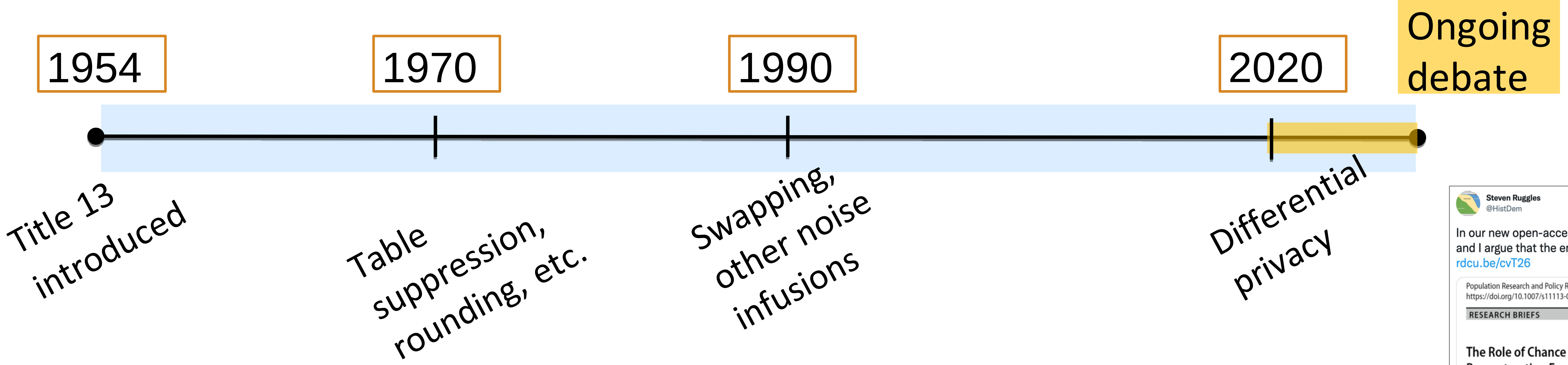
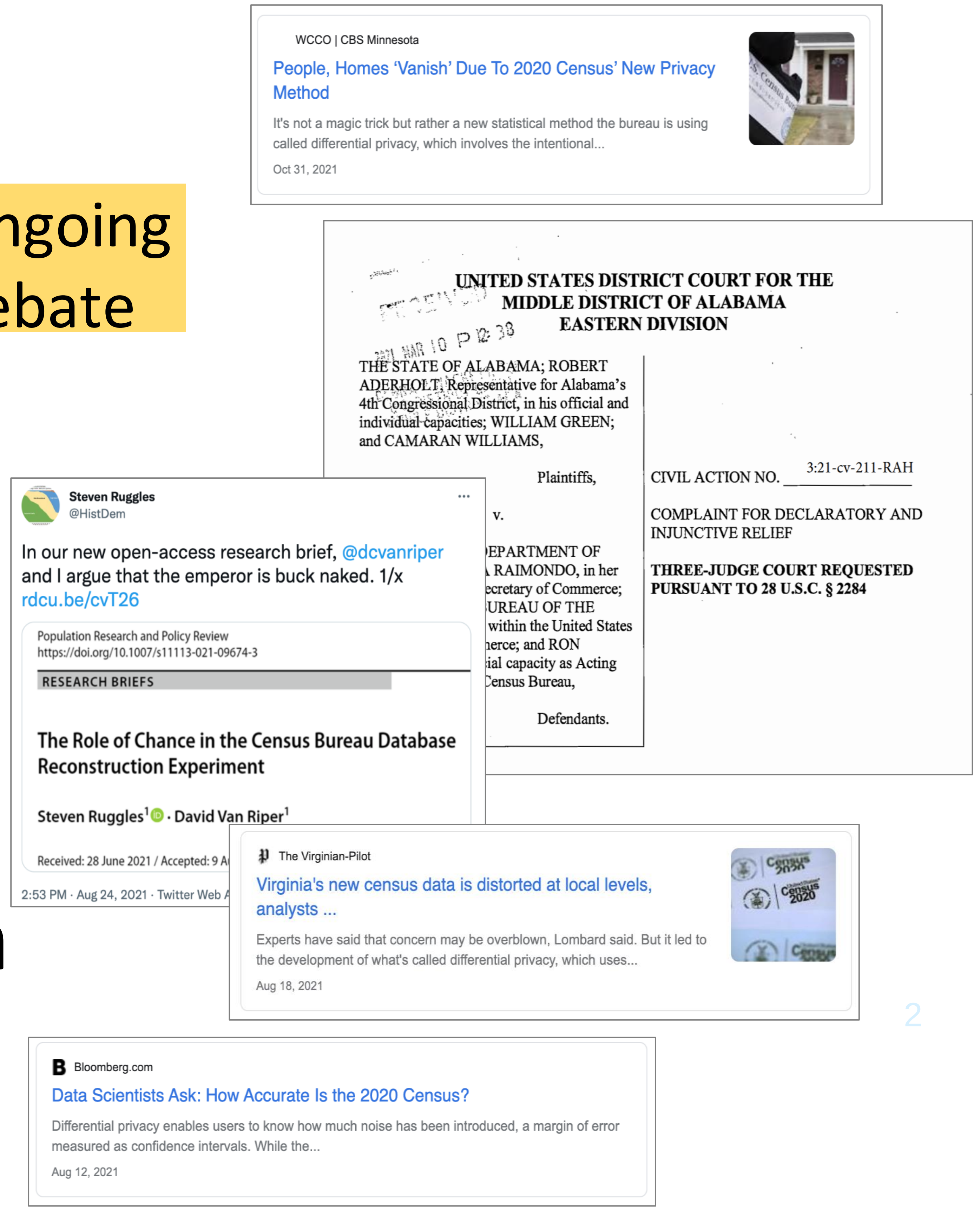
Replace *conventional certitude* with strategic communication of uncertainty

Jessica Hullman
Ginni Rometty Associate Professor of Computer Science
Northwestern University

*Term coined by Manski 2011

Legitimacy of the US Census at risk





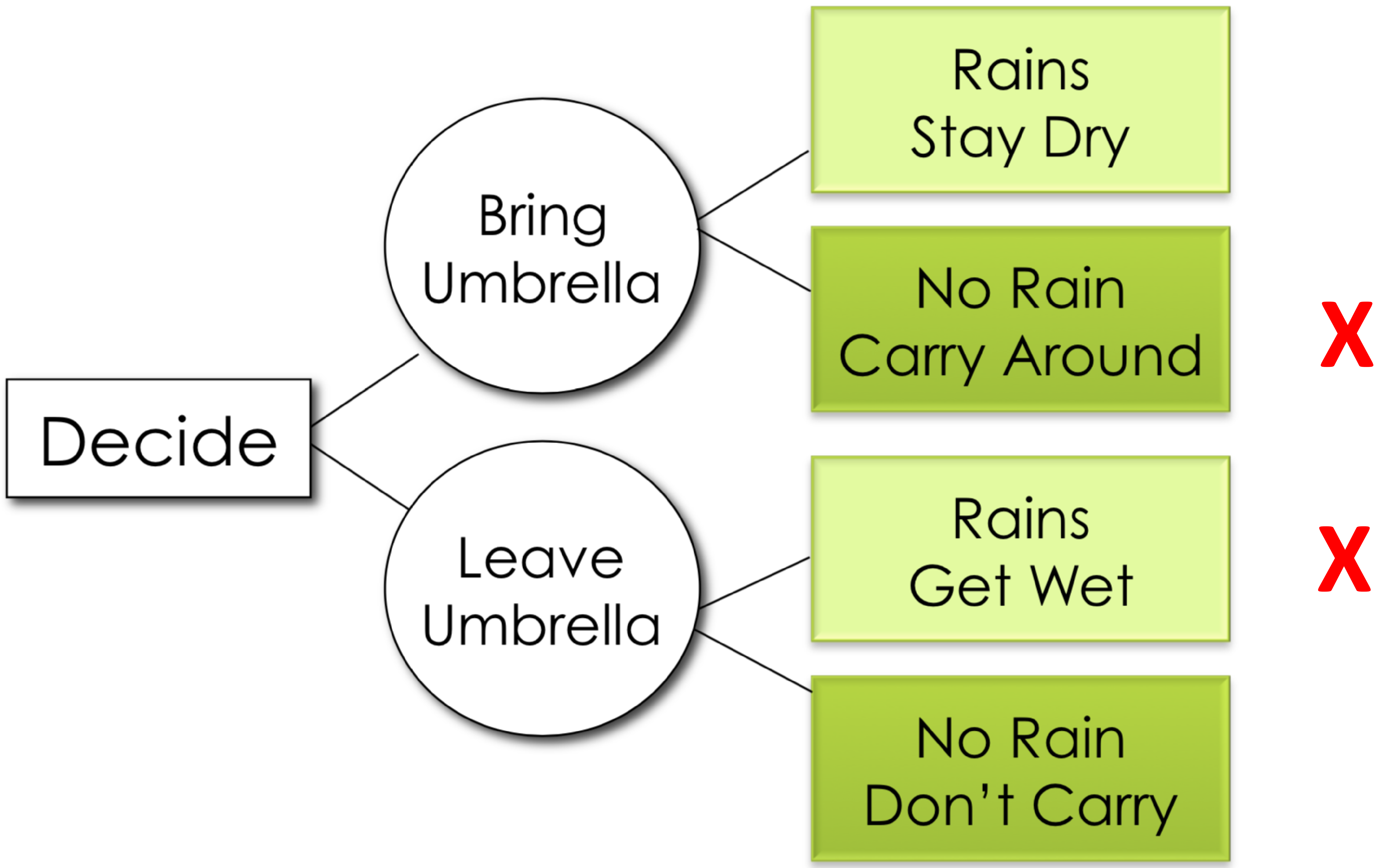
New DAS is not a "sea change," but is interpreted as such in light of pervasive **conventional certitude**

U.S. Population: 332,574,351
332,574,350?
332,574,400?
332,574,000?
332,570,000?

Conventional certitude pervades reporting

332,574,351 in US	**Census Bureau**
$3995 bil baseline budget	**Congressional Budget Office**
888k on temporary layoff	**Bureau of Labor Statistics**
79,571,321 new cases 975,513 total deaths	**Centers for Disease and Control**
$22,997.5 bil GDP	**Bureau of Economic Analysis**

Communicating uncertainty improves trust, decisions



Joslyn & LeClerc 2011, Johnson & Slovic 1995, Johnson 2003.

Reducing data to point estimates cannot yield diversification or information acquisition → ***Express uncertainty with all point estimates***.

Implement strategic uncertainty communication

Quantify and visualize uncertainty to imply importance

Use frequency framing to make probability concrete

Suppress “as-if optimization” at all levels of the info hierarchy

Quantify and/or acknowledge transitory uncertainty

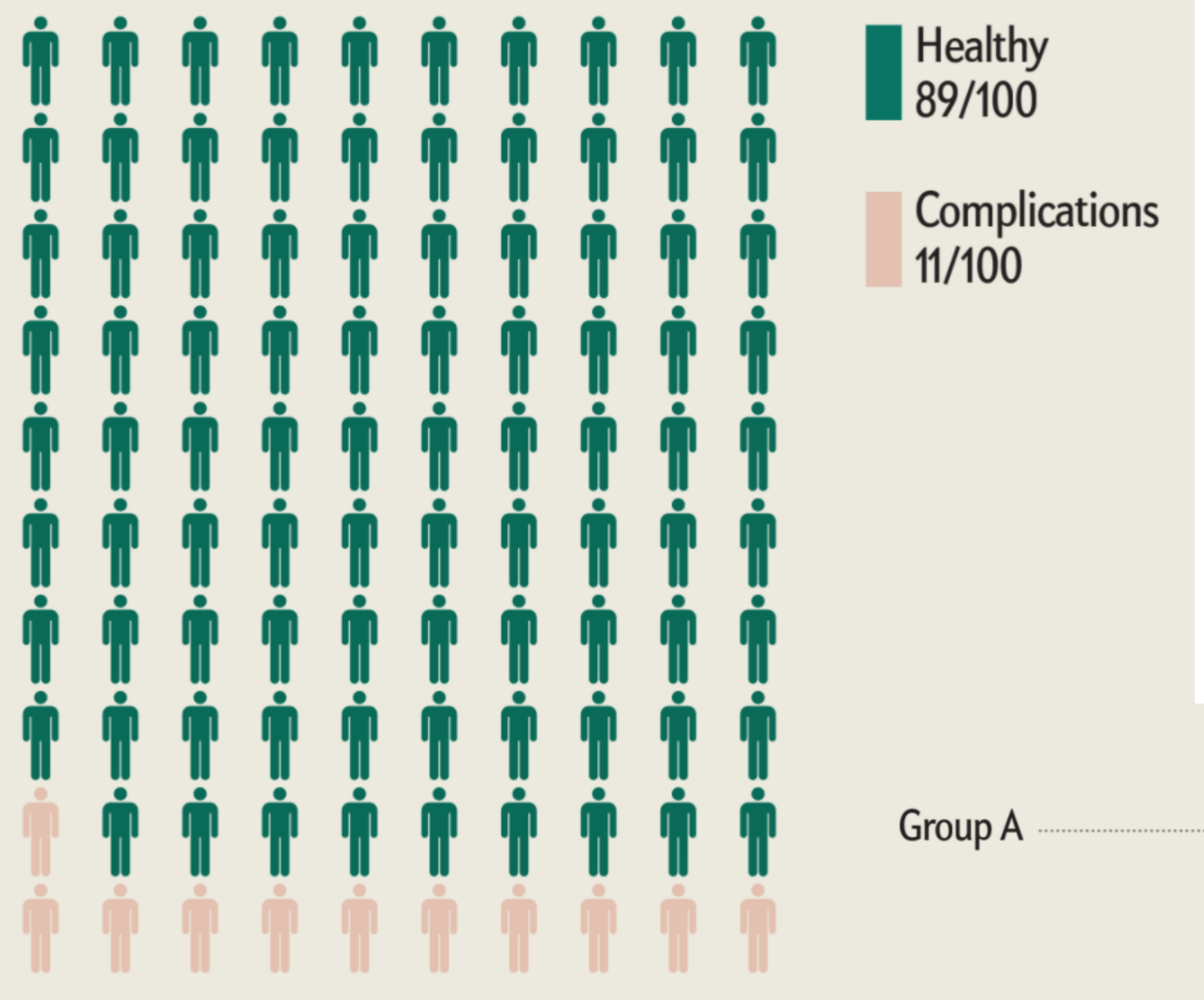
Provide prior forecast error by default

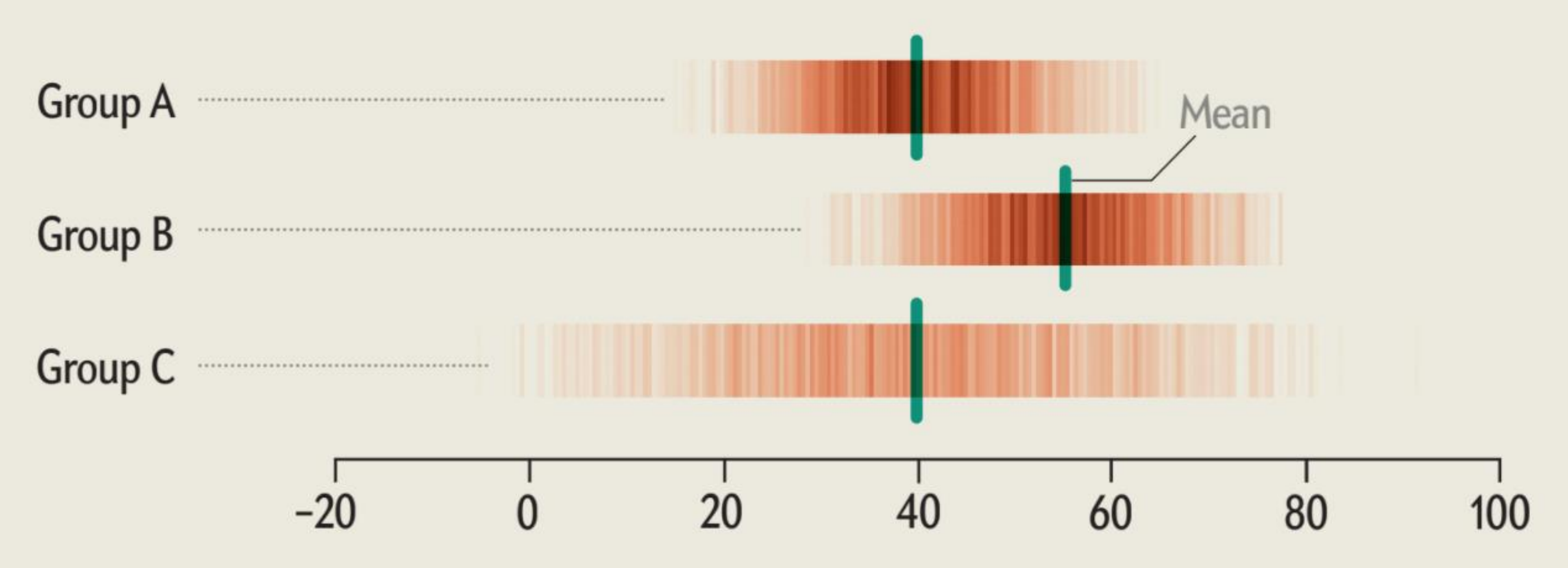
Label forecasts as hypothetical outcomes from statistical experiments

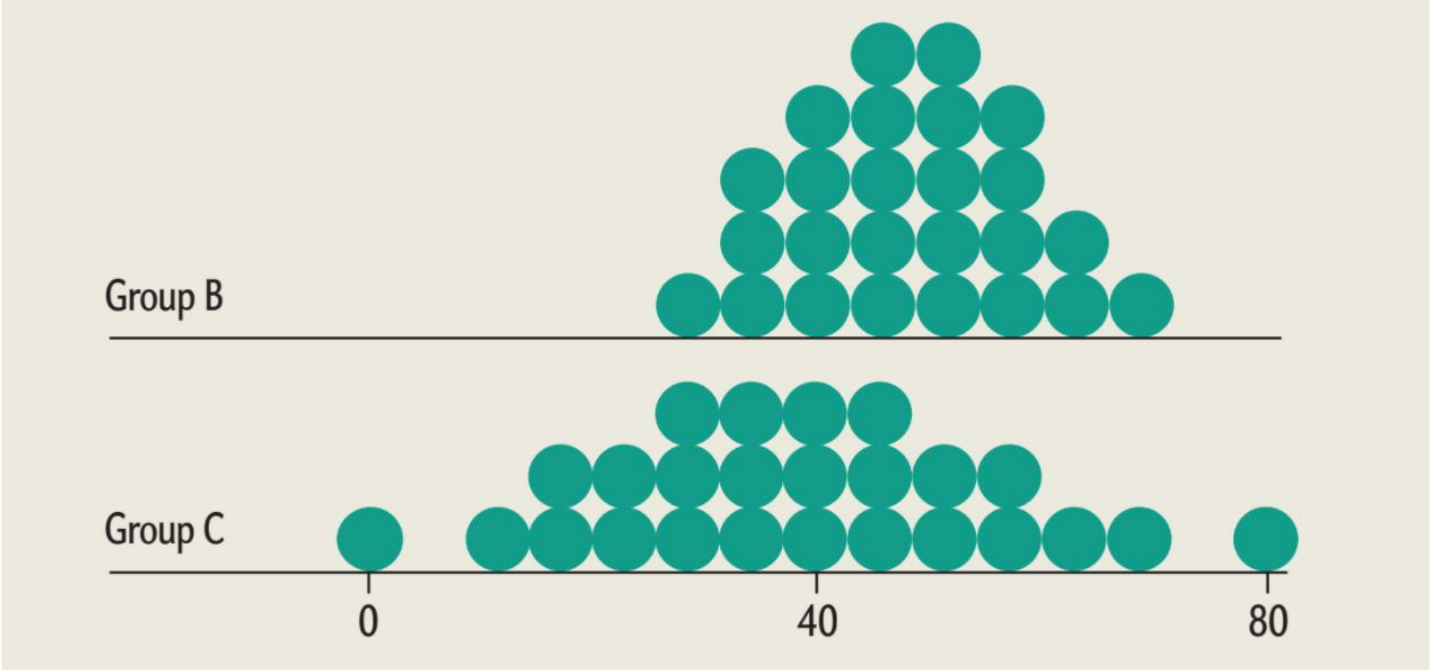
Label partial uncertainty expressions as incomplete

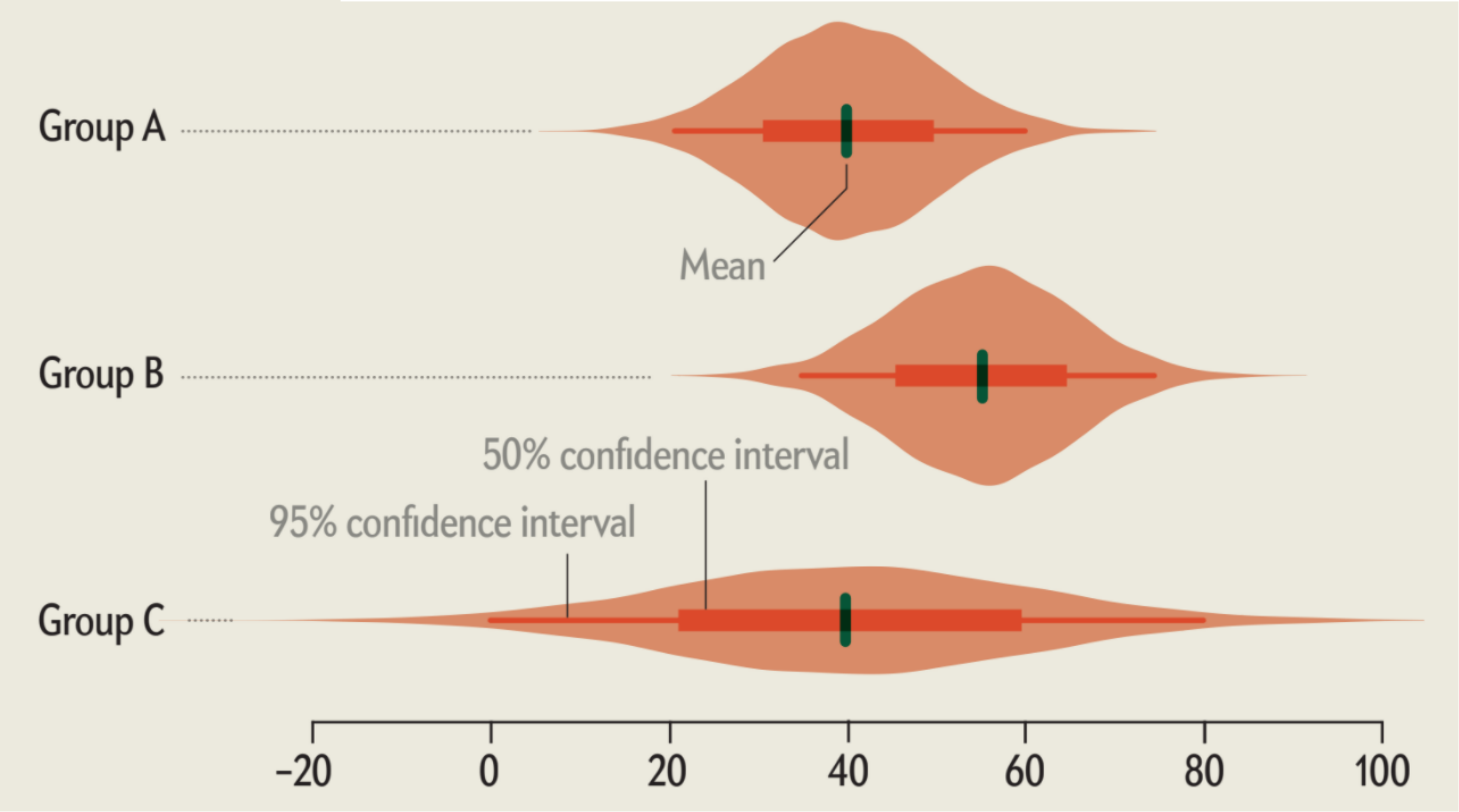
Quantify and visualize uncertainty

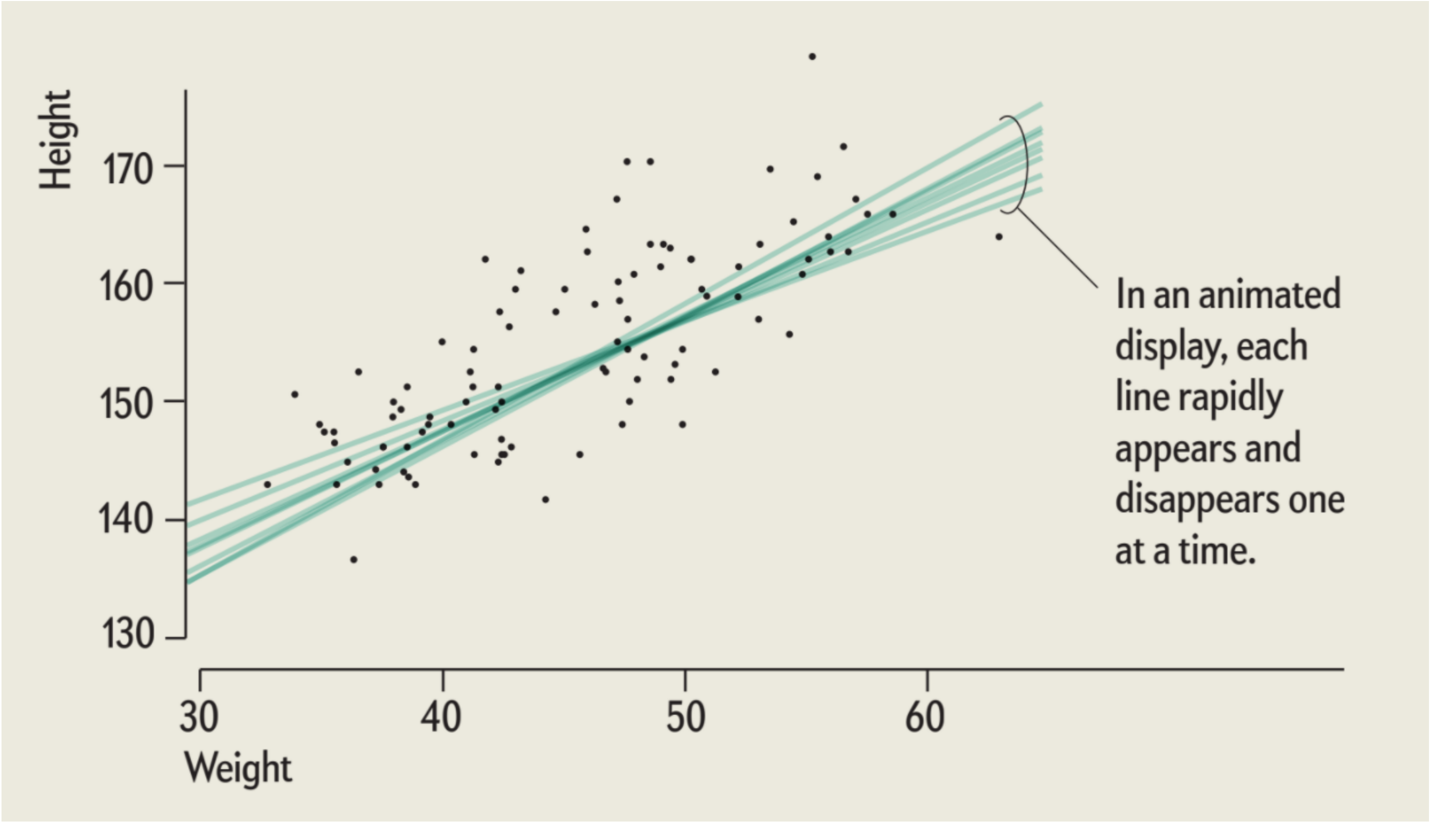
Graphs get attention, makes comparisons salient, and convey importance.







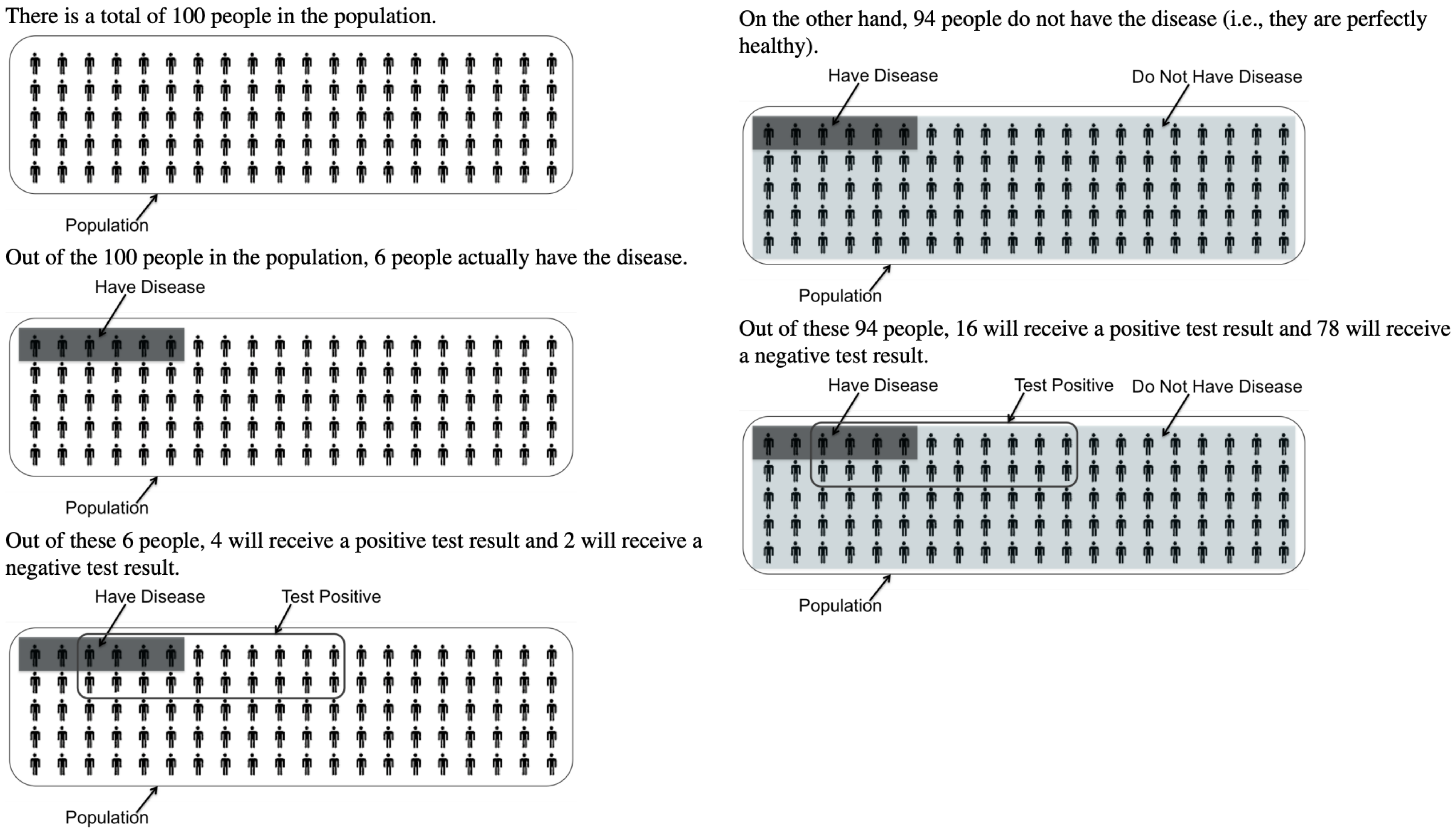


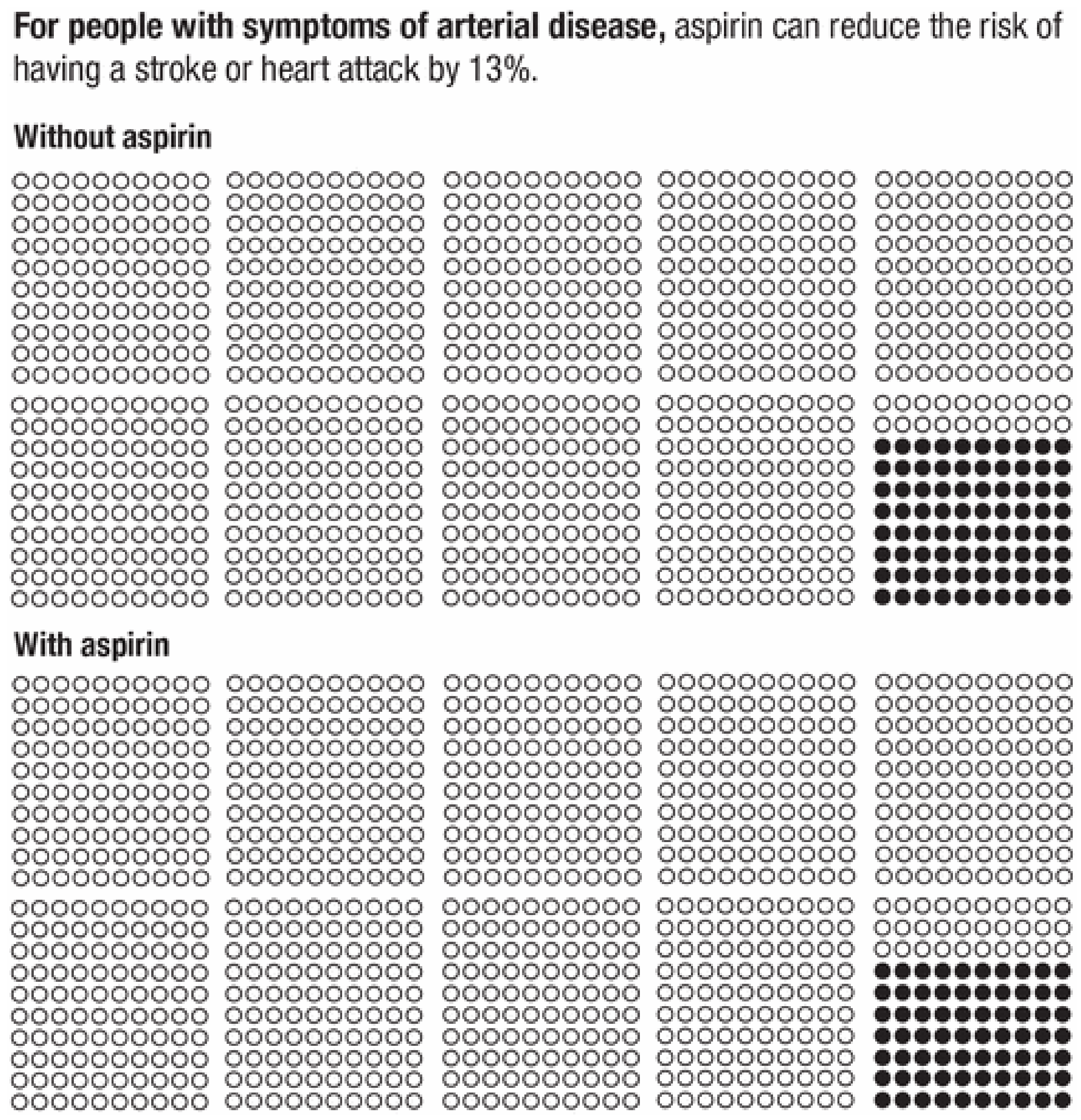


Hullman 2019. Graphics credit: Hullman, Christiansen.

Frame probability as frequency to ease reasoning

Gigerenzer and Hoffrage, 1995.

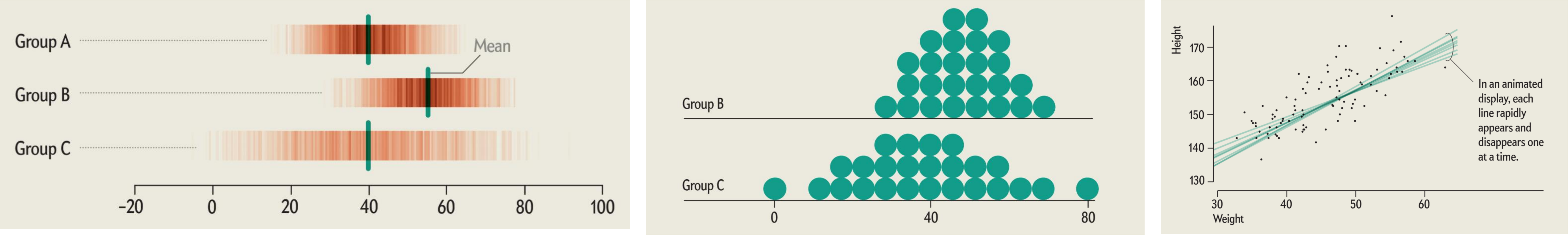




Ottley et al. 2015.

Galesic et al. 2009.

Use continuous frequency formats over error bars



Hullman 2019. Graphics credit: Hullman, Christiansen.

Curate sets of scenarios to convey distribution

“This is something we see a lot”

“This is something we sometimes see”

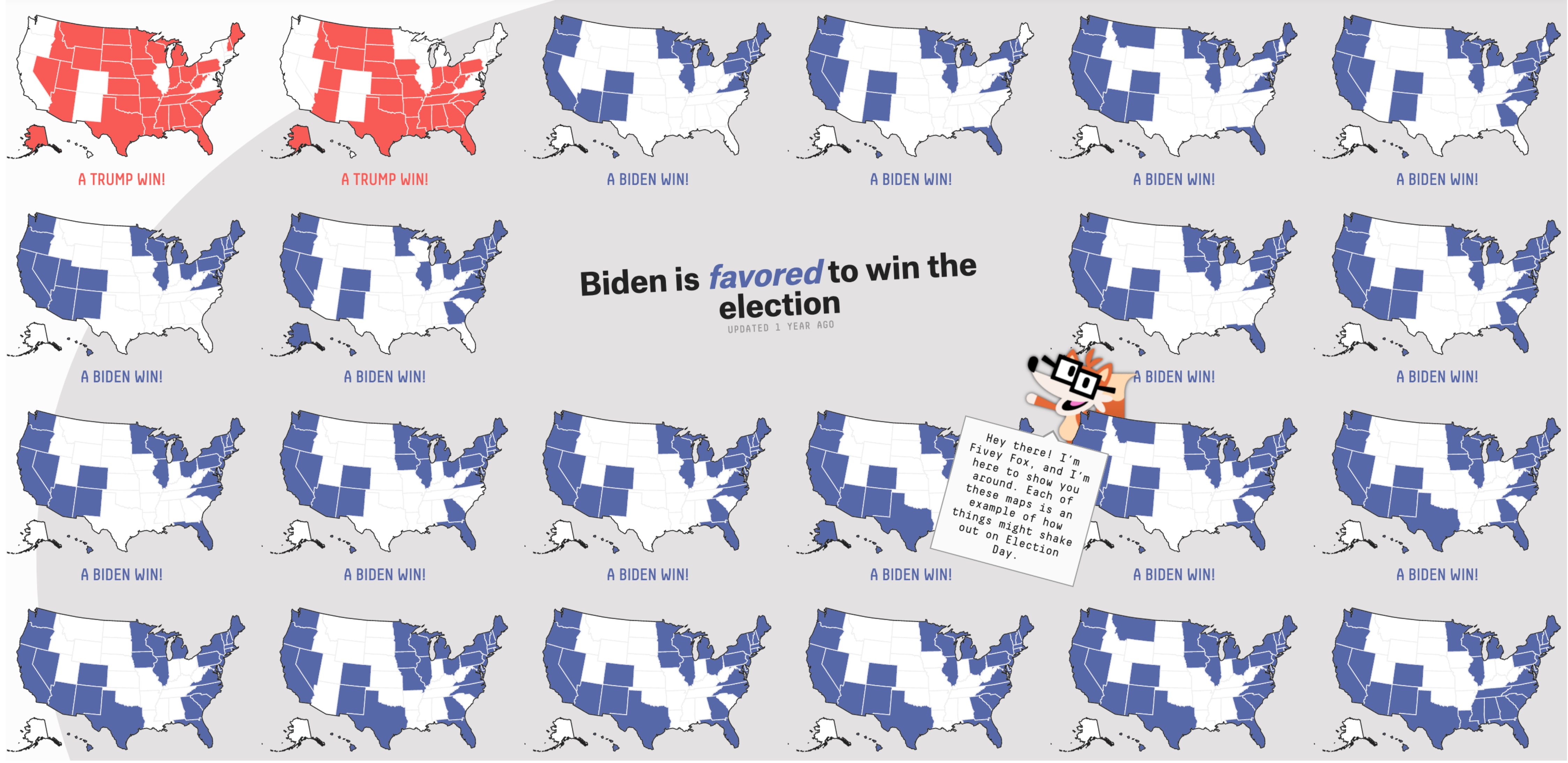
”This is something we see rarely (but with large implications for decisions)”

Tailor to information needs but anticipate heuristics

Not all users are alike in their information needs/aptitude → Provide info at different levels of granularity with different emphasis.

But: Expect users to tend to suppress uncertainty information at all levels.

2016



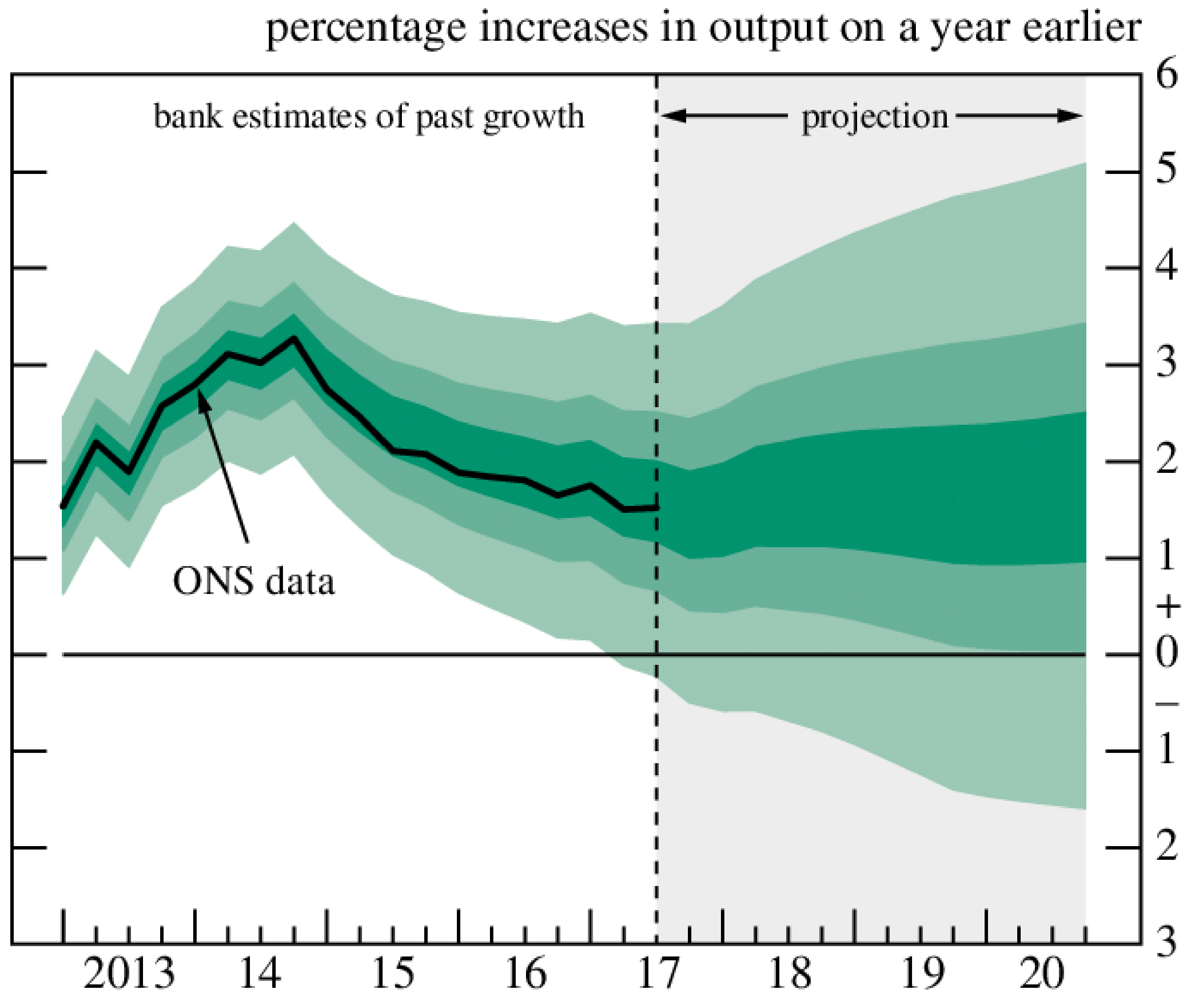
2020

FiveThirtyEight top-level forecasts

Explicitly acknowledge transitory uncertainty

Project uncertainty to past data (e.g., BEA), propagate past uncertainty to future forecasts.

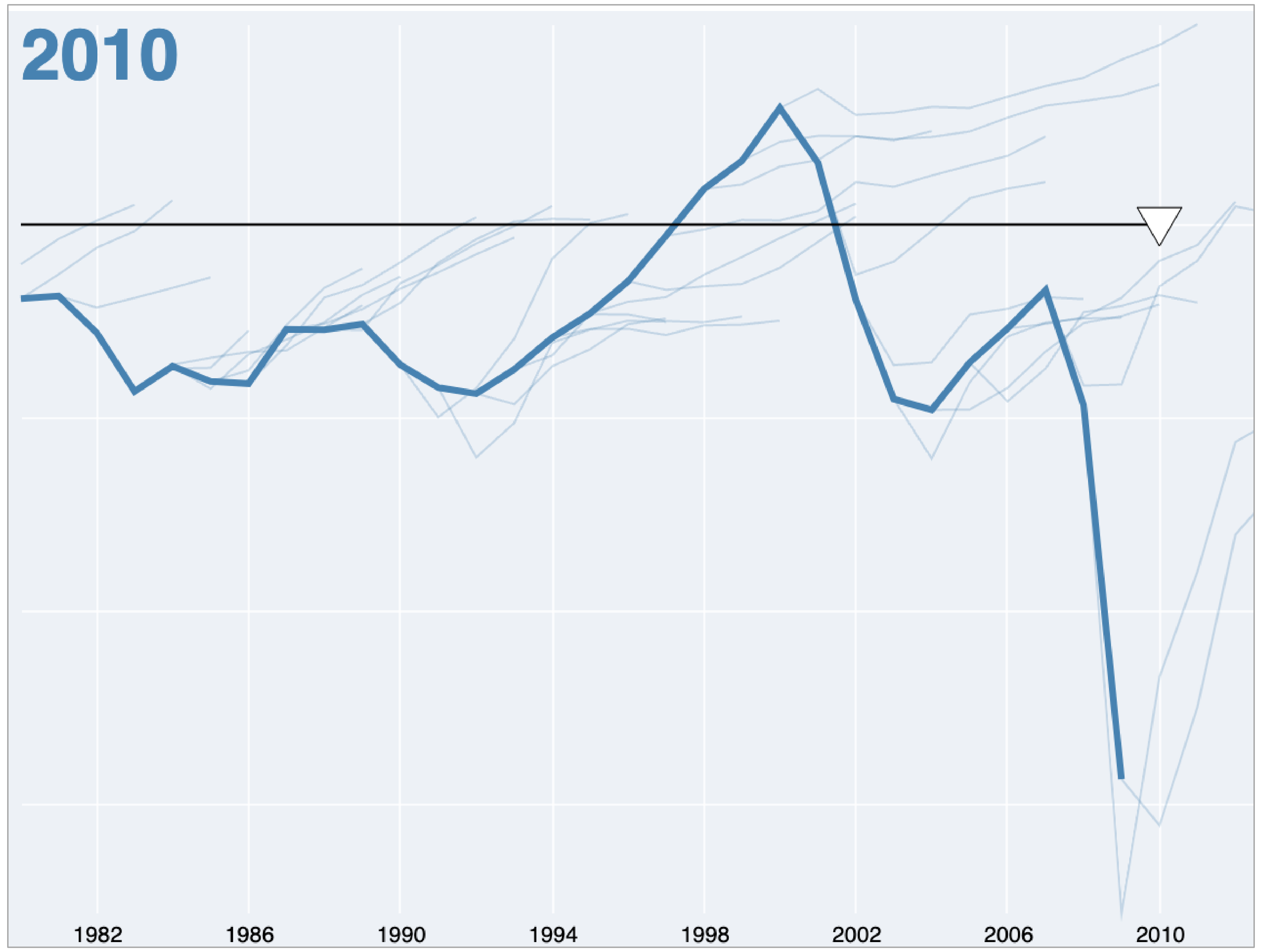
Standardize a data quality or completeness scoring system



Bank of England Fan Chart, 2017.

Provide past error & calibration info by default

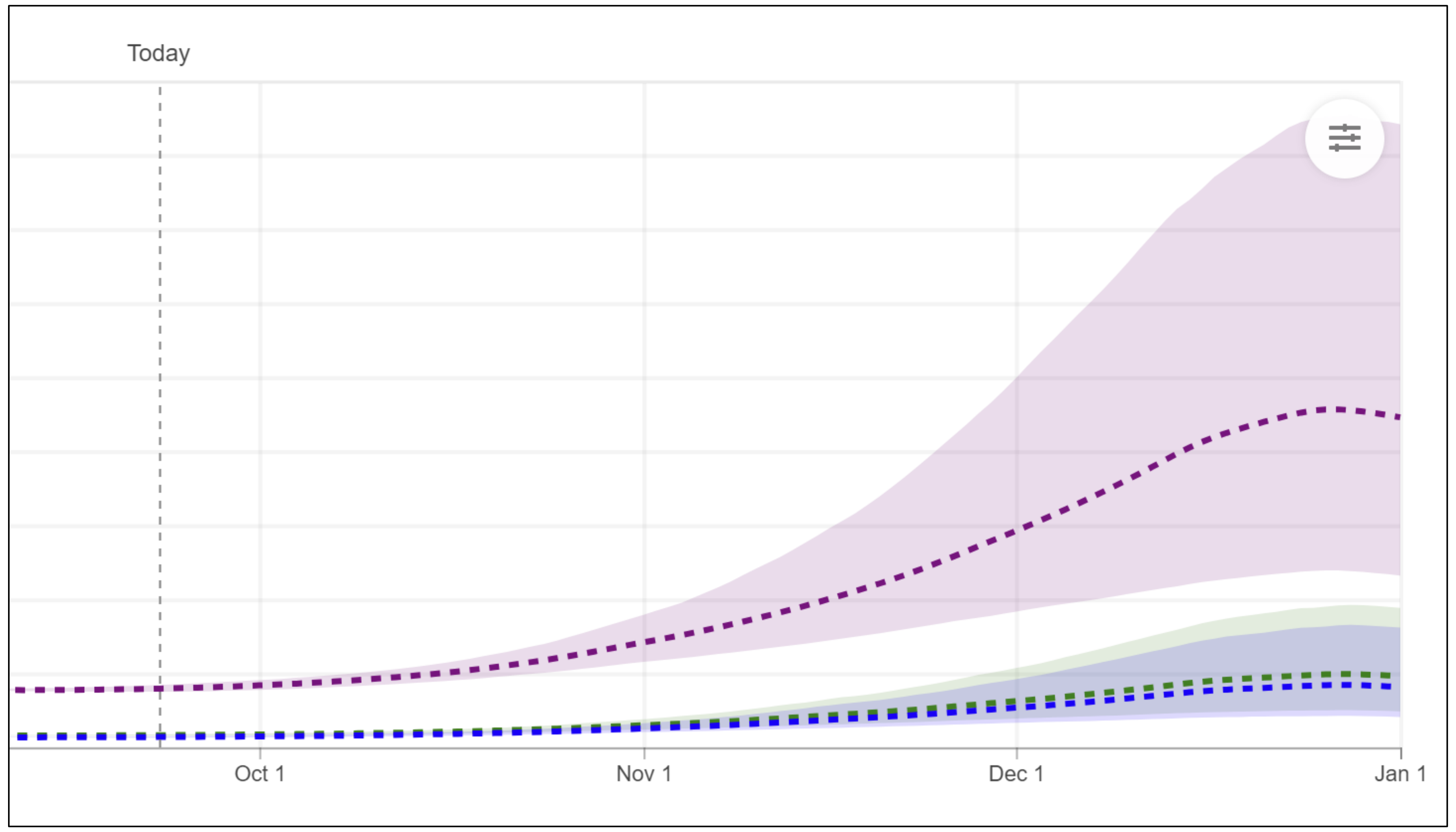
Accompany all new forecasts with prior prediction error in the same units/outcome spaces as the predictions.



Adaption of Cox (2012) NYTimes graphic.

Label partial expressions (i.e., of risk) incomplete

E.g., SEIR models that drove COVID-19 policy ignore behavioral, economic outcomes →
Label forecasts as hypothetical experiment results



UWashington IHME 2020

Report and/or acknowledge all expected forms of error (e.g., non-response and other non-sampling error), not just one type.

Back to Census: Transition to releasing “noisy” counts

What if government data looked imprecise?

Providing obviously imperfect measurements by default avoids the veneer of certitude, normalizing error, and will enable analysts to account for noise in inference.

There’s a simple solution to the latest census fight

Trust is important for ensuring participation in all future censuses, and confidentiality of responses is essential to maintaining trust.

By Cynthia Dwork, Ruth Greenwood, and Gary King Updated July 26, 2021, 3:00 a.m.

What is at stake: Trust in science

For trust in data-driven estimates and science, government communication must convey sources of uncertainty.

The legitimacy of government institutions is at stake.

See also:

Manski. The lure of incredible certitude.

Manski. Communicating uncertainty in policy analysis

Manski. Forming covid-19 policy under uncertainty.

boyd and Sarathy. Differential perspectives: Epistemic disconnects surrounding the US Census Bureau's use of differential privacy

Jessica Hullman

jhullman@northwestern.edu

users.eecs.northwestern.edu/~jhullman

mucollective.northwestern.edu

@JessicaHullman