So You Think You Can Adapt?

Heuristics and Biases in the Perception of Climate Risk

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STANFORD UNIVERSITY
EMMETT INTERDISCIPLINARY PROGRAM IN
ENVIRONMENT and RESOURCES

Outline

- Why Culture Matters
- How We Think About Risk
- When Uncertainty Is Scary
- Discussion: How Do These Affect Climate Change Adaptation?

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Climate Change & Science Literacy

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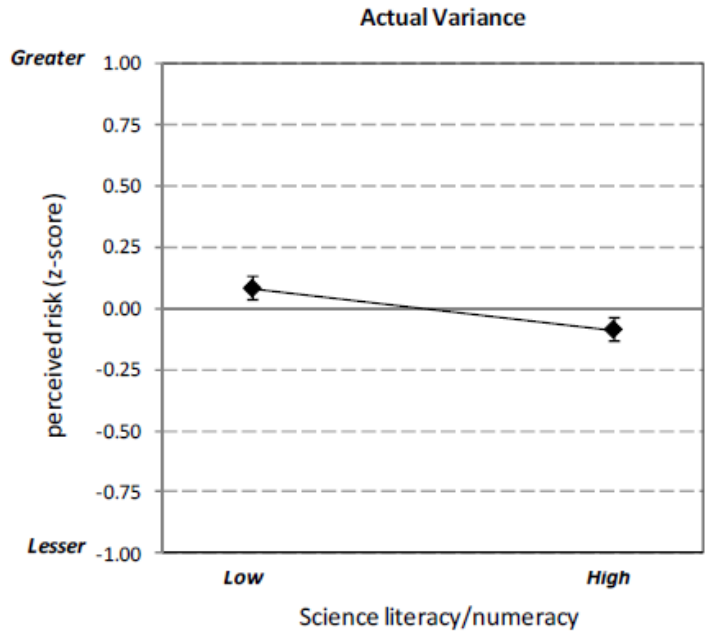
- We hope that more knowledge & intellect = greater attention to consequences

Climate Change & Science Literacy

"How much risk do you believe climate change poses to human health, safety, or prosperity?"



Kahan et al. (2011) "Tragedy of the Risk-Perception Commons"

Cultural Cognition

- Questions about the role of government and equality in society can predict which risks you find most important

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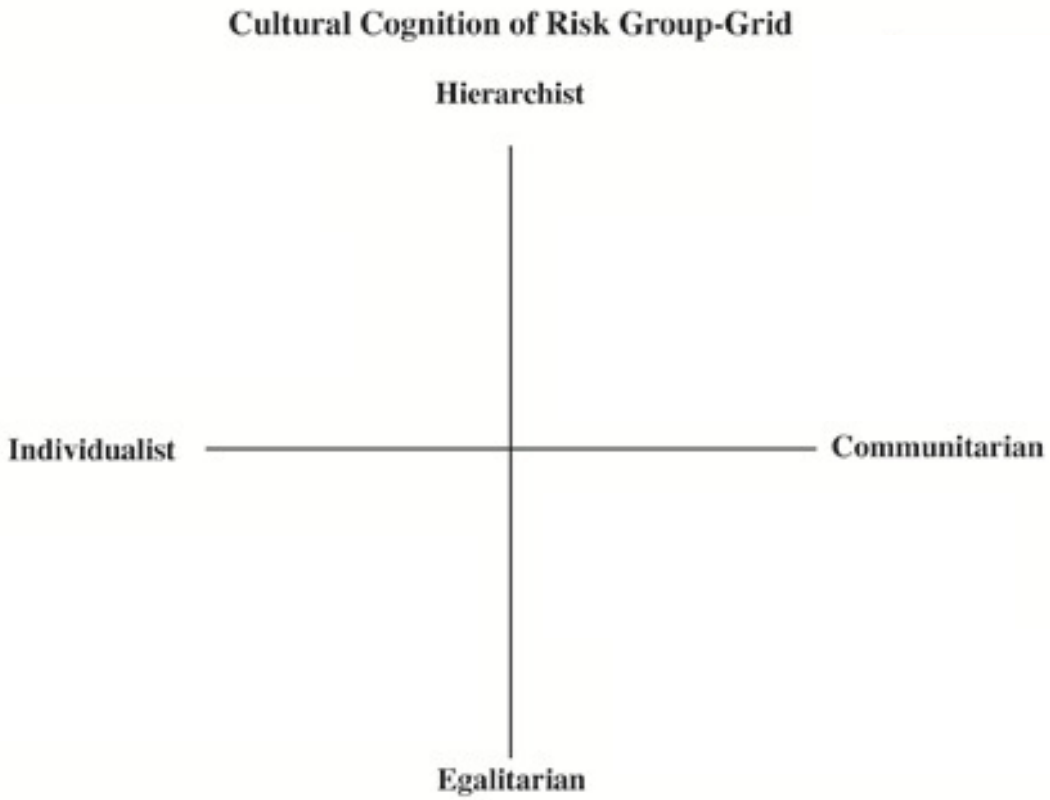
- *The government should do more to advance society's goals, even if that means limiting the freedom and choices of individuals.*

- *Our society would be better off if the distribution of wealth was more equal.*

Defines Perception of Risks



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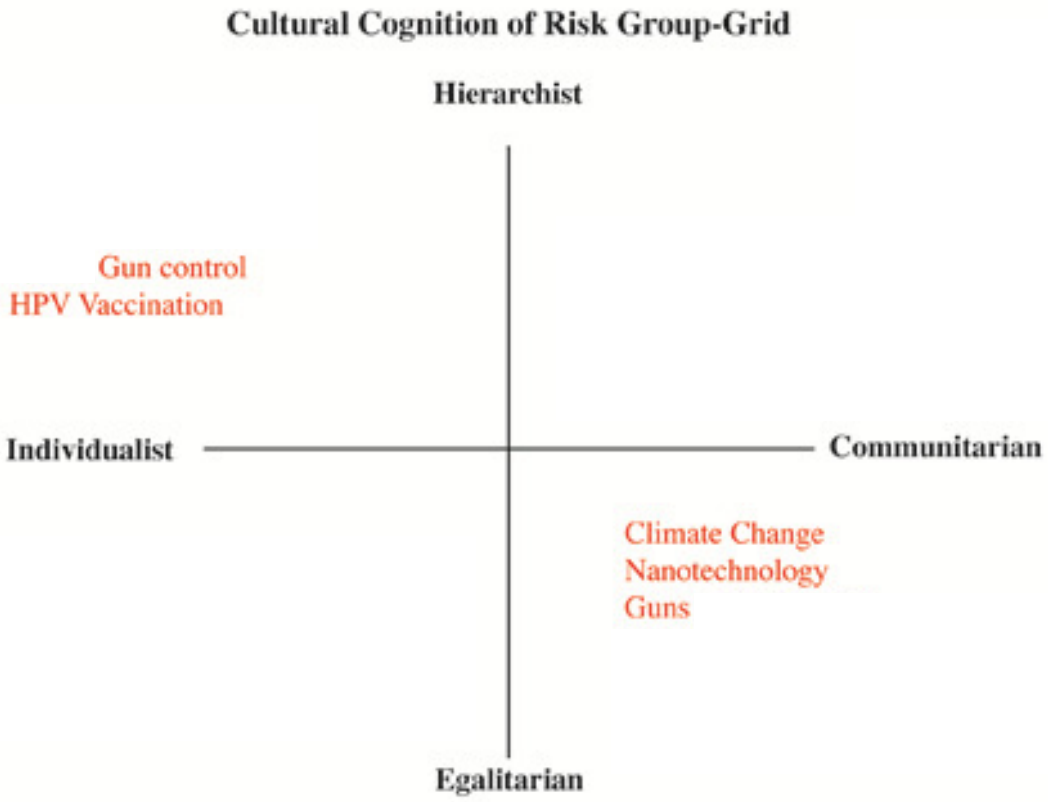
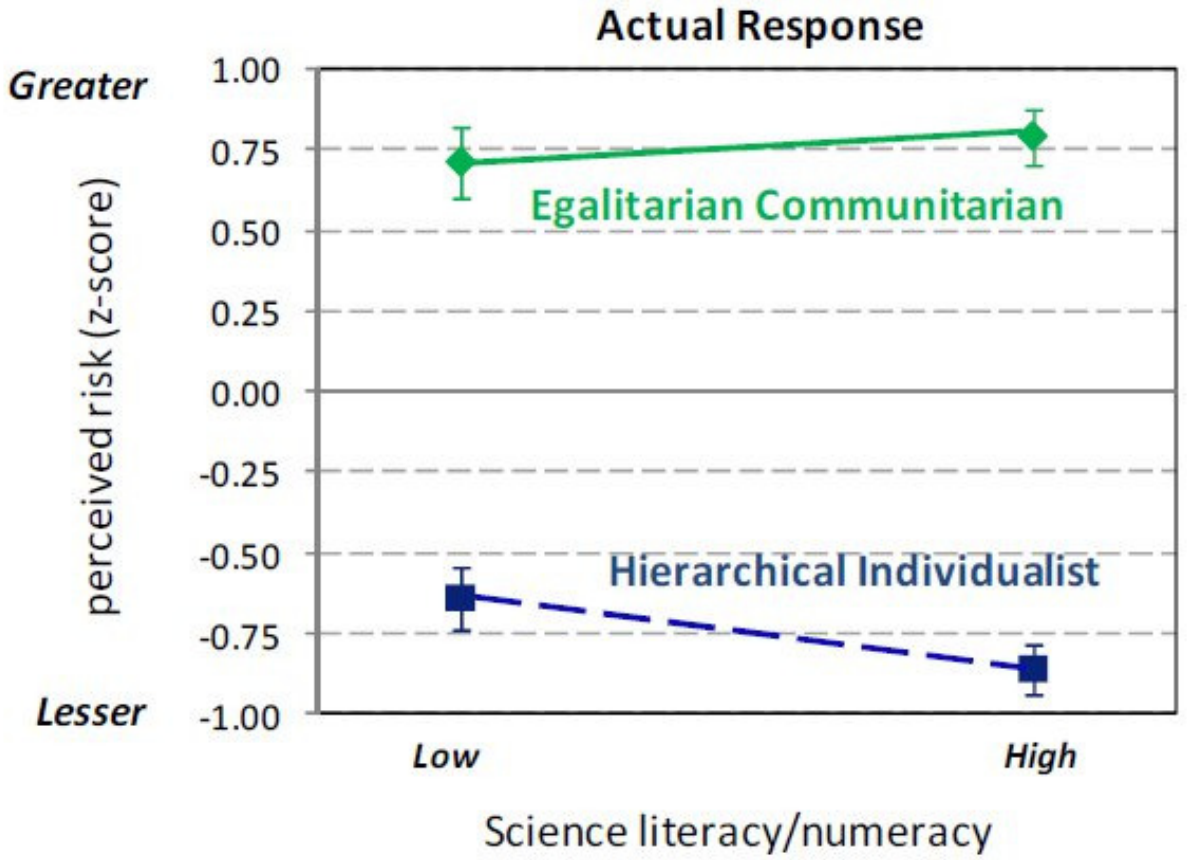


Climate Change Risk & Culture



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Do You Need to Believe in Climate Change to Adapt?

Do You Need to "Believe" in Climate Change to Adapt?

- Who is this?

"I'm not one to attribute activity of man to the changes in the climate. There is something to be said also for man's activities, but also for the cyclical temperature changes on our planet… But there are real changes going on in our climate. And I don't want to argue about the causes. What I want to argue about is, how are we going to get there to positively affect the impacts?"

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Governor Sarah Palin, Vice-Presidential Debate, 2008

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Disaster preparedness and response	
Reduce exposure or sensitivity to climatic variation (e.g. insurance, diversification)	
Short-term decisions (e.g. changing planting date / crop varieties)	

Do You Need to "Believe" in Climate Change to Adapt?

NO NEED TO "BELIEVE"	NEED TO "BELIEVE"
Disaster preparedness and response	Prepare for extremes never experienced in past climate (e.g. sea-level rise, unprecedented storms and heatwaves)
Reduce exposure or sensitivity to climatic variation (e.g. insurance, diversification)	Adjust long-term management strategies
Short-term decisions (e.g. changing planting date / crop varieties)	Mitigate

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Relative Risks

Which risk in each of the following pairs is responsible for a larger number of deaths in the US?

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- Motor vehicle accidents vs colorectal cancer
- Drowning vs leukemia

Relative Risks

Which of the following pairs are responsible for a larger number of deaths?

(deaths per 100,000)

- Homicide (3.6) vs **diabetes** (**20.8**)
- Motor vehicle accidents (10.8) vs **colorectal cancer** (16.4)
- Drowning (1.3) vs **leukemia** (7.1)

Availability Heuristic

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Vividness: how easily can we imagine it?

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Willingness to pay for insurance for hospitalization from:

Any reason	$41.53
Any disease or accident	$47.12
Any accident (assuming disease ins.)	$69.55
Any disease (assuming accident ins.)	$89.10

Climate Change Information Sources

1. Media Sources

Where does most climate change-relevant information come from for the American public?

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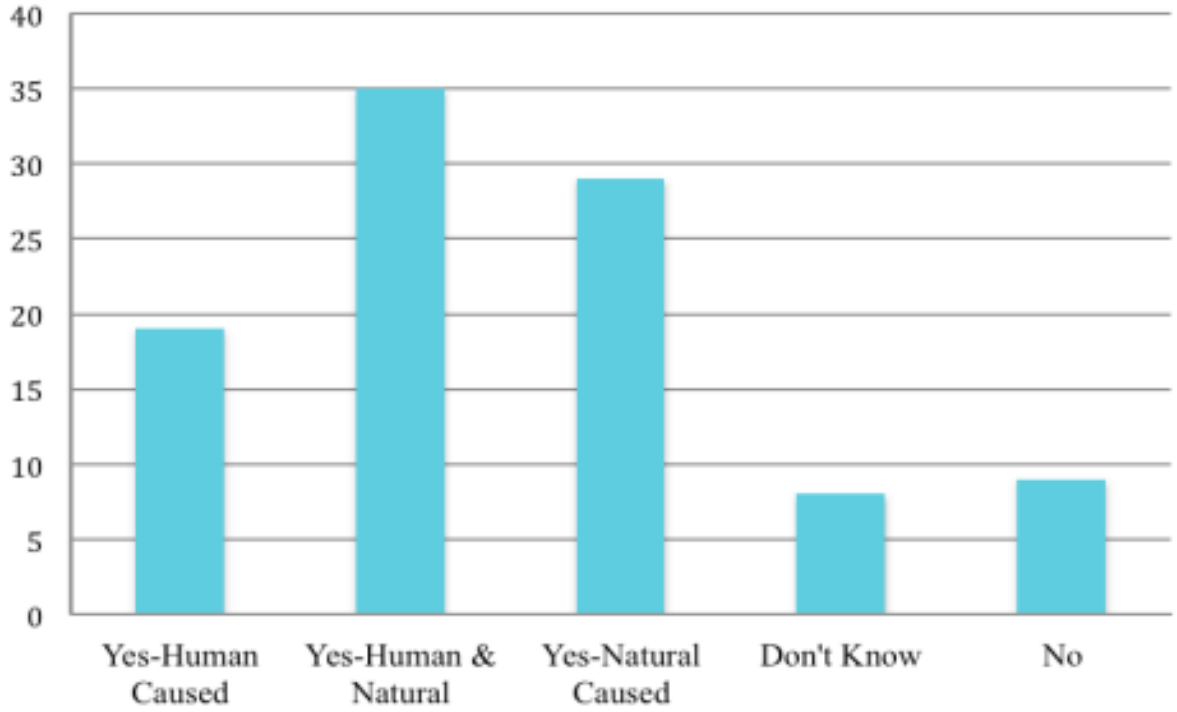
Figure 1

Proportional Size of Five Groups of Weathercasters Based on Their Response to: Do You Think Global Warming is Happening?



Maibach et al., 2011

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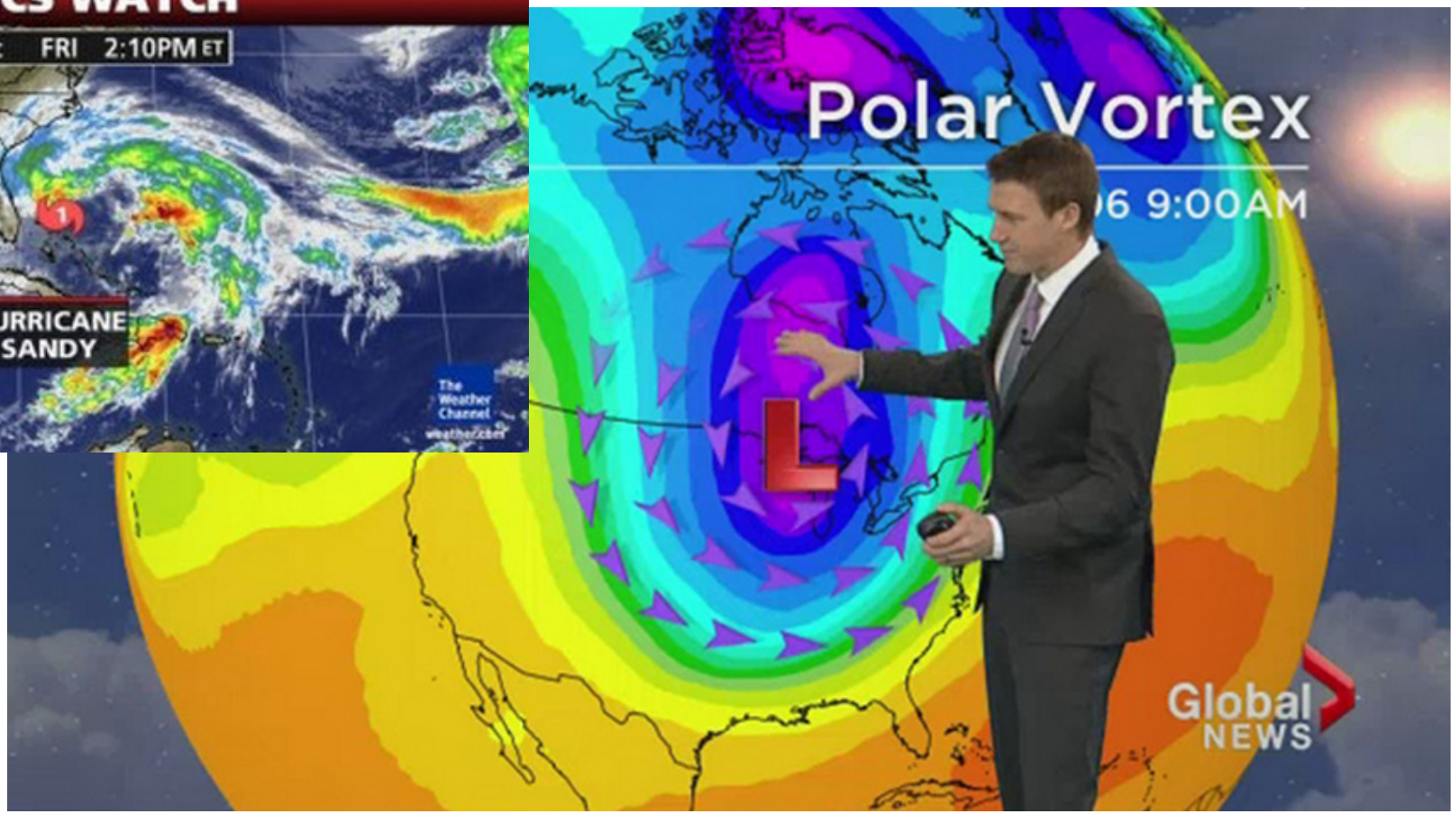

Climate Change Information Sources

- Which is responsible for the most > $1 billion-events in the US 1980-2013?

1. Hurricanes / Tropical Storms
2. Extra-Tropical Storms / Tornadoes
3. Flooding
4. Droughts / Heatwaves
5. Blizzard / Freeze / Ice Storms
6. Wildfires

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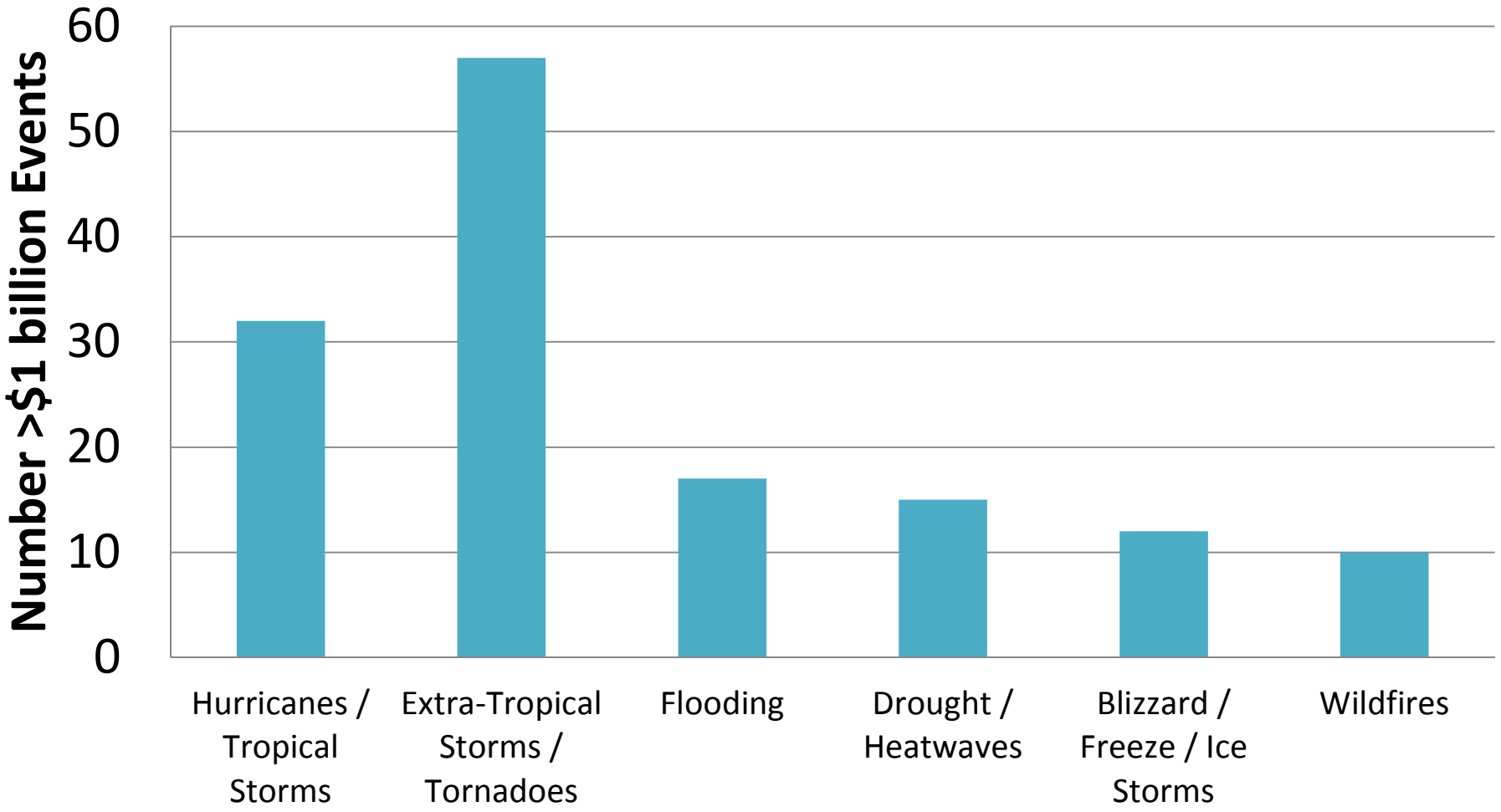
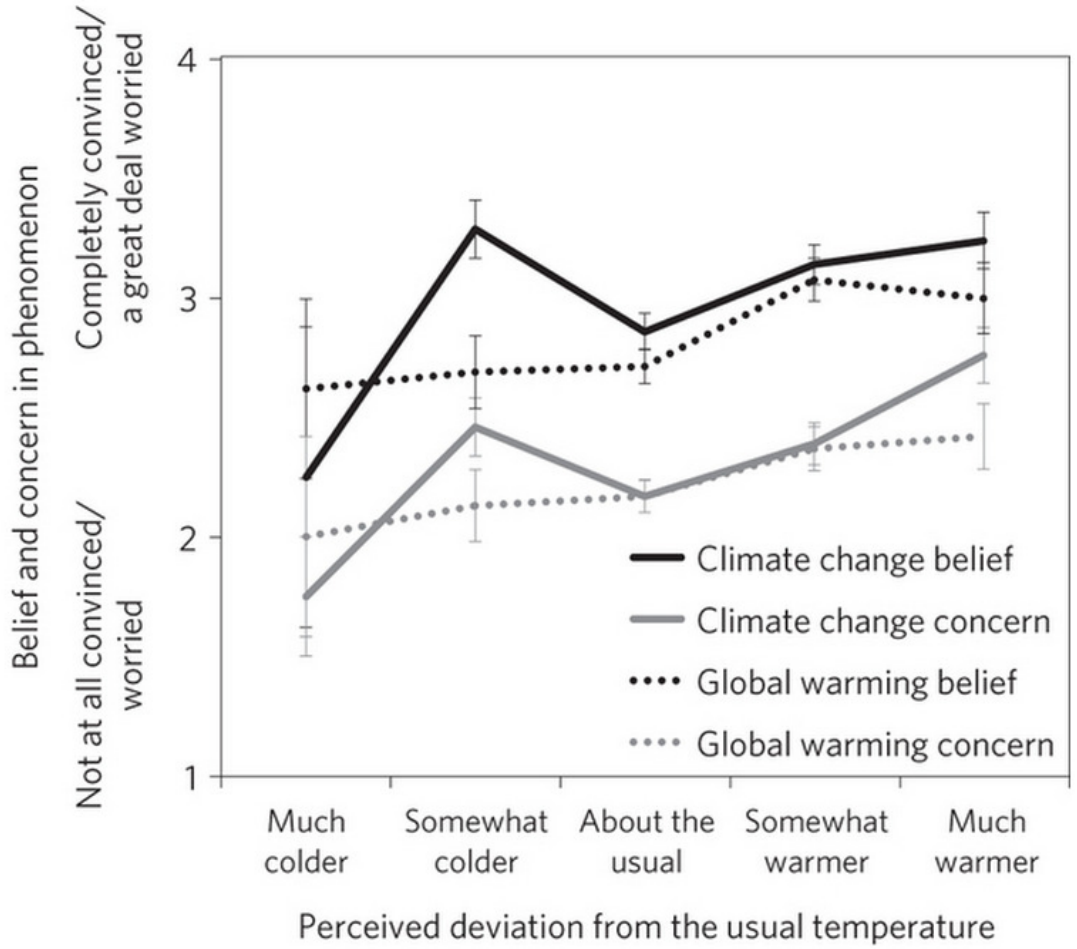


Climate Change Information Sources

2. Subjective Experience



Zaval et al, 2014

Which of These is a Random Sequence?

H H T H H H T T H H H H H H T

T T T H H T H H H T T H T H H

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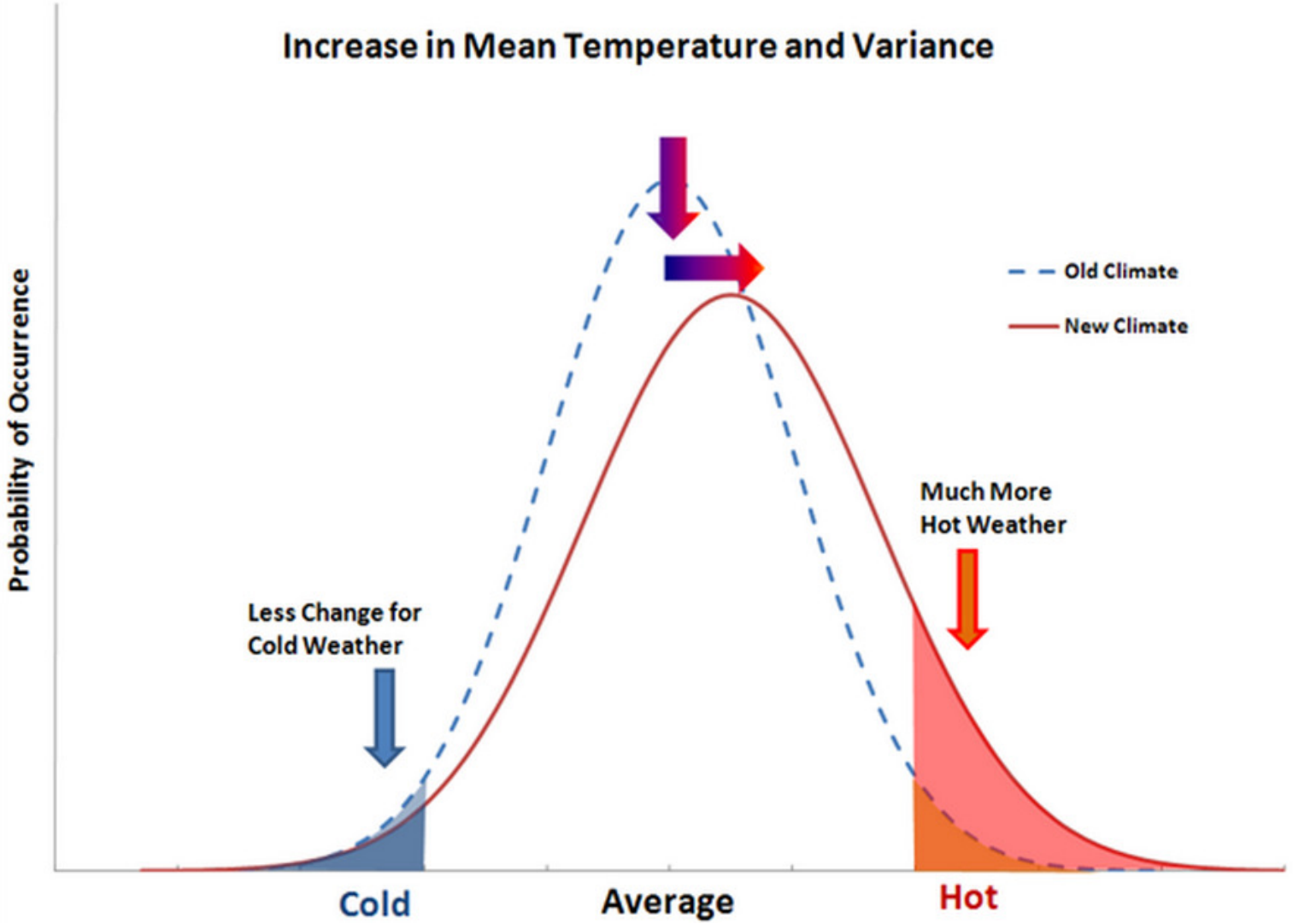
Climate Change Information Sources



Climate Change Information Sources

JANUARY 6, 2014

POLAR VORTEX CAUSES HUNDREDS OF INJURIES AS PEOPLE MAKING SNIDE REMARKS ABOUT CLIMATE CHANGE ARE PUNCHED IN FACE

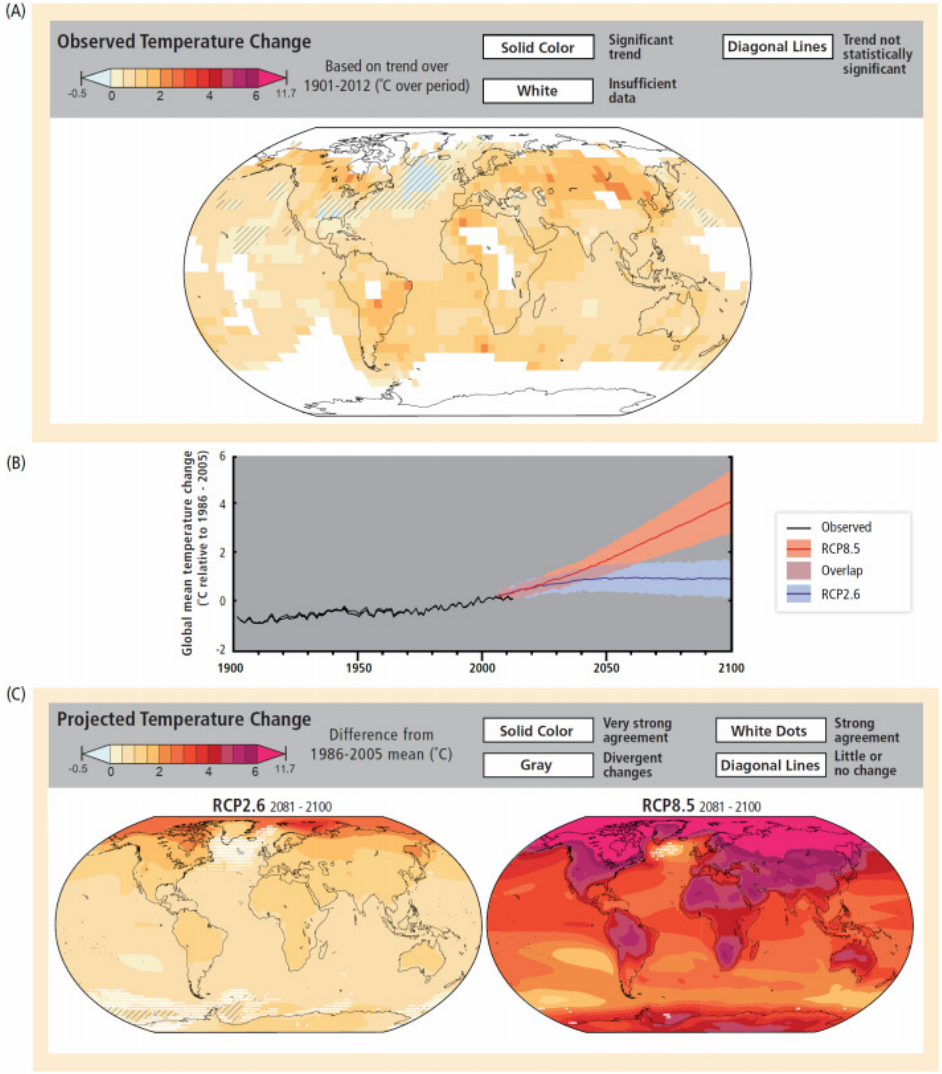
POSTED BY ANDY BOROWITZ

Share 144.5K Tweet 1,707 +1 PRINT + MORE

New Yorker, 2014

Climate Change Information Sources

3. Scientific Sources



Questions for Adaptation

- Are we adapting to the wrong things because we are over-influenced by vivid and salient extreme events heavily covered by the media?
- Do we always adapt to the last extreme event rather than what we expect for the future?
- Is there a risk of over-adapting?

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Ellsberg Paradox

Urn has 30 red balls, 60 black and/or yellow balls

First draw:

Choice A	Choice B
Receive $100 if you draw a red ball	Receive $100 if you draw a black ball

Ellsberg Paradox

Urn has 30 red balls, 60 black and/or yellow balls

First draw:

Choice A	Choice B
Receive $100 if you draw a red ball	Receive $100 if you draw a black ball

Second draw:

Choice C	Choice D
Receive $100 if you draw a red or yellow ball	Receive $100 if you draw a black or yellow ball

Ellsberg Paradox

Urn has 30 red balls, 60 black and/or yellow balls

First draw:

Choosing Choice A assumes fewer black than red

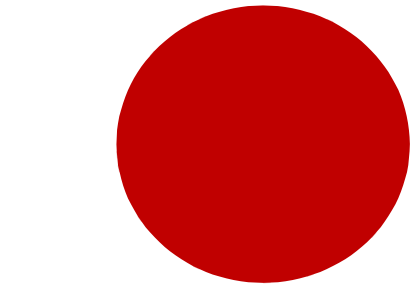
Choice A	Choice B
Receive $100 if you draw a red ball	Receive $100 if you draw a black ball

Second draw:

Choosing Choice D assumes more black than red

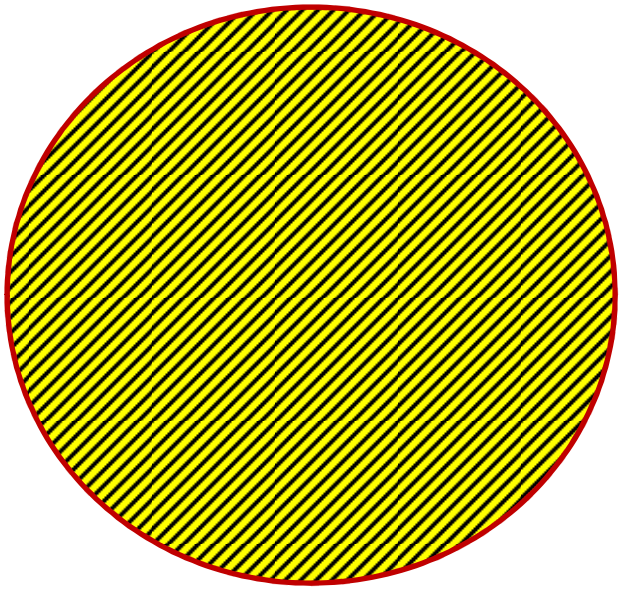
Choice C	Choice D
Receive $100 if you draw a red or yellow ball	Receive $100 if you draw a black or yellow ball

Ellsberg Paradox



A: p=1/3

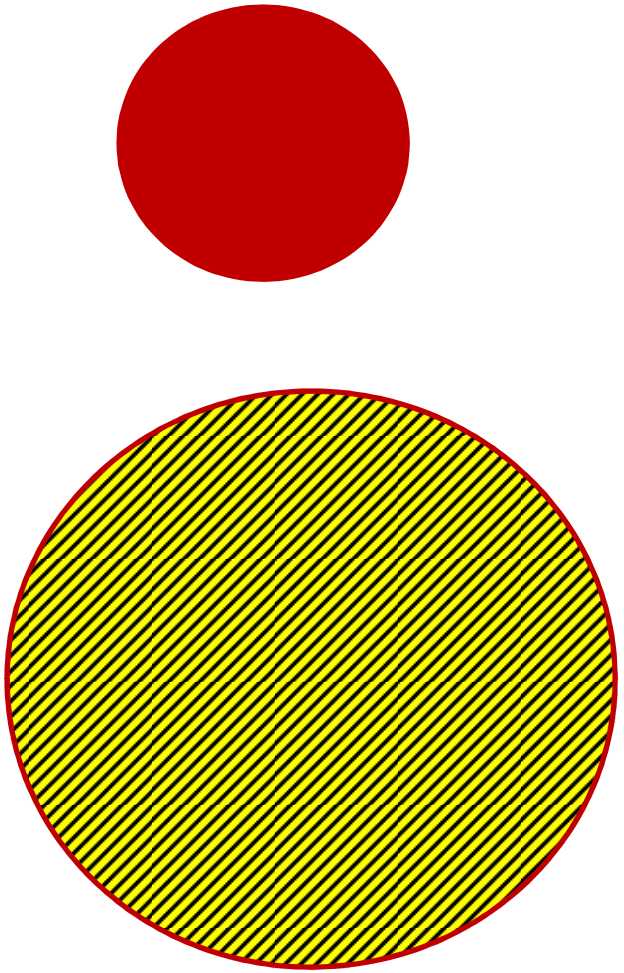
B: p between 0 and 2/3



C: p between 1/3 and 1

D: p=2/3

Ellsberg Paradox



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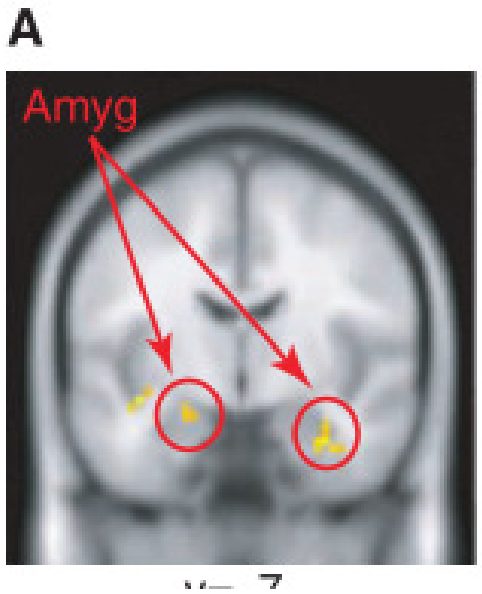
Uncertainty vs Ambiguity

Two major things happened in the brain:

- Fear/anxiety region (amygdala) activated

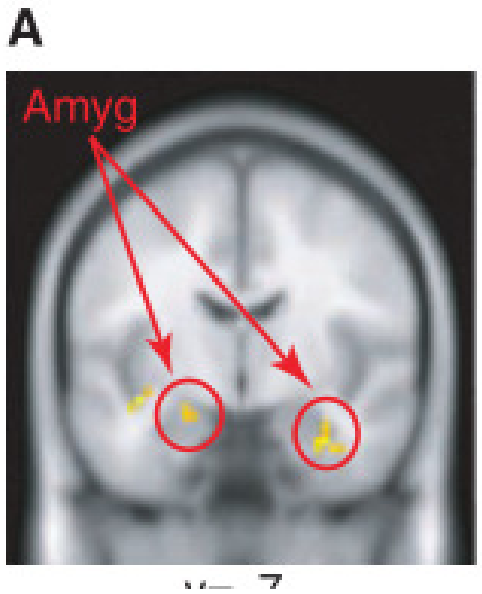


Hsu et al. (2005)

Uncertainty vs Ambiguity

Two major things happened in the brain:

- Fear/anxiety region (amygdala) activated
- Reward system (ventral striatum) deactivated



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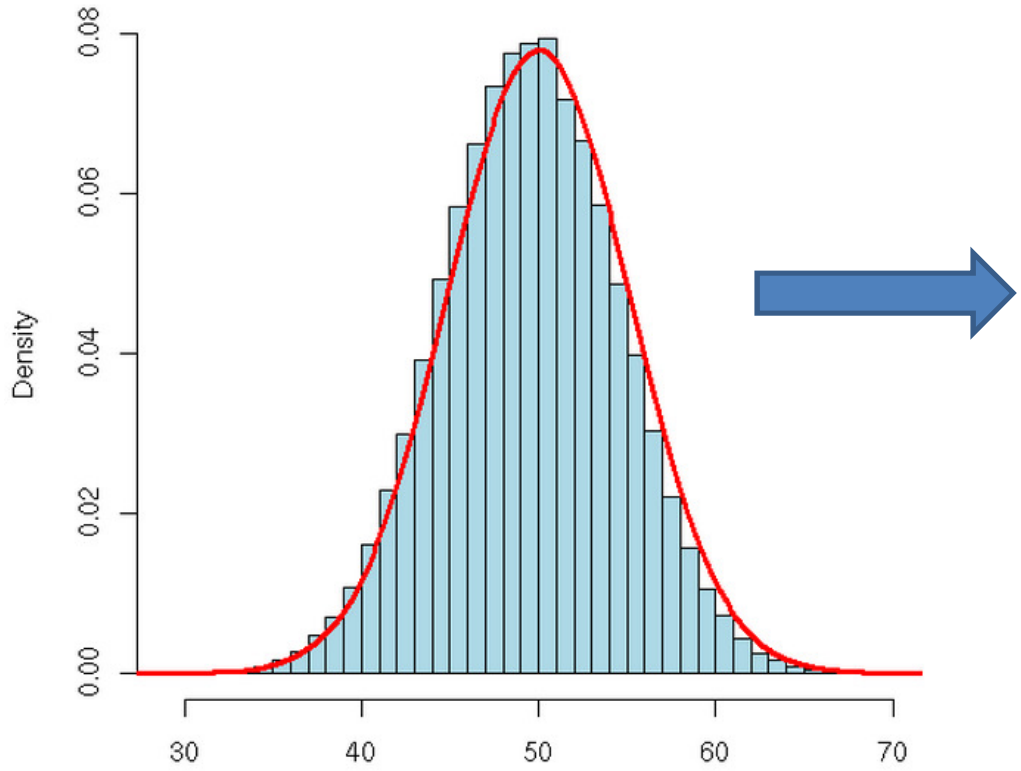
Ambiguity and Climate Change

- Climate change moves us from a risky situation to an ambiguous situation



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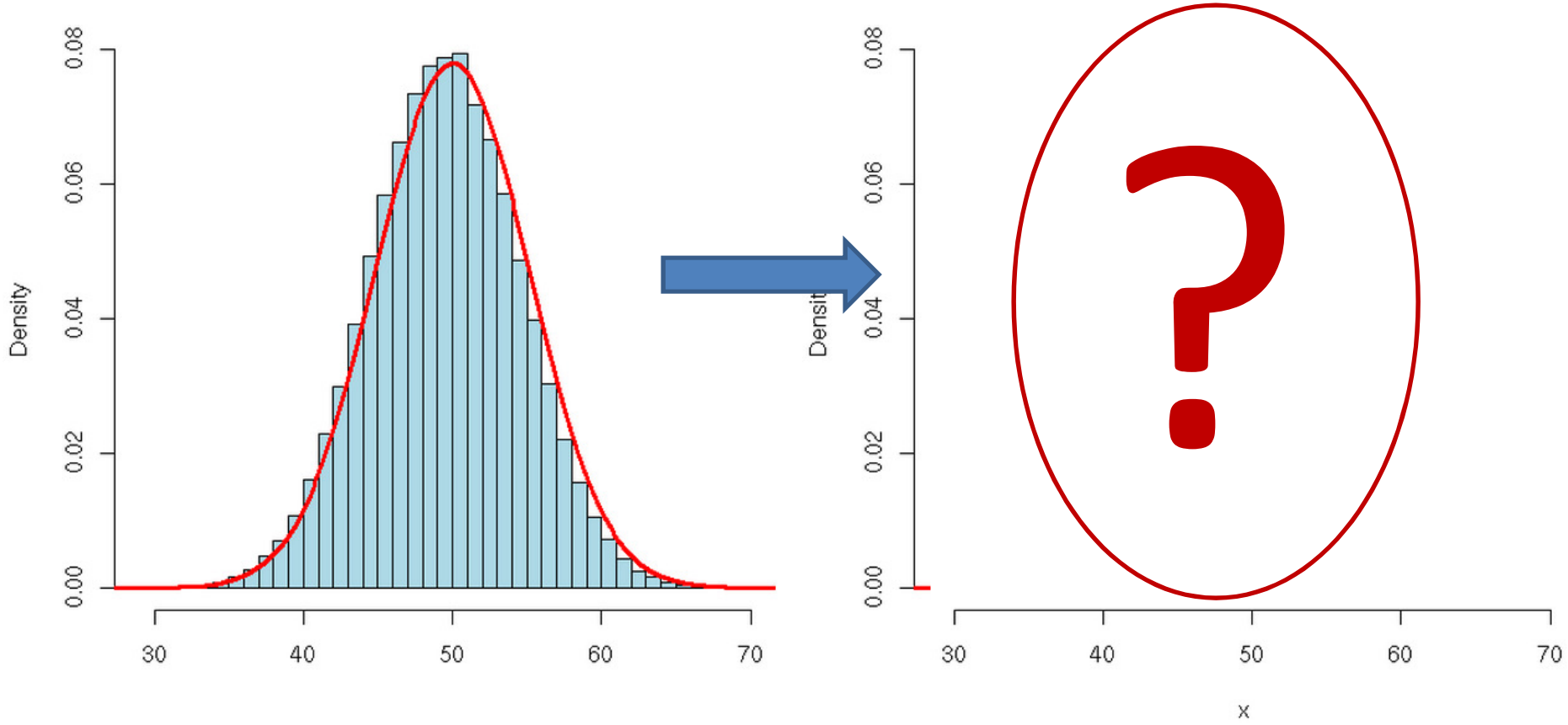

Ambiguity and Climate Change

What kind of decisions become ambiguous rather than risky?

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How high do my levees need to be to protect against a 100-year flood?

Ambiguity and Climate Change

What kind of decisions become ambiguous rather than risky?

When should I plant my crops to make sure they germinate?

Questions for Discussion

- Do you need to believe in climate change in order to adapt?
- Are we adapting to the wrong things?
- Do / should we base adaptation decisions on the most recent extreme events?
- Is there a risk of over-adapting?
- How important are these heuristics and biases for adaptation?
- Can we overcome them by learning / education?