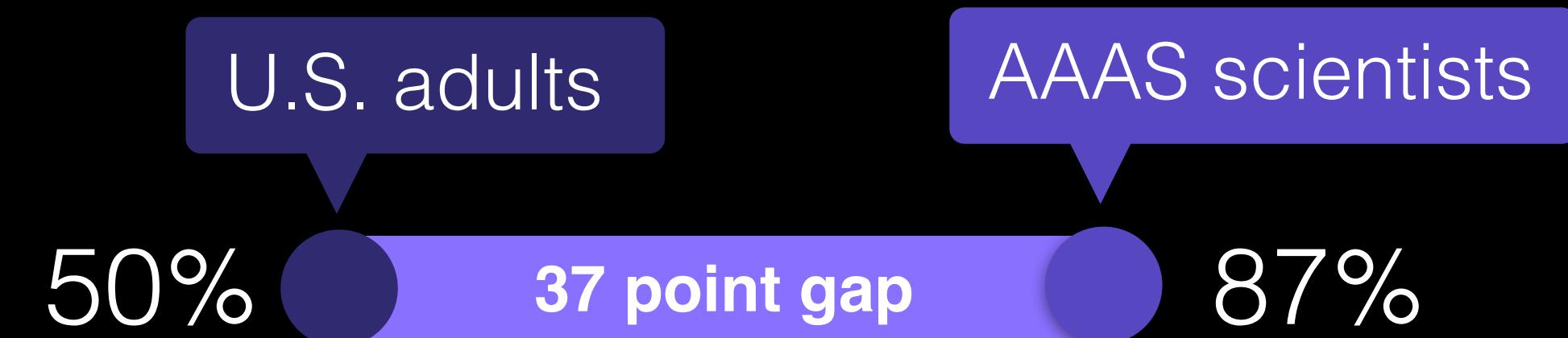
Facts alone do not persuade people

We're not asking the right question



What is this measuring, exactly?

Climate change is mostly due to human activity



Safe to eat genetically modified foods



Childhood vaccines such as MMR should be required



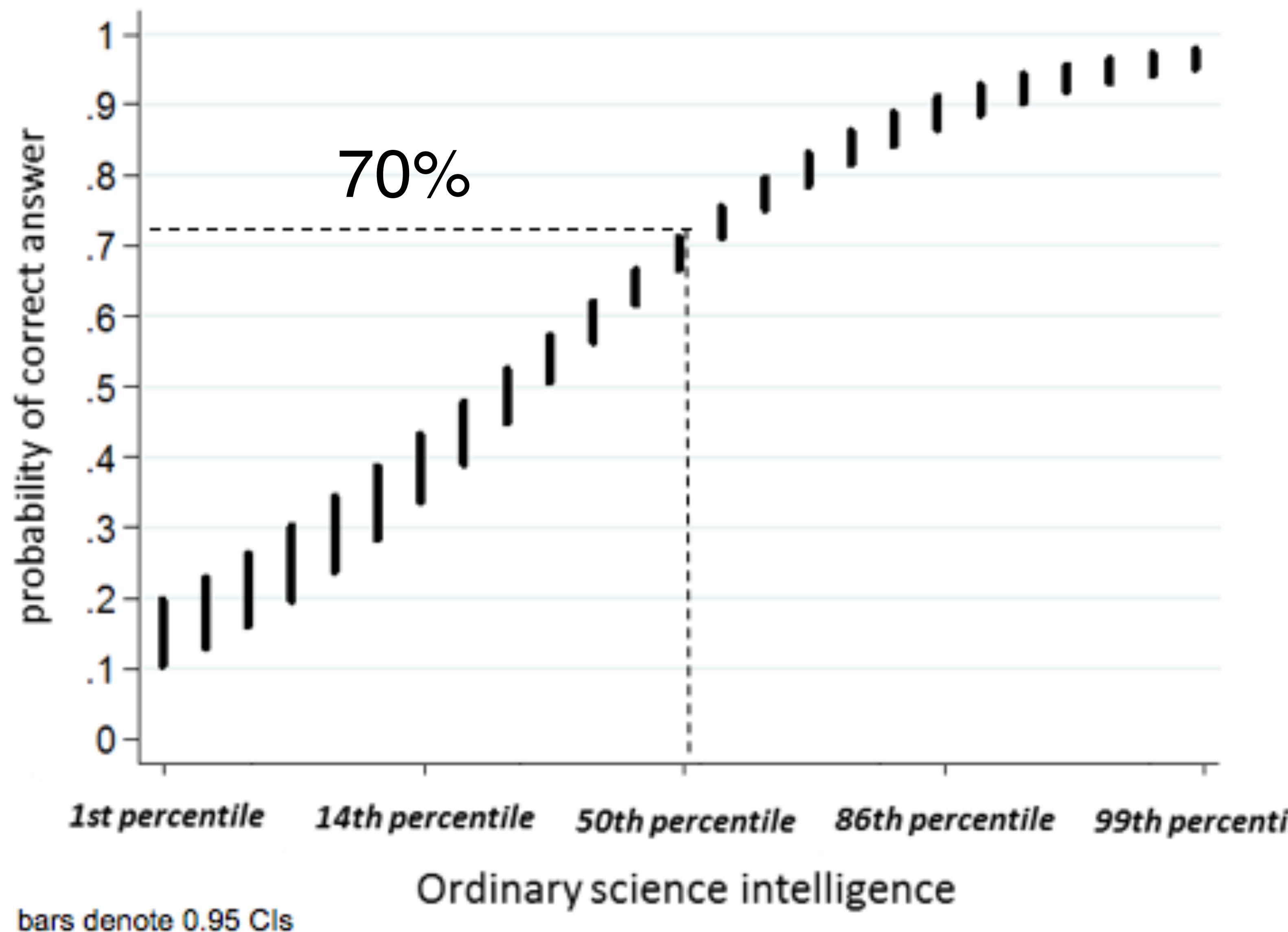
Not **what** people know
but **who** they are

“Ordinary Science Intelligence” tries to disentangle
what people know
from **who** they are

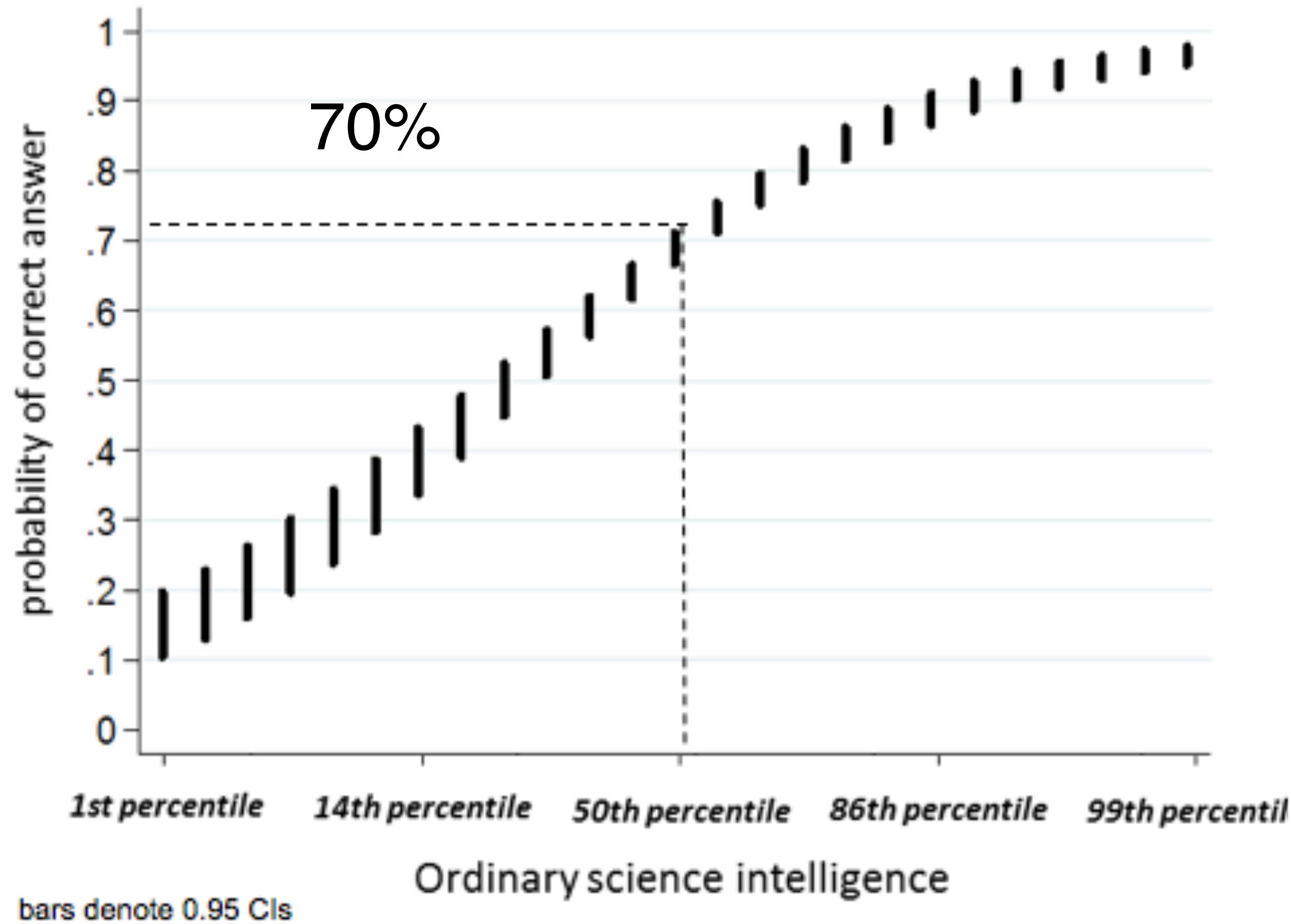
18 items

- 6 “Basic facts” (NSF Indicators, Pew)
- 3 “Theory of science” (NSF Indicators)
- 6 Numeracy (Peters et al. 2006)
- 3 Cognitive reflection (Frederick 2005)

“Electrons are smaller than atoms.” (True/false)

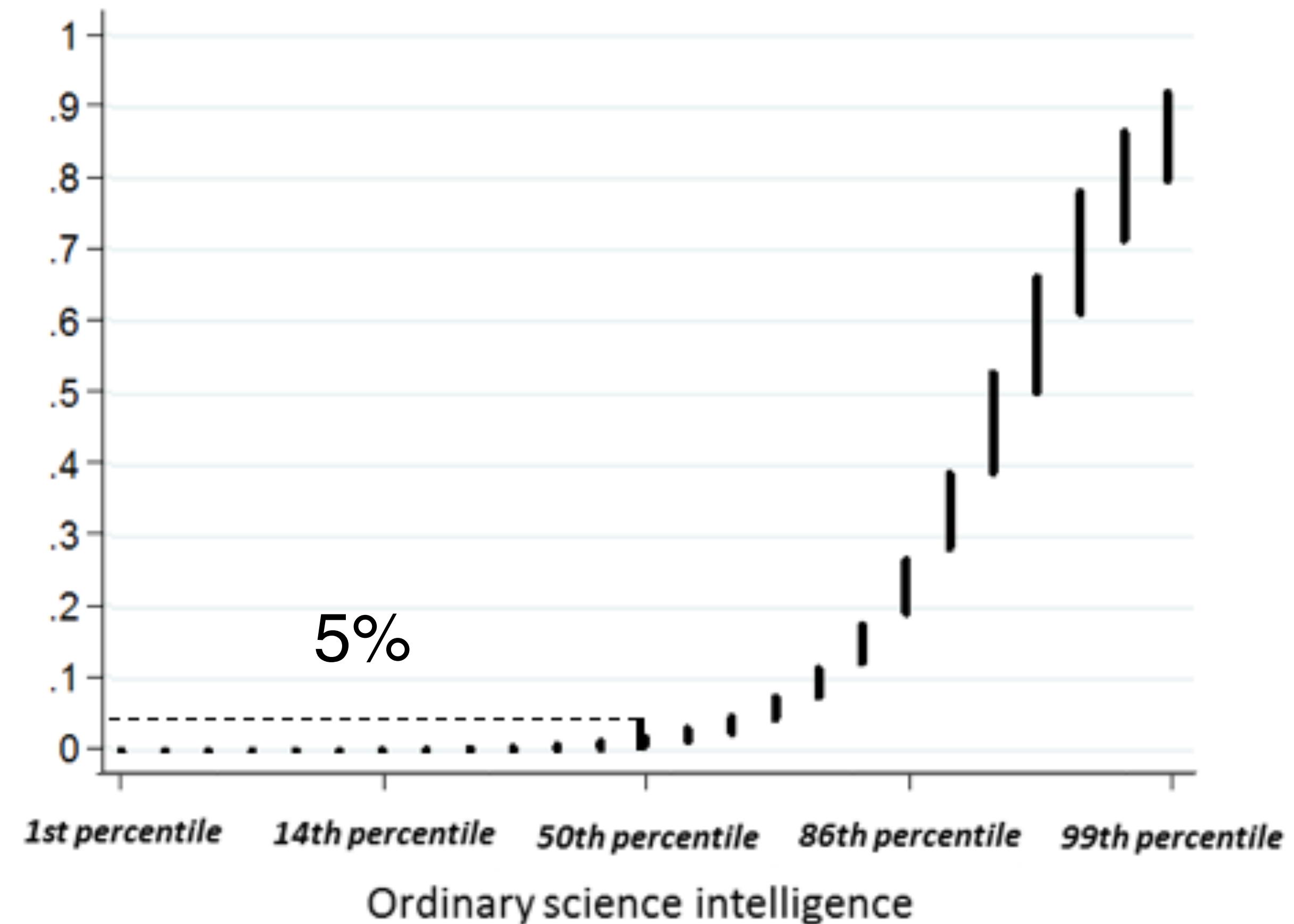


"Electrons are smaller than atoms." (True/false)



Easy

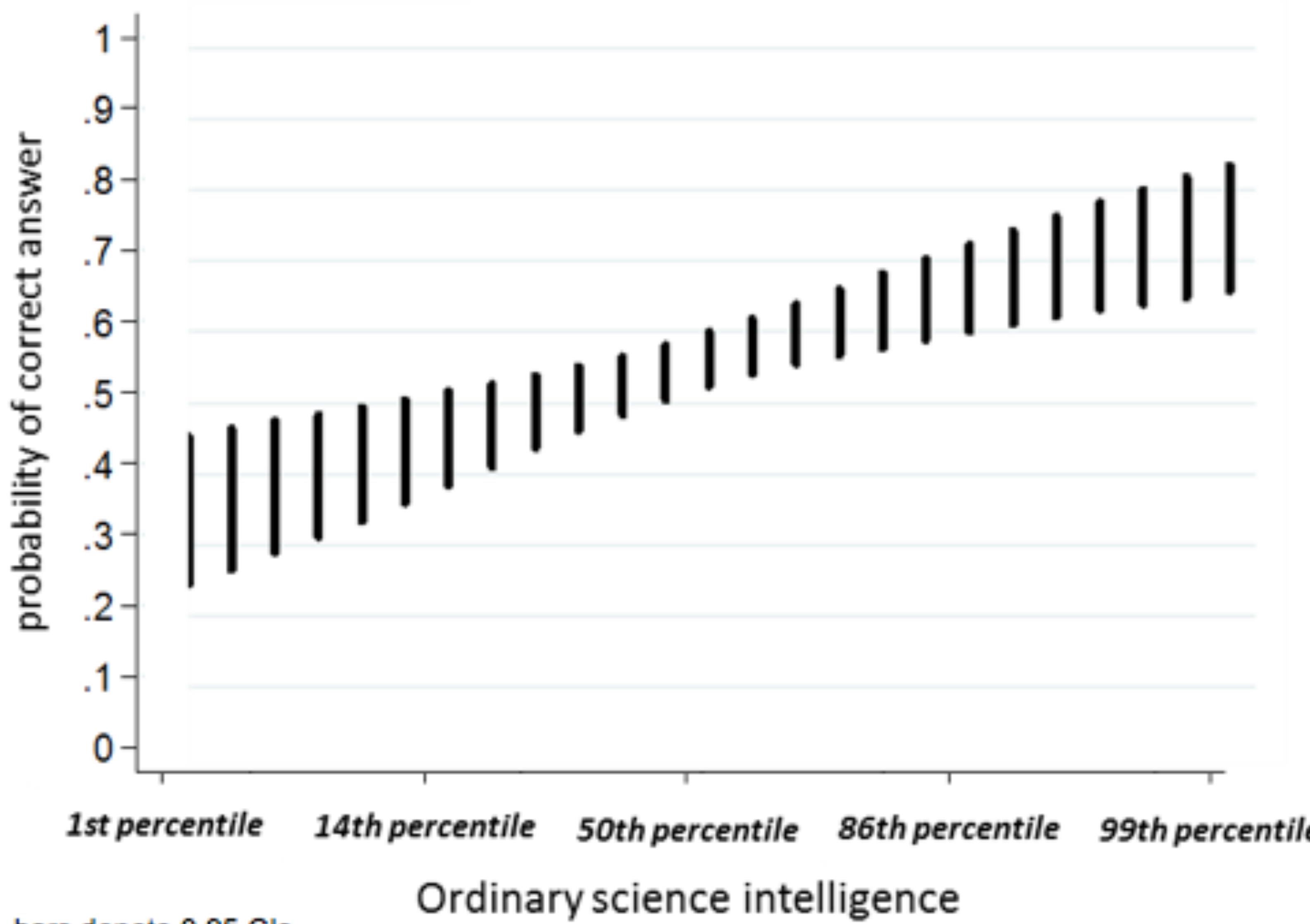
What is the probability that the woman who tested positive in a routine mammography has cancer? [conditional probability]



Hard

Kahan et al.

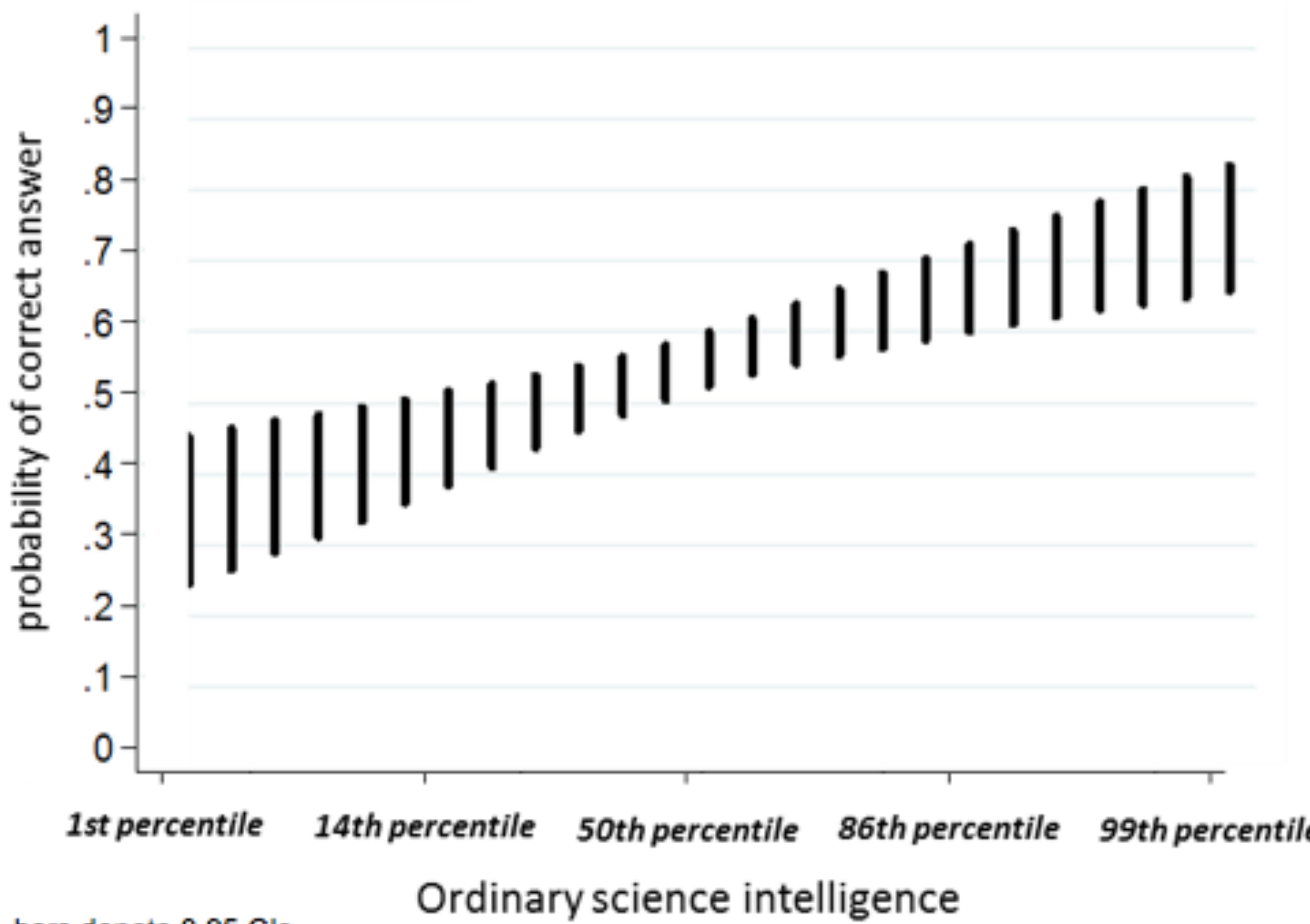
*"Human beings, as we know them today,
developed from earlier species of animals."
(True/false)*



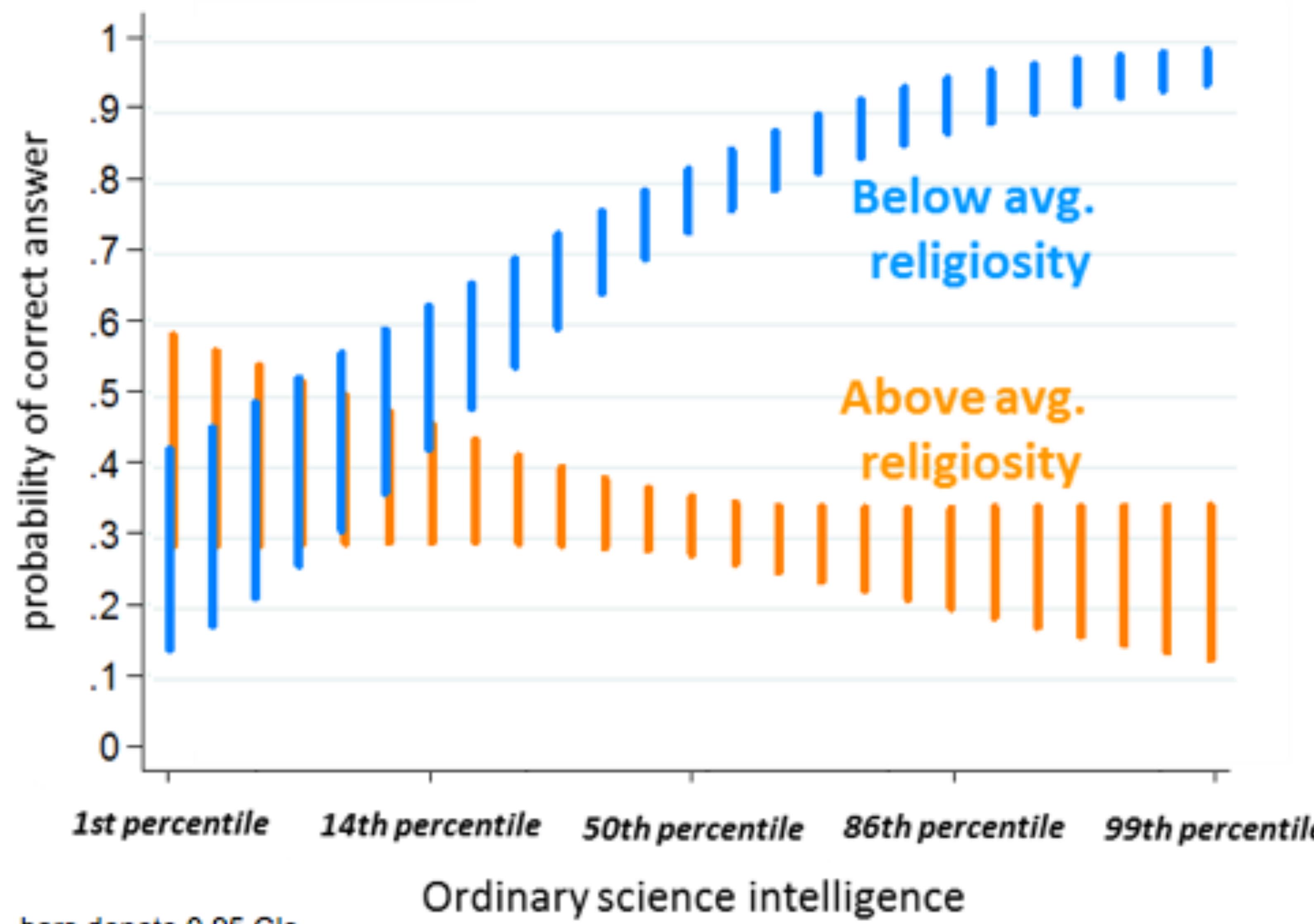
They also measured religiosity

item	focus	wording	measure
pew_religimp	Religious importance	<i>How important is religion in your life?</i>	1 = very important 2 = somewhat important 3 = Not too important 4 = Not at all important
pew_churatd	Church attendance	<i>Aside from weddings and funerals, how often do you attend religious services...</i>	1 = More than once a week 2 = once a week 3 = once or twice a month, 4= a few times a year 5 = seldom 6= or never
pew_prayer	Frequency of prayer	<i>Outside of attending religious services, do you pray . . .</i>	1 =several times a day 2 = once a day 3 = a few times a week 4 = once a week 5 = a few times a month 6= seldom 7= or never?

*"Human beings, as we know them today,
developed from earlier species of animals."
(True/false)*

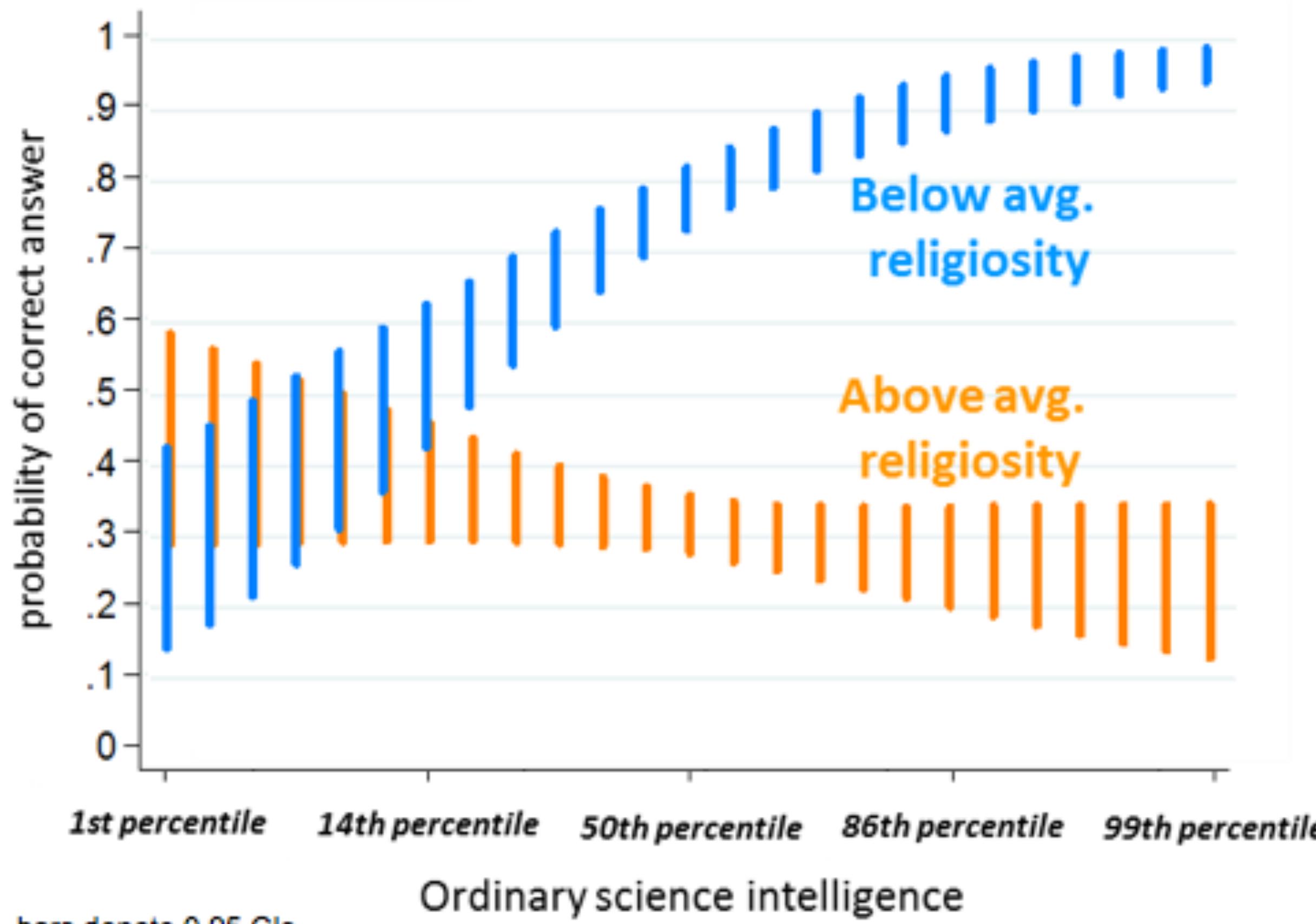


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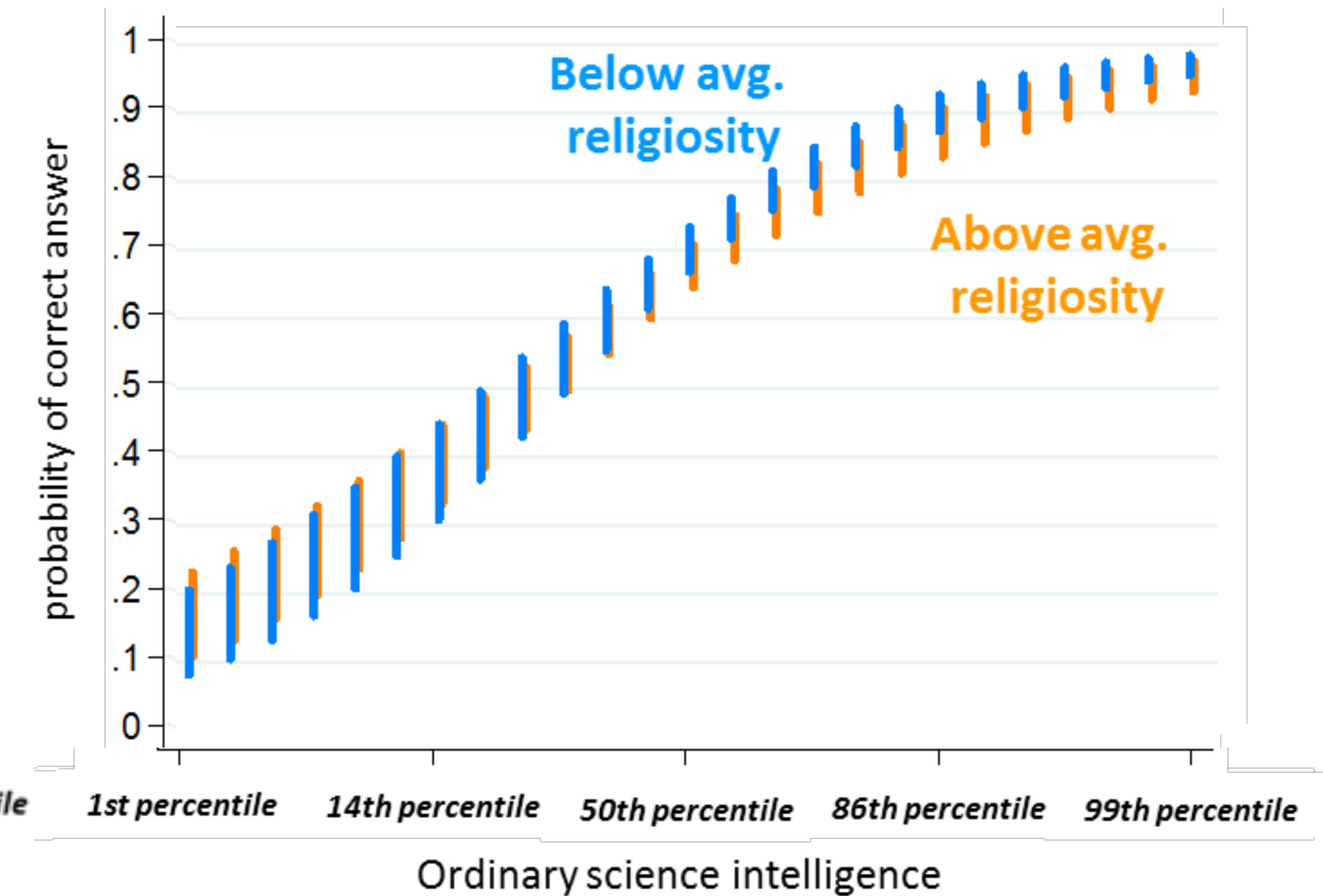


Religiosity is NOT polarizing on neutral questions

*"Human beings, as we know them today,
developed from earlier species of animals."*
(True/false)

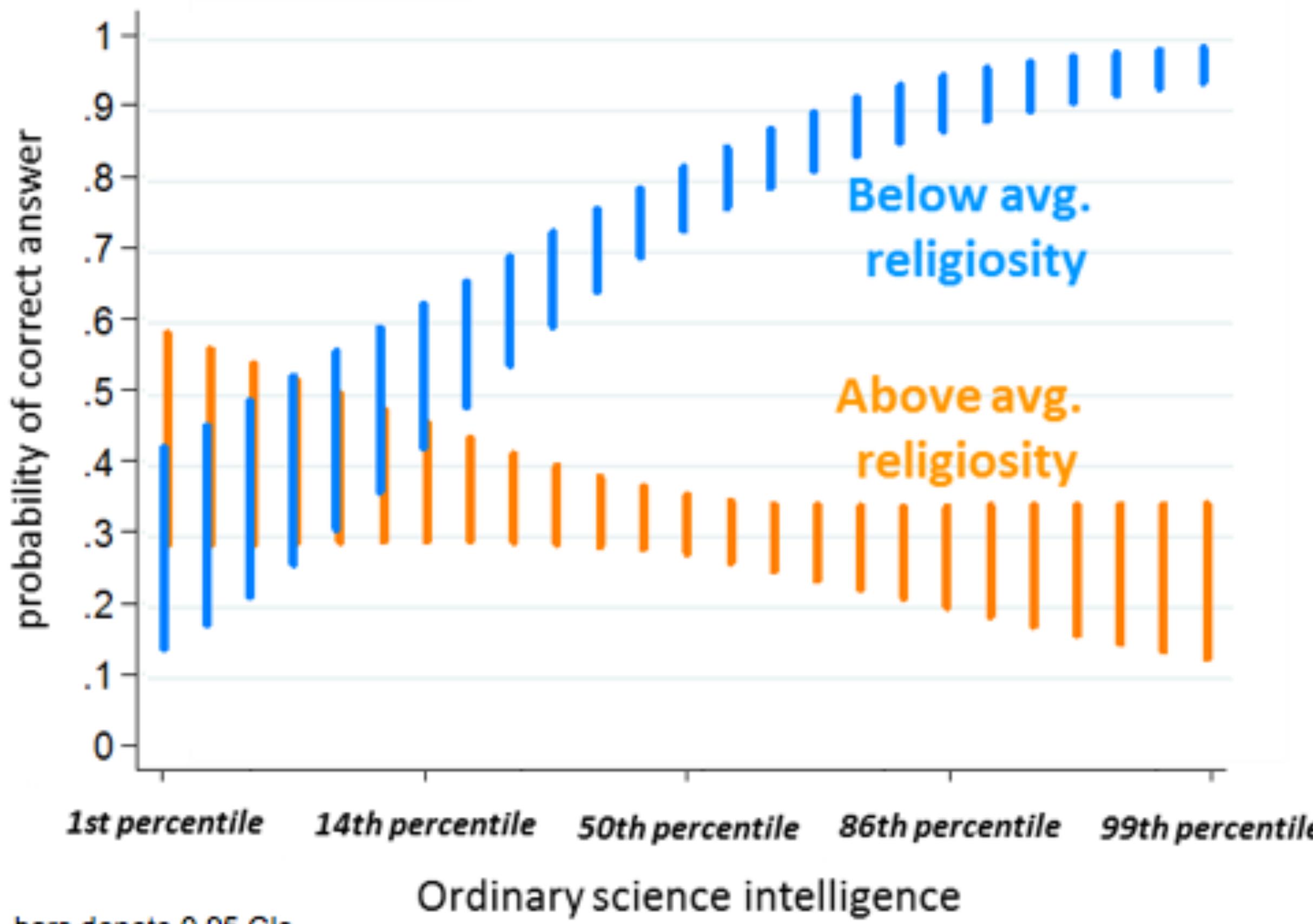


"Electrons are smaller than atoms." (True/false)

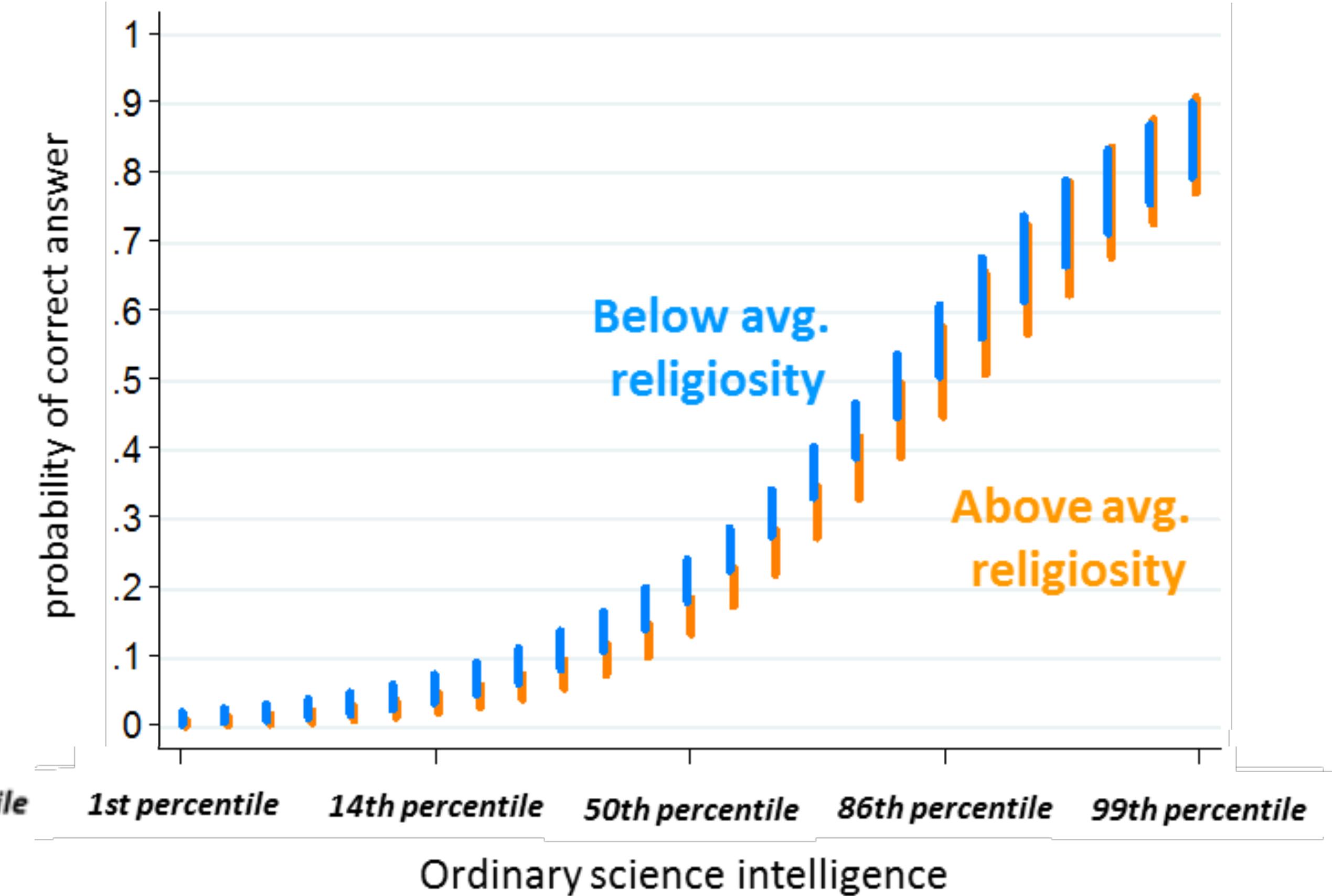


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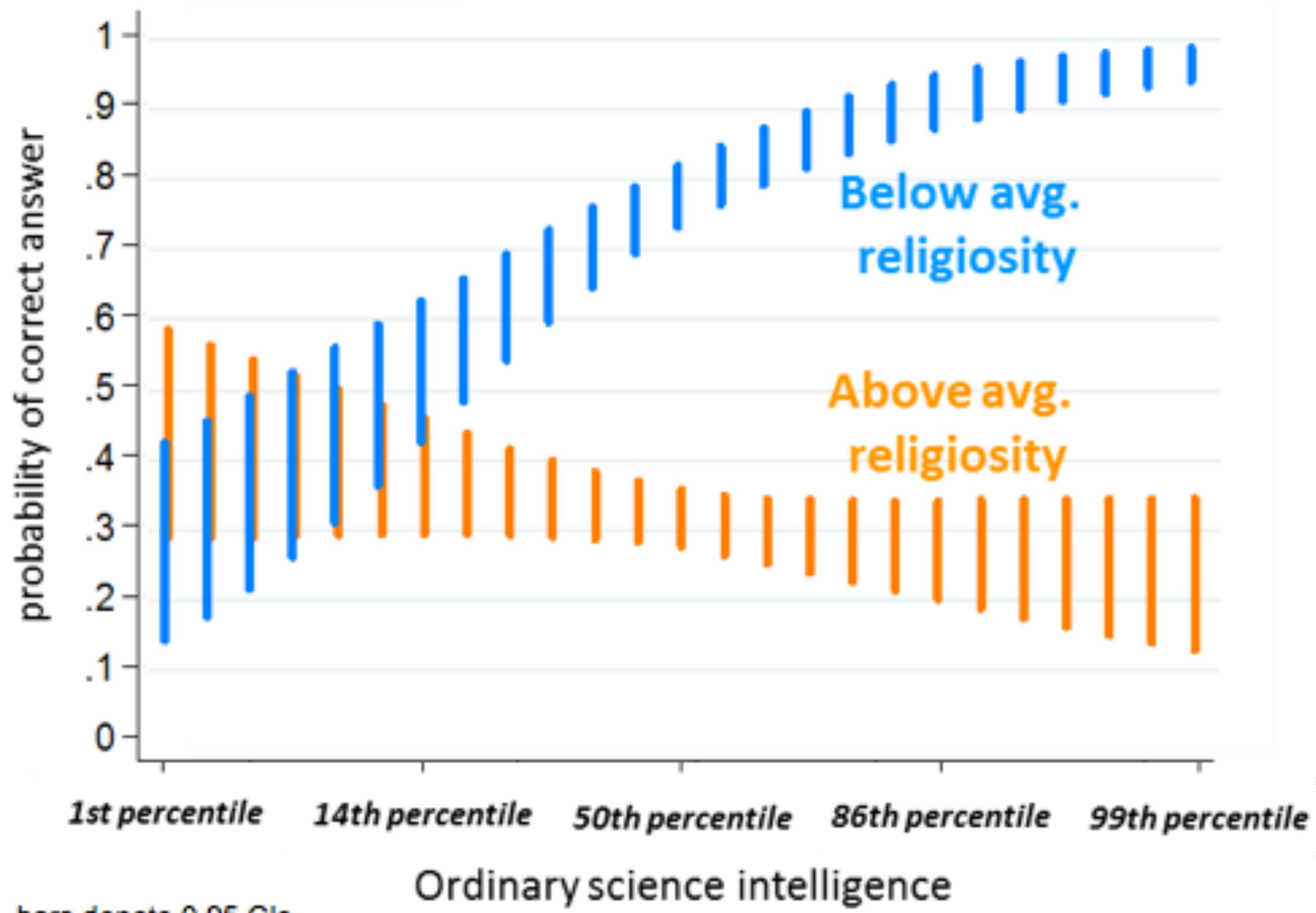


“Which gas makes up most of the Earth's atmosphere?” [Hydrogen, Nitrogen, Carbon Dioxide, Oxygen]

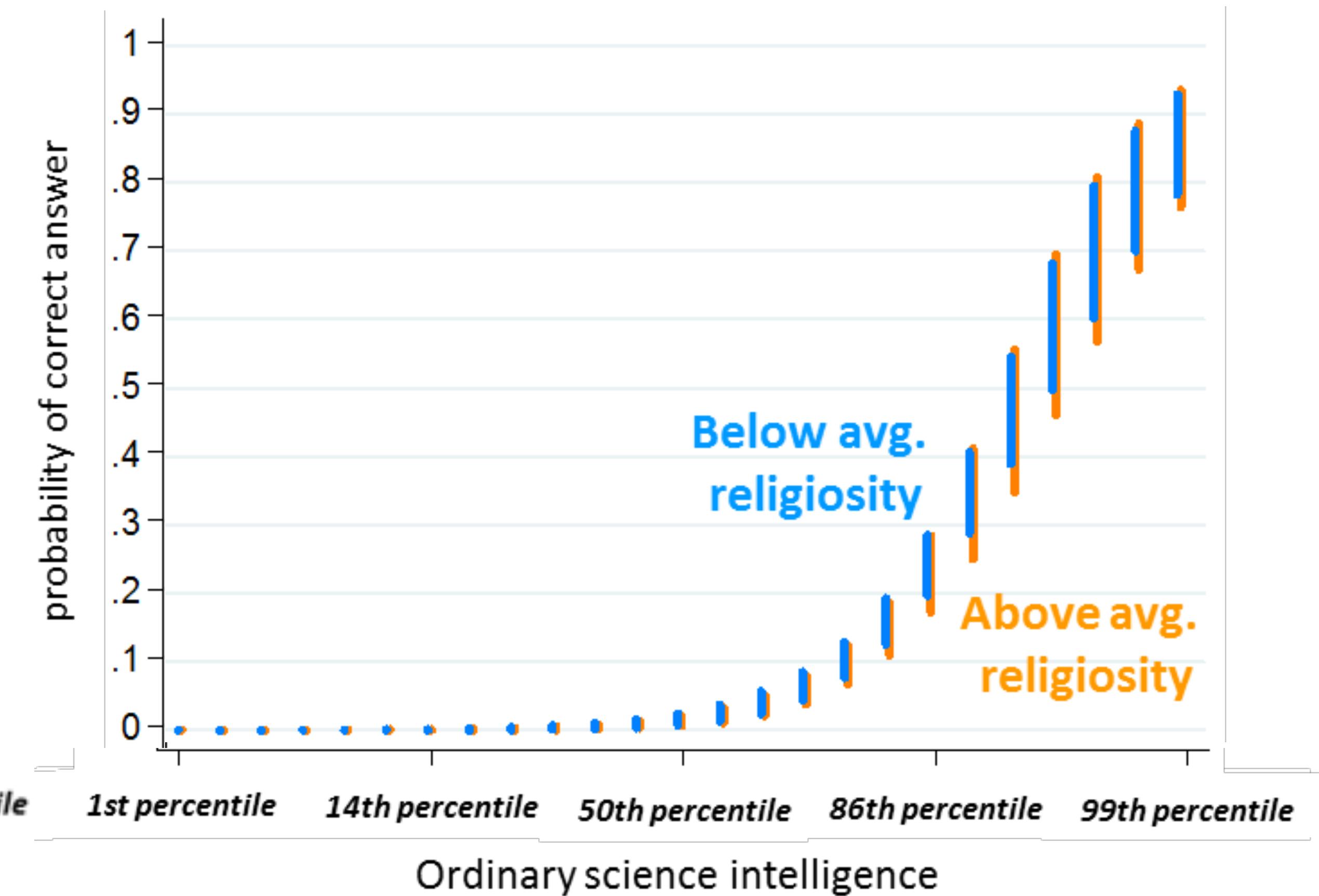


Religiosity is NOT polarizing on neutral questions

*"Human beings, as we know them today,
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(True/false)*



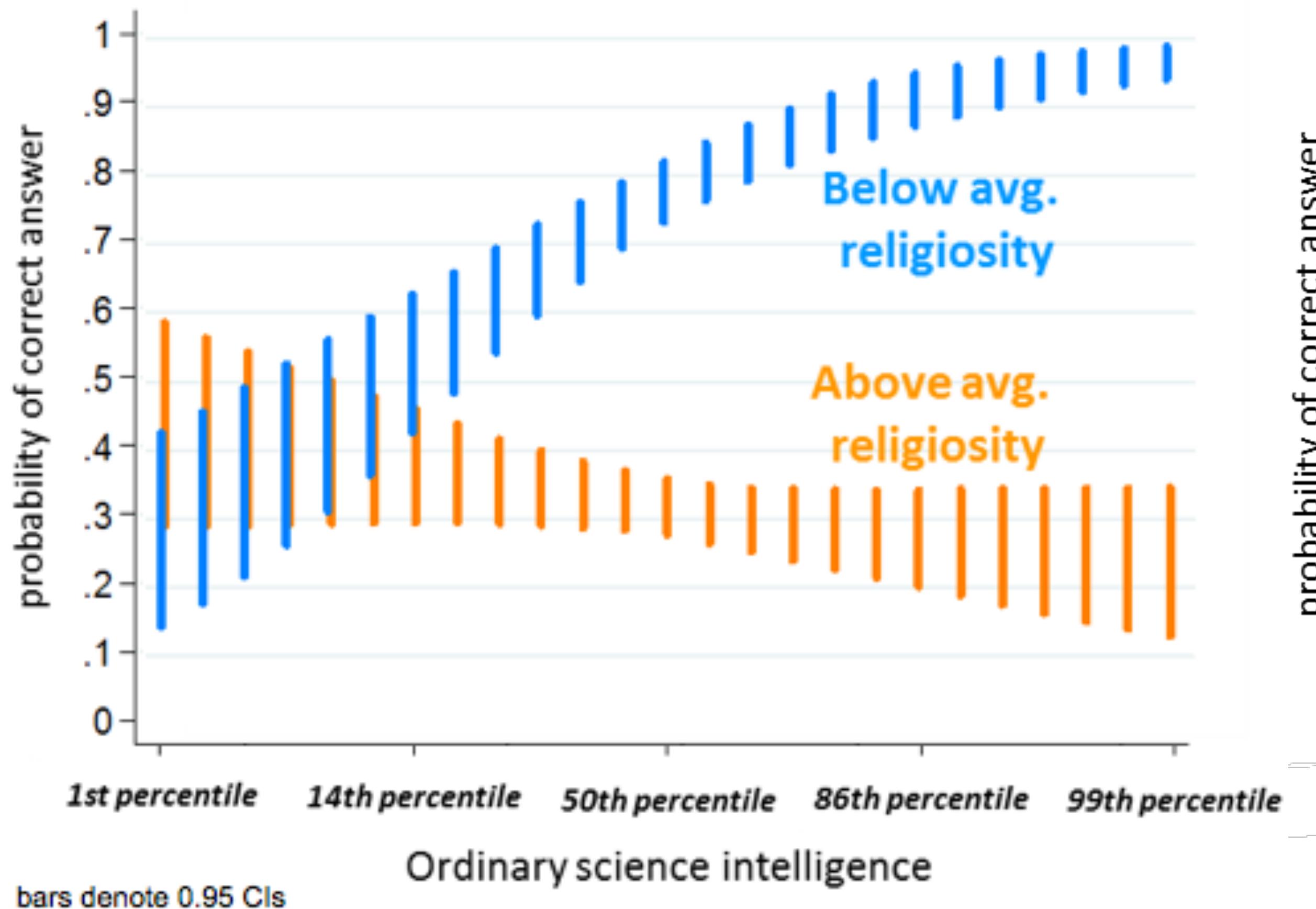
*What is the probability that the woman who tested positive in a routine mammography has cancer?
[conditional probability]*



bars denote 0.95 CIs

Religiosity is NOT polarizing on neutral questions

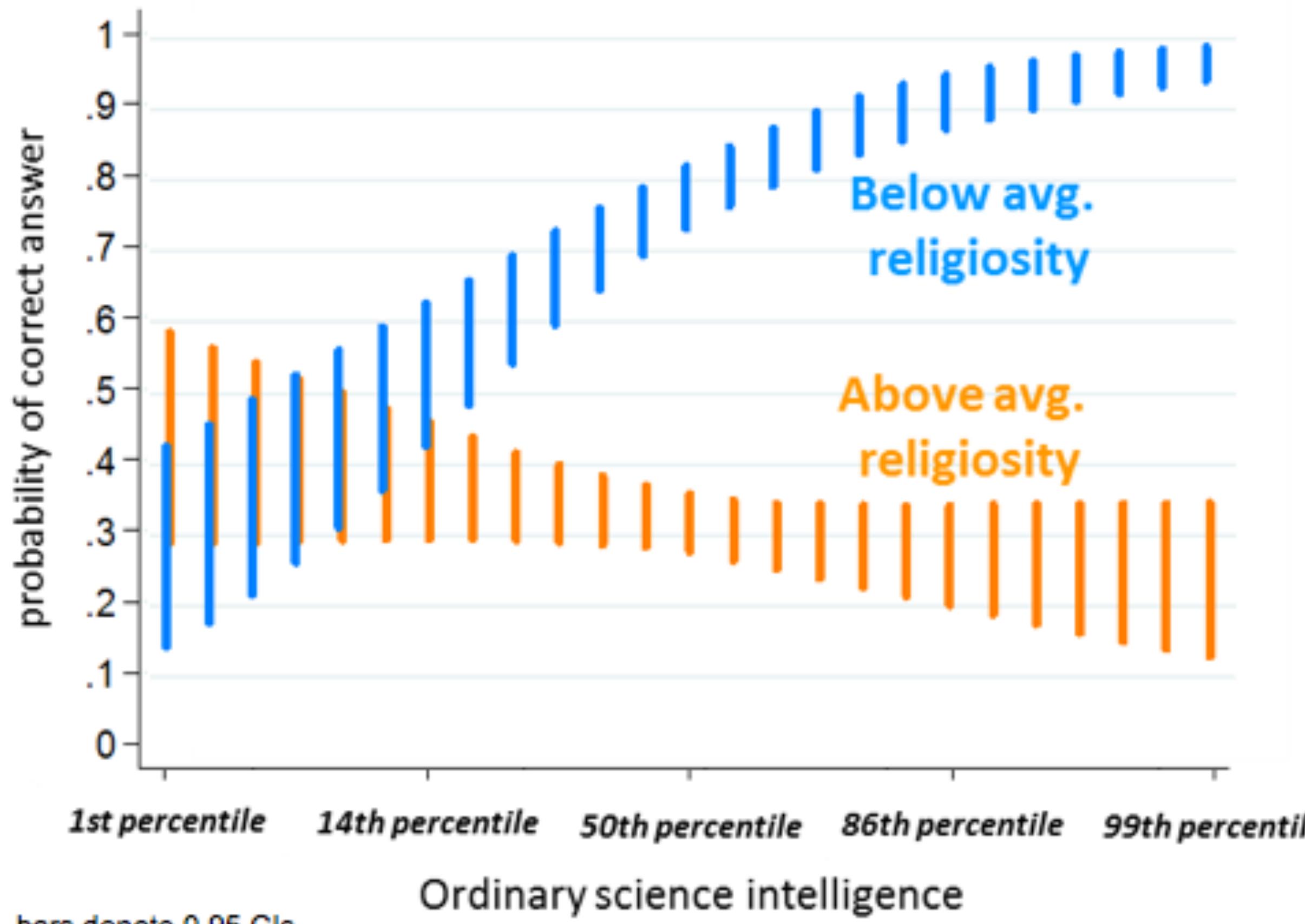
*“Human beings, as we know them today, developed from earlier species of animals.”
(True/false)*



“According to the theory of evolution, human beings, as we know them today, developed from earlier species of animals.” (True/false)

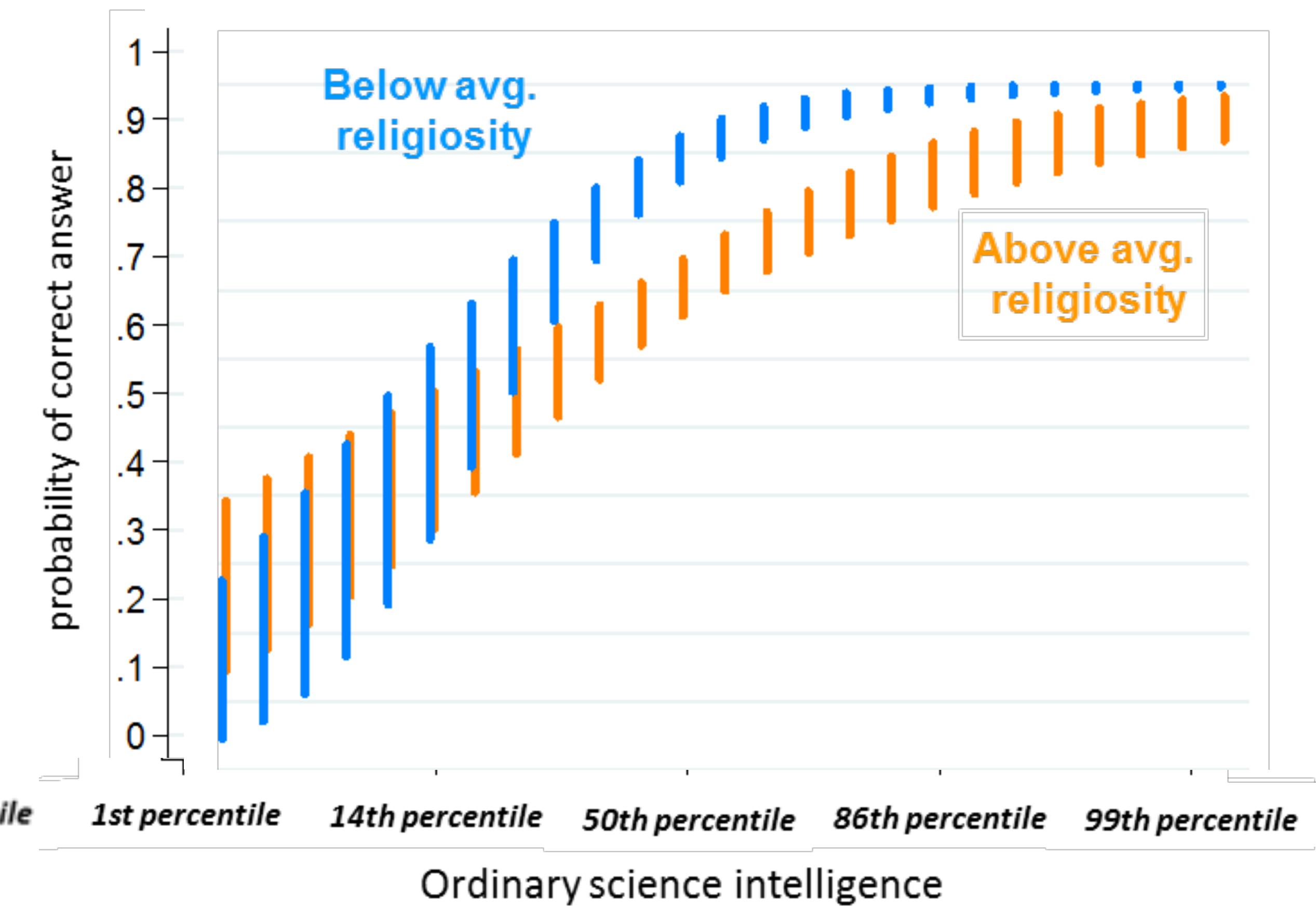
We've been measuring this all wrong

"Human beings, as we know them today, developed from earlier species of animals."
(True/false)



Who we are

"According to the theory of evolution, human beings, as we know them today, developed from earlier species of animals." (True/false)

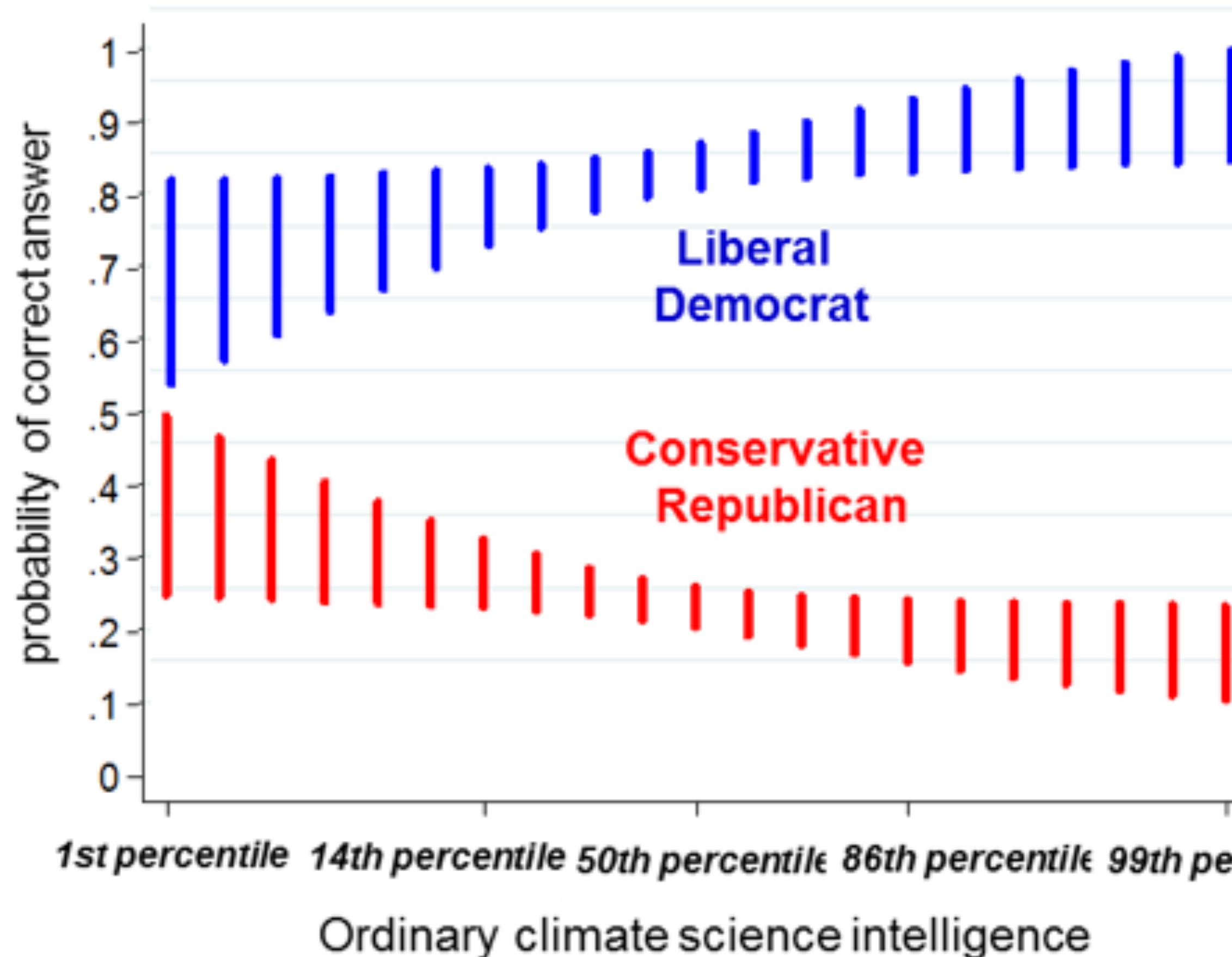


What we know

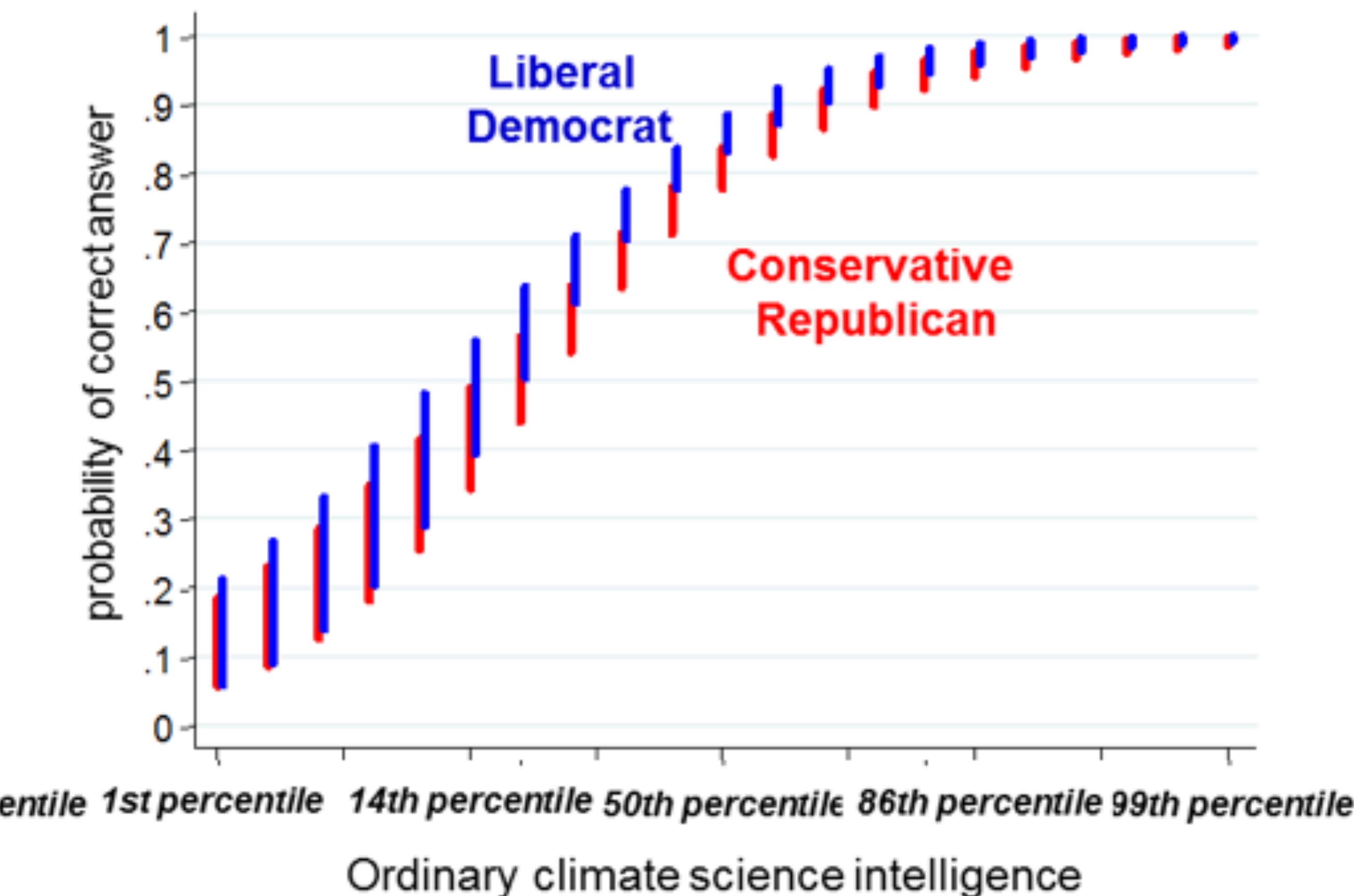
We've been measuring this all wrong

There is “solid evidence” of global warming due to “human activity such as burning fossil fuels” [agree, disagree]

“What gas do most scientists believe causes temperatures in the atmosphere to rise? Is it [hydrogen, helium, carbon dioxide, radon]?”



Who we are



What we know

Dispelling distractions

Science literacy does not predict science acceptance

Acceptance is a social signal

If you make people choose,
they choose group loyalty over curiosity

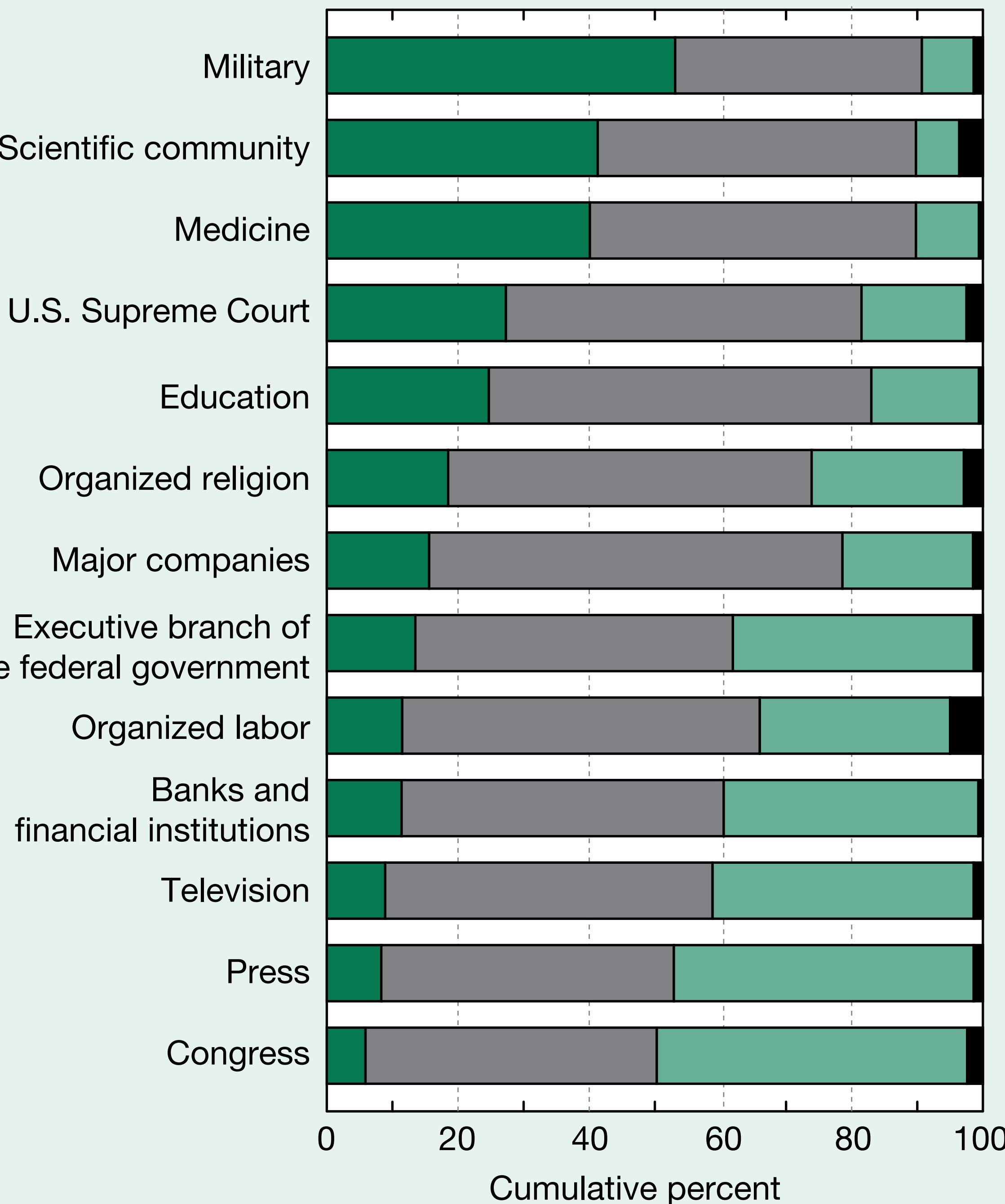
Dispelling distractions

Science literacy does not predict science acceptance

The public trusts science

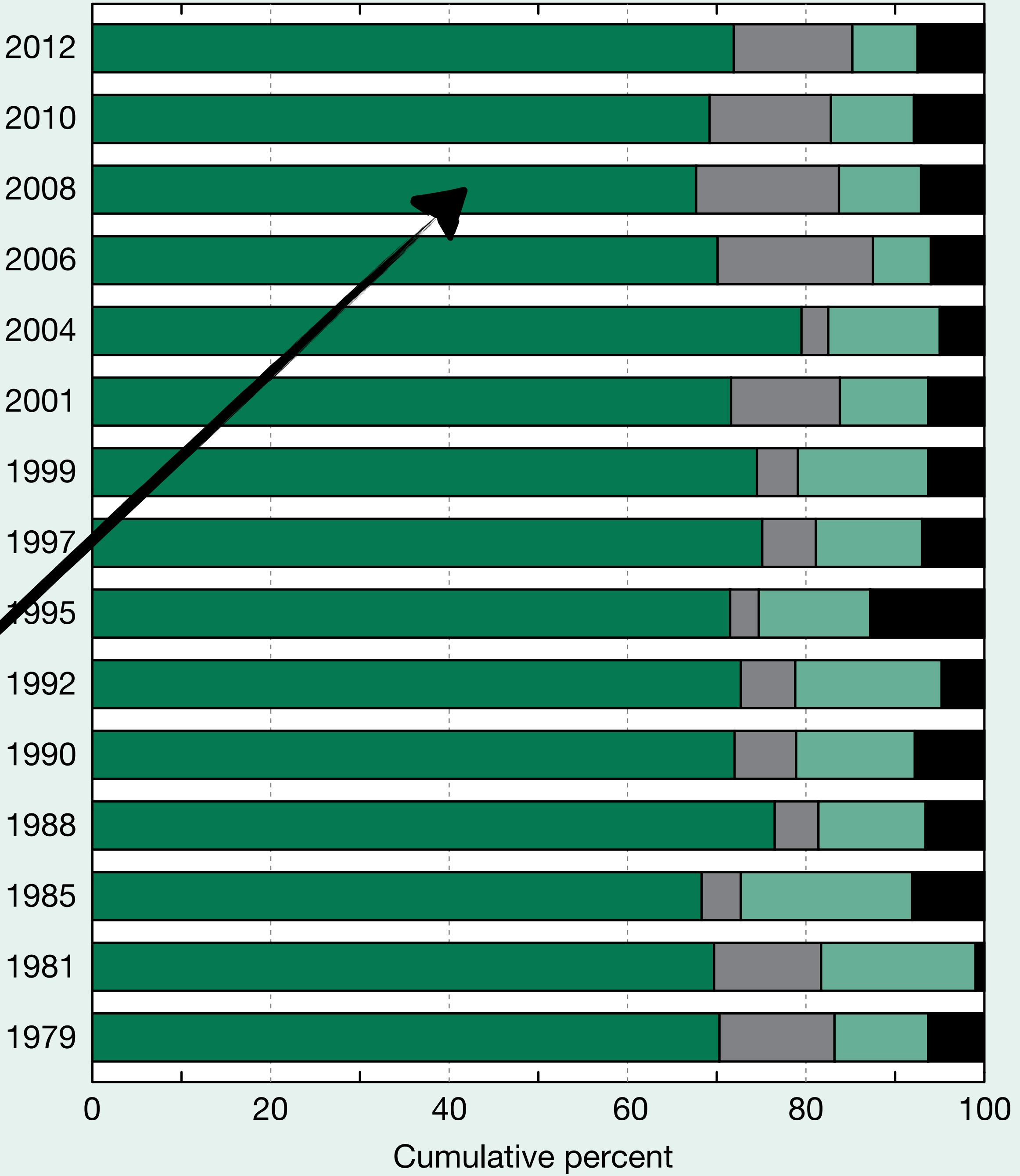
■ A great deal ■ Some ■ Hardly any ■ Don't know

The public trusts scientists



The public trusts research

“Climategate”



If they trust us so much
Why don't they follow consensus?

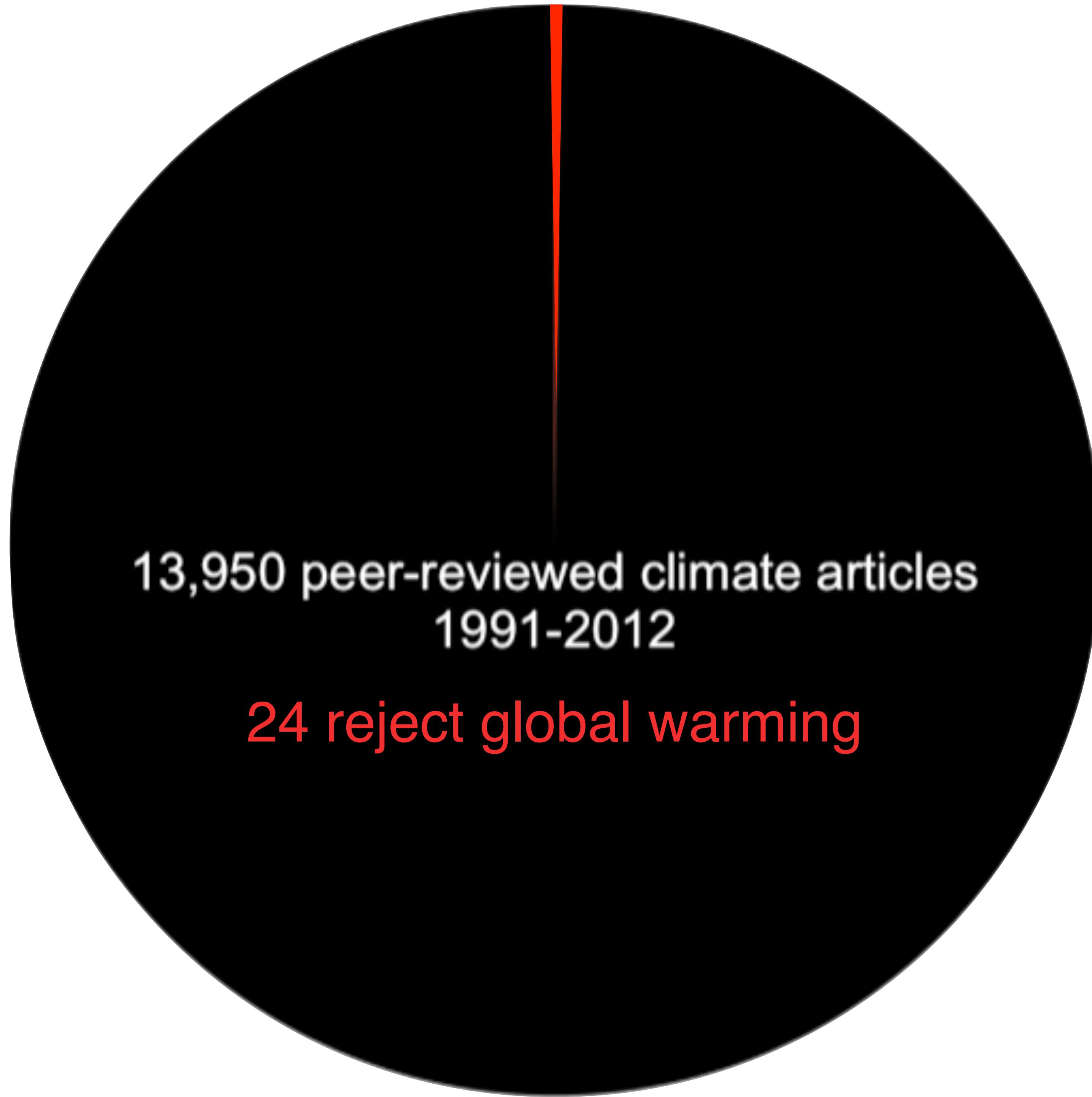
People who disagree with scientific consensus
still care about science



STUART BURGESS

BSc PhD CEng FIMechE

BIOMIMETICS, ENGINEERING



13,950 peer-reviewed climate articles
1991-2012

24 reject global warming



24 reject global warming!

“You are an intensely privileged group of people.
You have more cultural, social, economic authority
than any other group. You’re it. You’re the hegemon.

I understand that you’re being harassed.
I understand that you’re frustrated.
And that’s a really good thing. You have a responsibility.
You have to be the adult in the room.”

Mark Largent, Historian of Science

Dispelling distractions

Science literacy does not predict science acceptance

The public trusts science

No wonder consensus messaging doesn't work



Liberals and conservatives agree:

According to climate scientists:

✓ human-caused global warming will result in flooding of coastal regions

✗ increase the risk of skin cancer

✗ stifle photosynthesis by plants

There's a weak grasp of the details

Americans have always been science illiterate

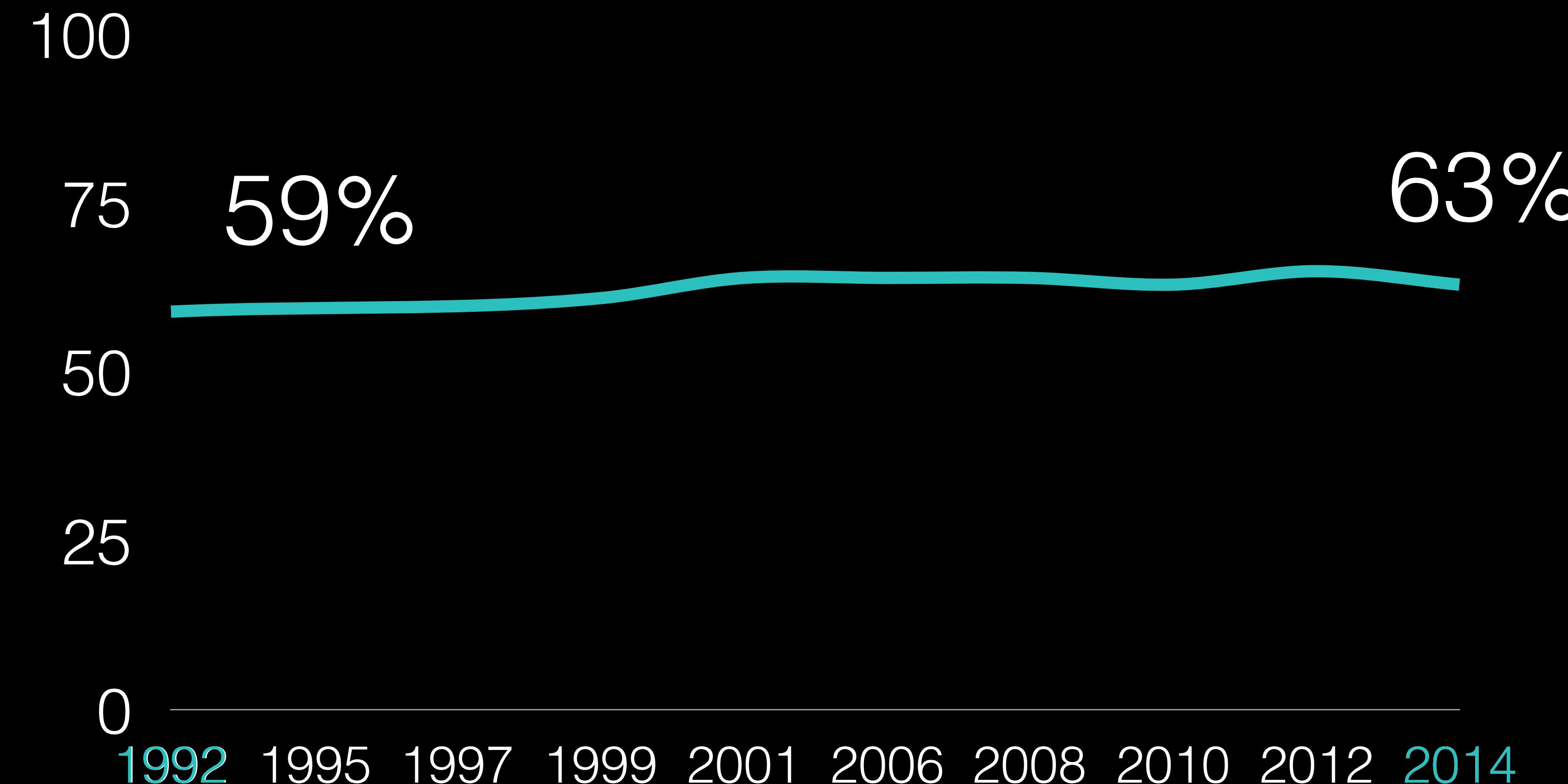
% who can correctly answer questions like
“does the Earth go around the Sun?”

63%

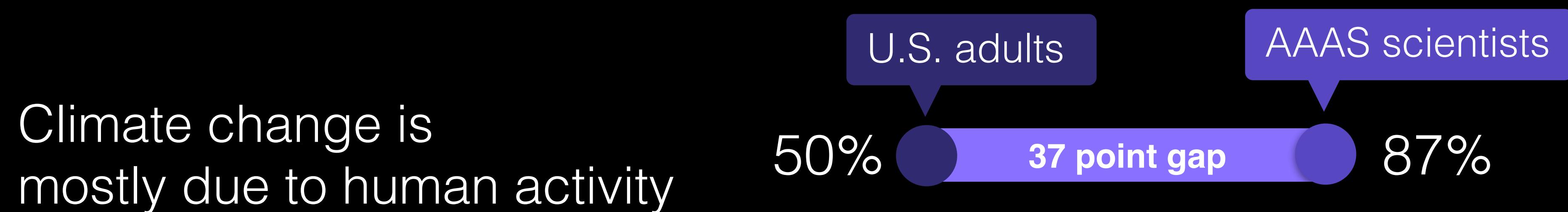
2014

Americans have always been science illiterate

Comparable to Europe!



We've been trying to change this:

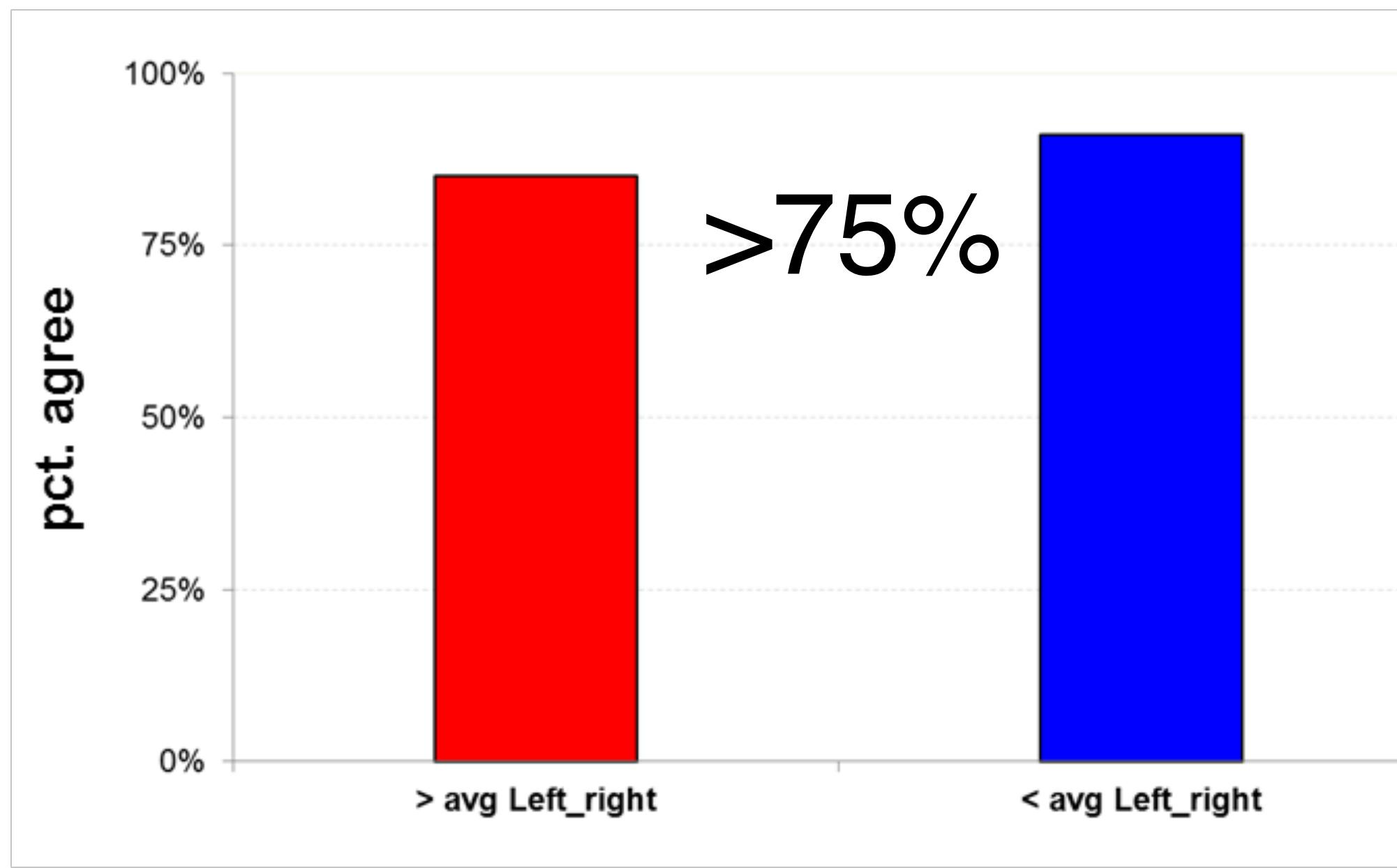


When what we really care about is

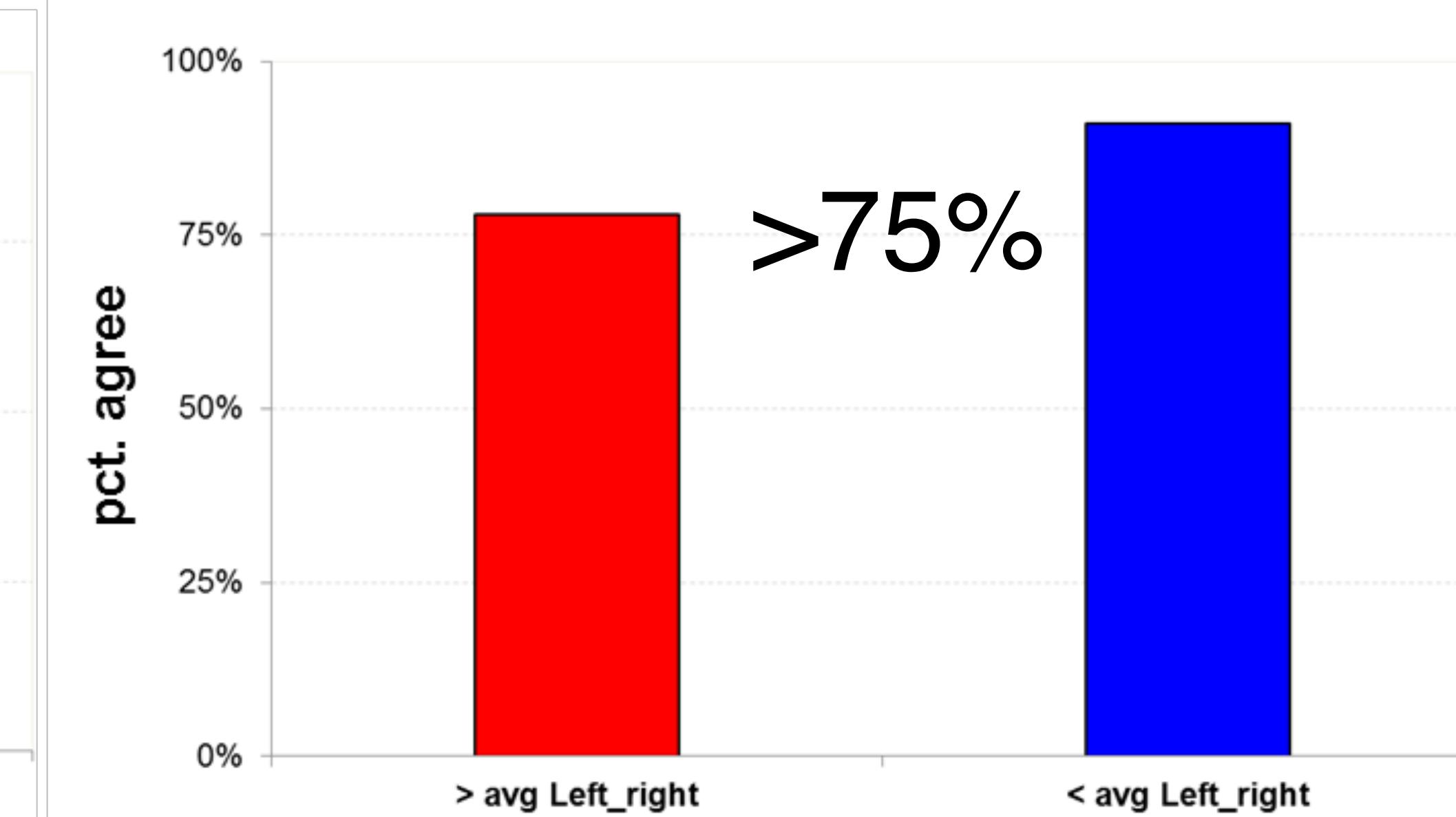


People who don't agree on climate change **agree that we should do something about it**

"Local and state officials should be involved in identifying steps that local communities can take to reduce the risk posed by rising sea levels."

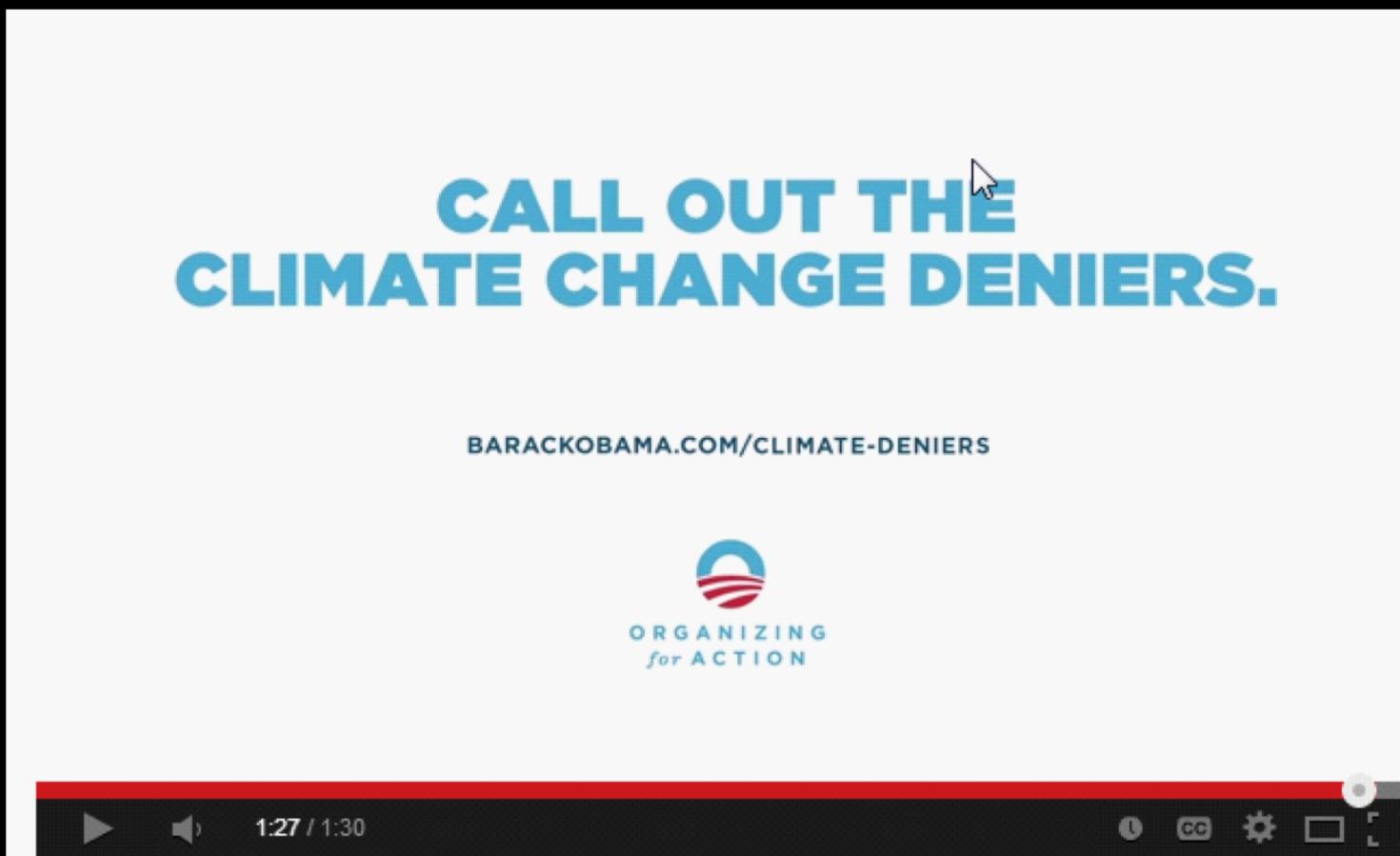


"Landuse planners should identify assess and revise existing laws to assure that they reflect the risks posed by rising sea level and extreme weather."



So leave out the litmus tests

So don't make it “us vs. them”



The four County Commissions jointly held the first Regional Climate Leadership Summit in 2009.

Just us - using what we know

Show the normality of climate change



Rob Kornahrens
Business Owner
Fort Lauderdale, Florida



Carey Kane
Homeowner
Miami, Florida



Francisco Santeiro
Managing Director, FedEx



John Van Leer
Conservationist/Scientist
Lake Belmar, Florida

Don't force
free, reasoning people
to choose

between

what they know

&

who they are

Does that work?

Facts alone do not persuade people

We're not asking the right question



How we saw the problem

How we tried to answer it

Does that work?

How we see the problem now



Bias is individually rational

Positions can entangle with social meaning → badges of loyalty

So while individual beliefs can't affect climate change,

they can ostracize you

But collectively irrational

Individuals need opinions
to express their identity

Societies need opinions
to be accurate

What is our role
in dispelling this conflict?

What we can do



You can't fight a feeling
with a fact

Liz Neeley



Some things to do less

Performative arguments

Condescension matters

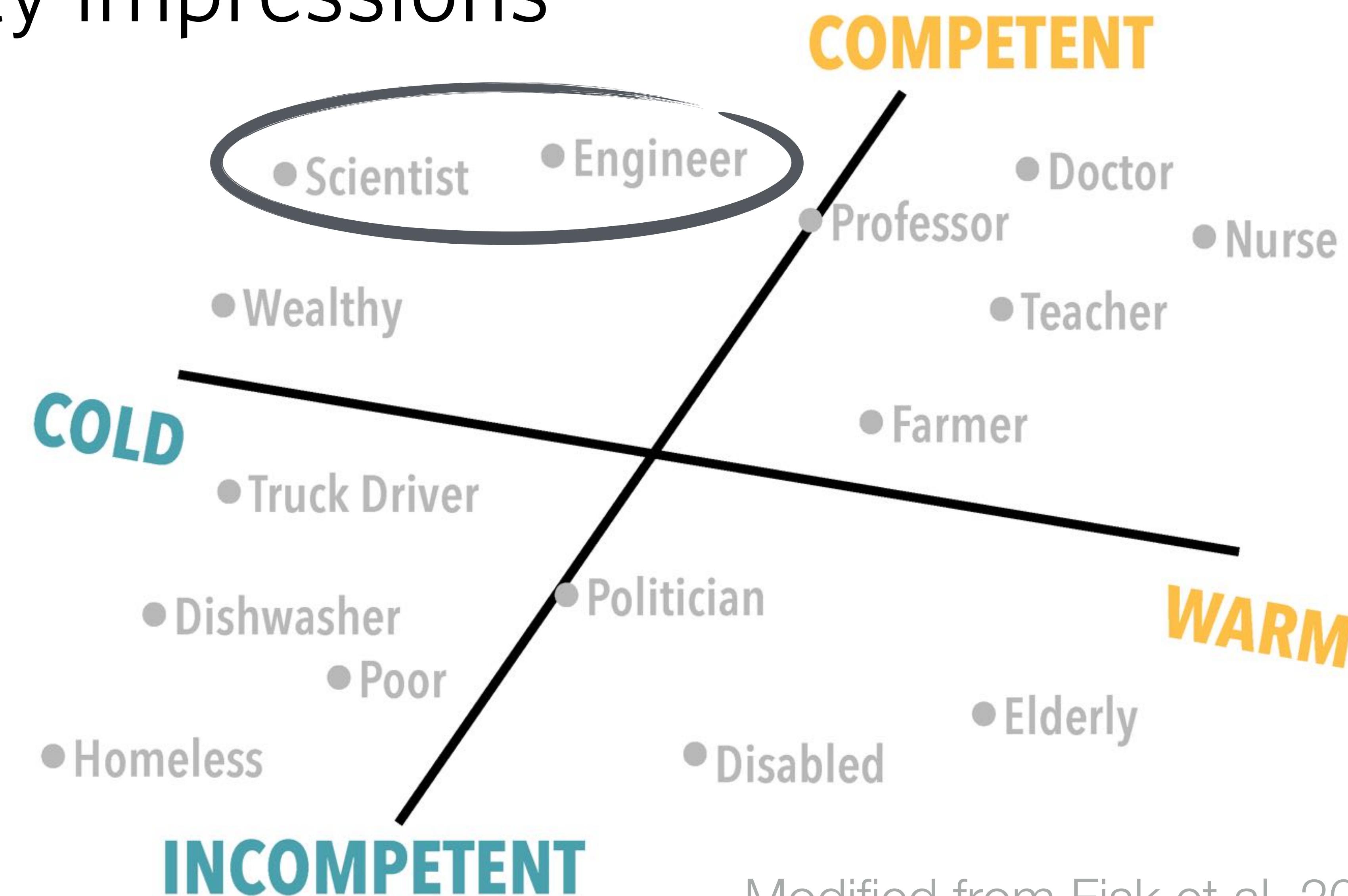
Some things to do more

Empathy, listening, curiosity

Recognize what is *not* a
science question

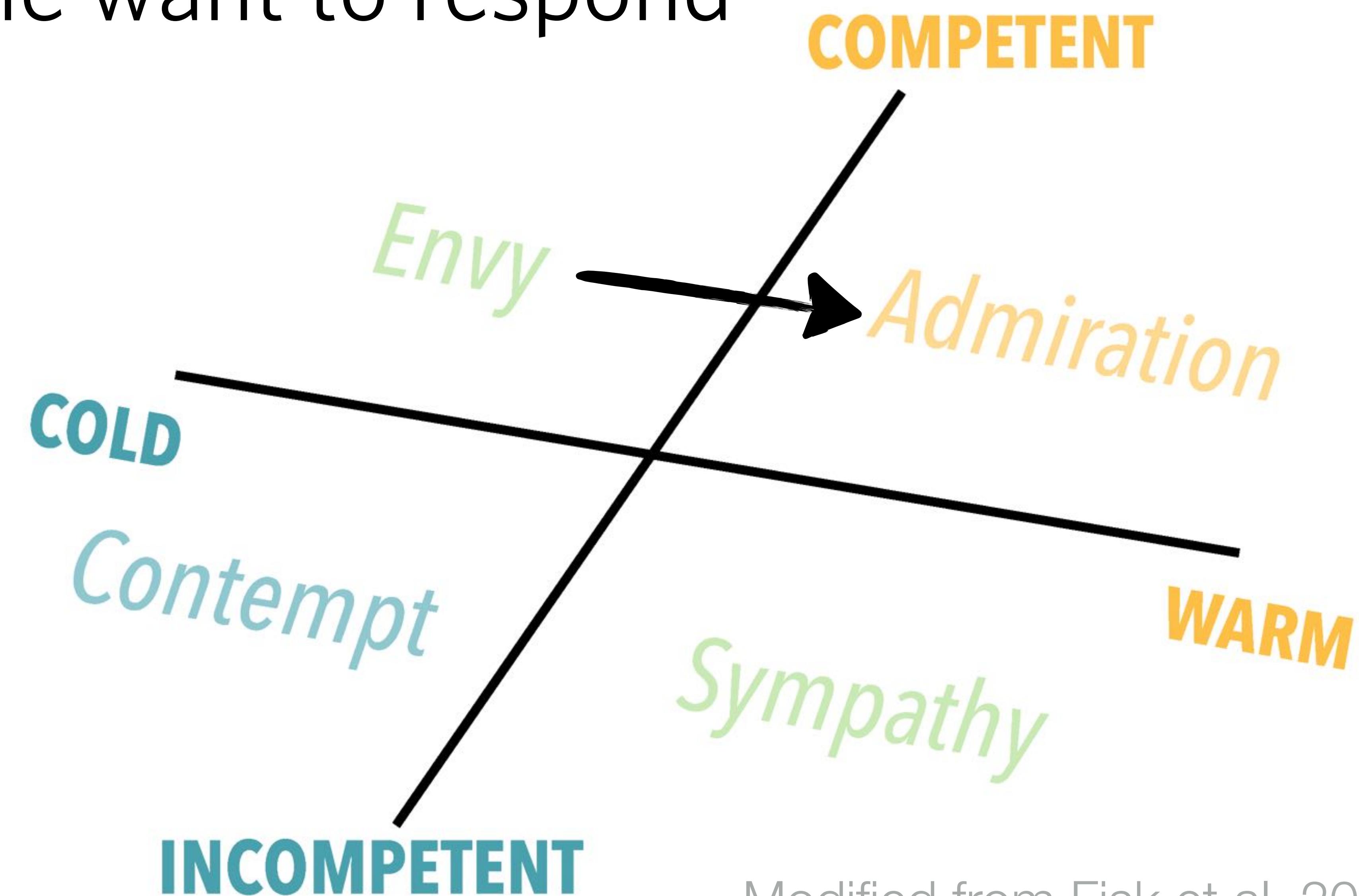
Storytelling

Warmth dramatically alters personality impressions



Modified from Fisk et al. 2006-2014

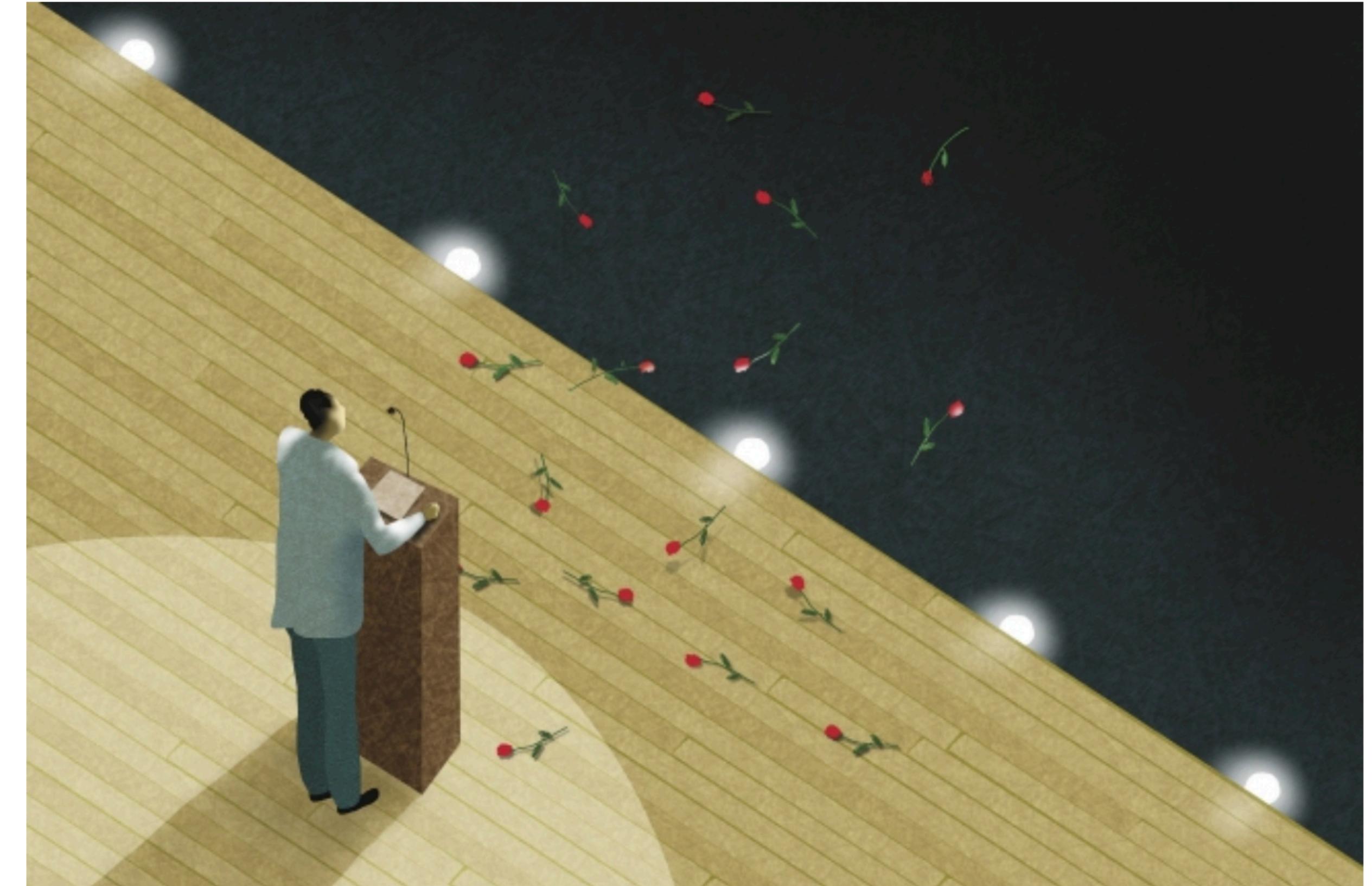
Warmth dramatically alters
how people want to respond



Modified from Fisk et al. 2006-2014

A surprising benefit:

Grad School Is Hard on Mental Health. Here's an Antidote.



David Cutler for The Chronicle

A ship in port is safe
but that's not what ships
are built for.

Grace Hopper

Start Here

JORGE



YOUR GRANDMA

...eventually
making it to...



LOCAL
EYEWITNESS
NEWS

...and caught
on ...

CNC Cable NEWS

We saw it on a Blog!

A causes B all the time
What will this mean for Obama?

BREAKING NEWS BREAKING NEWS BREA

...then noticed by...

Your Research

Conclusion: A is correlated with
B ($p=0.56$), given C, assuming
D and under E conditions.



...is translated by...

UNIVERSITY PR
OFFICE
(YES, YOU HAVE ONE)

FOR IMMEDIATE RELEASE:
SCIENTISTS FIND
POTENTIAL LINK
BETWEEN A AND B
(UNDER CERTAIN CONDITIONS).



...which is then
picked up by...

NEWS WIRE
ORGANIZATIONS



A CAUSES B, SAY
SCIENTISTS.

THE INTERNETS



[Scientists out to kill us again.](#)

POSTED BY RANDOM DUDE

Comments (377)

OMG!! i kneew it!!

WTH???????

...who are
read by ...

Why are facts not enough?

