

# **Discrete outcome encodings: Hypothetical outcome plots (HOPs)**

**SIADS 542: Presenting uncertainty – Week 3, Lecture 2**

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# Roadmap

- Week 1:      Introduction to uncertainty visualization  
                Types of uncertainty; **small** vs **large** world
- Week 2 & 3: **Small world uncertainty**  
                Continuous uncertainty encodings  
                Frequency-framing uncertainty encodings
- Week 4:      **Large world uncertainty**

# Today

Last time we talked about spaghetti plots

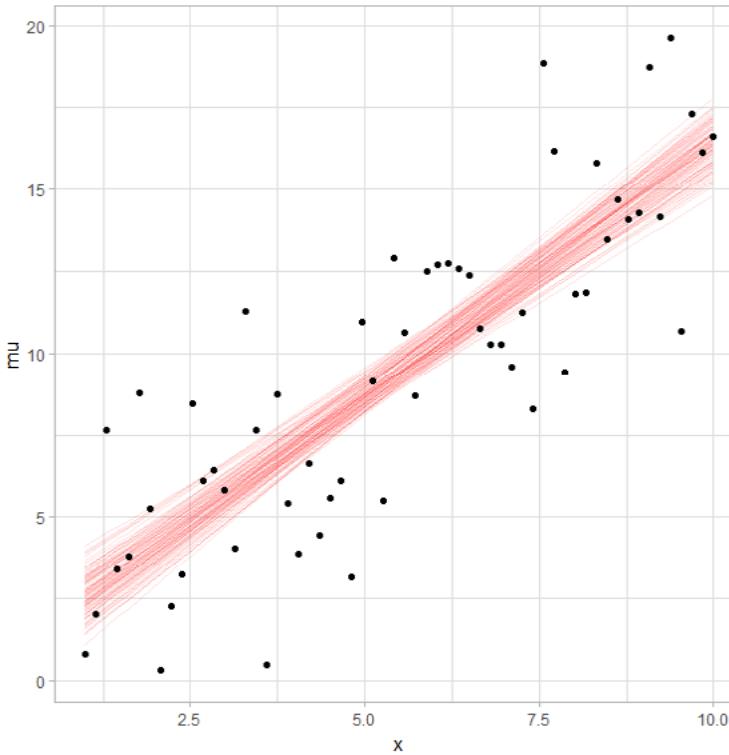
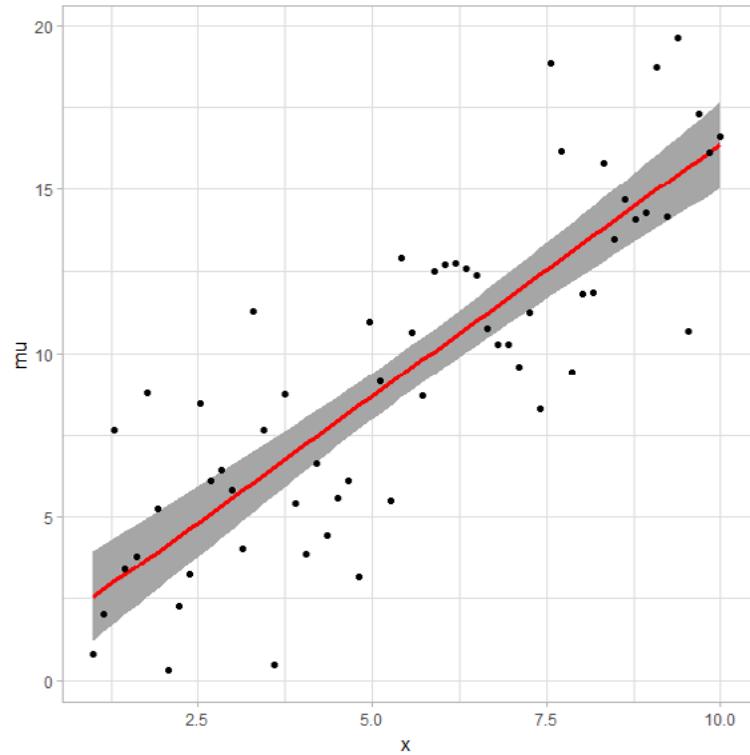
# Today

Last time we talked about spaghetti plots

Let's imagine what happens if we use animation  
to construct frequency-framing visualizations

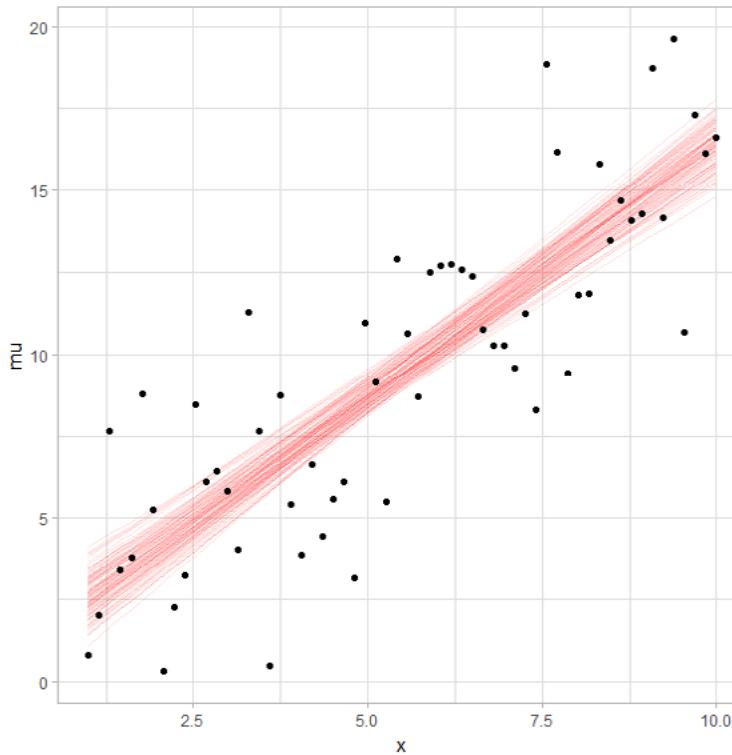
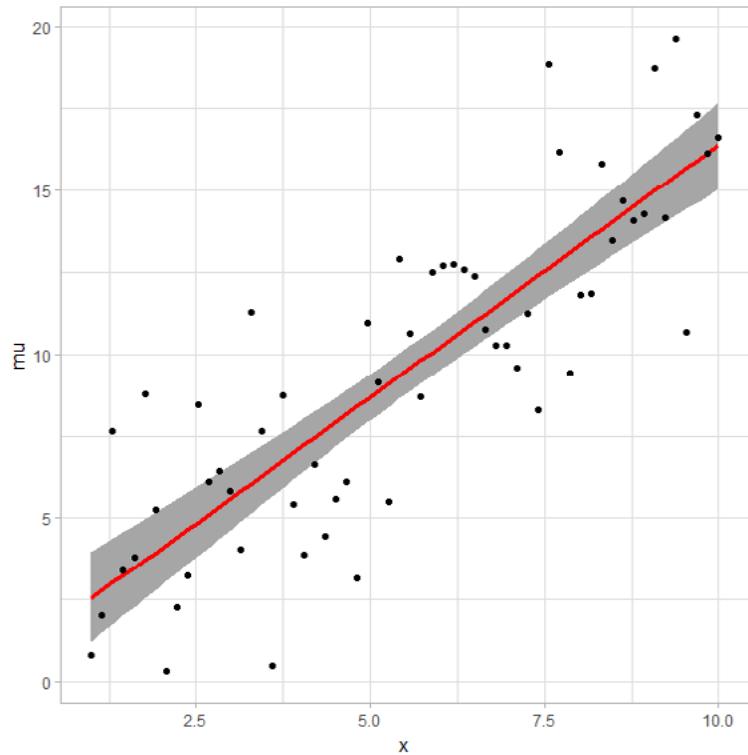
We'll start with fit line uncertainty again

# Fit line uncertainty

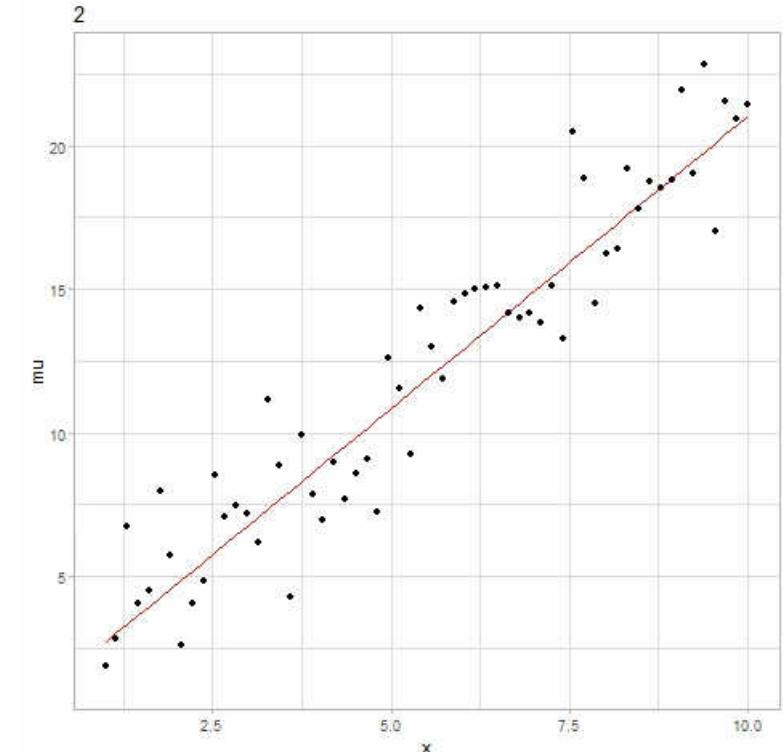


# Fit line uncertainty

[Hullman, Resnick, Adar. Hypothetical Outcome Plots Outperform Error Bars and Violin Plots for Inferences about Reliability of Variable Ordering. PloS One, 10(11). 2015]

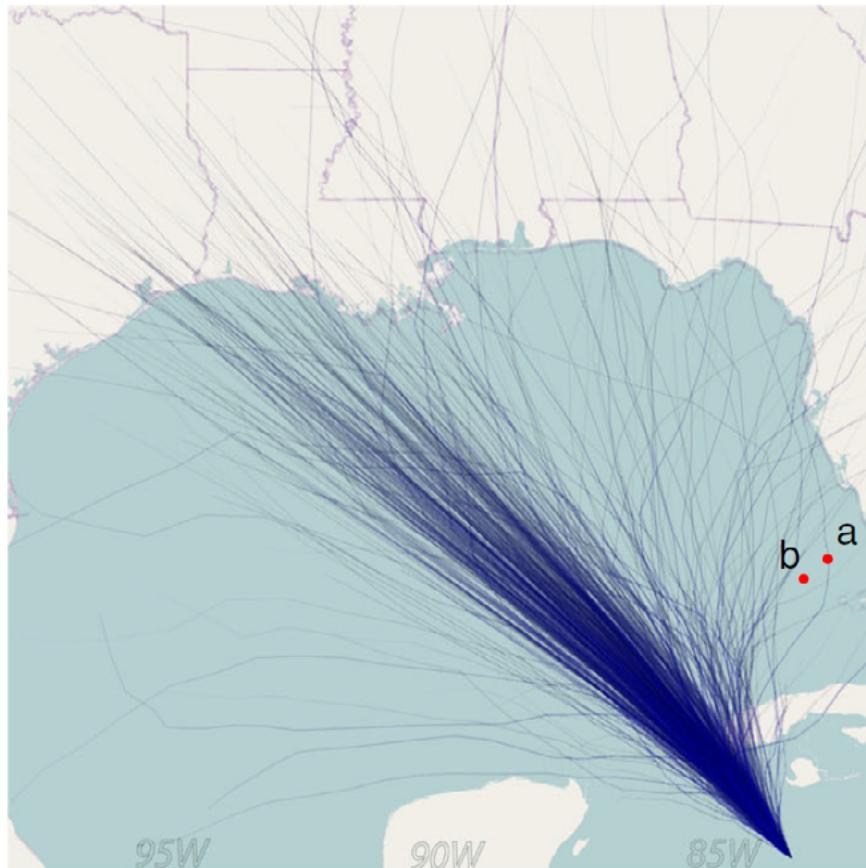


**Hypothetical outcome plots  
(HOPs)**



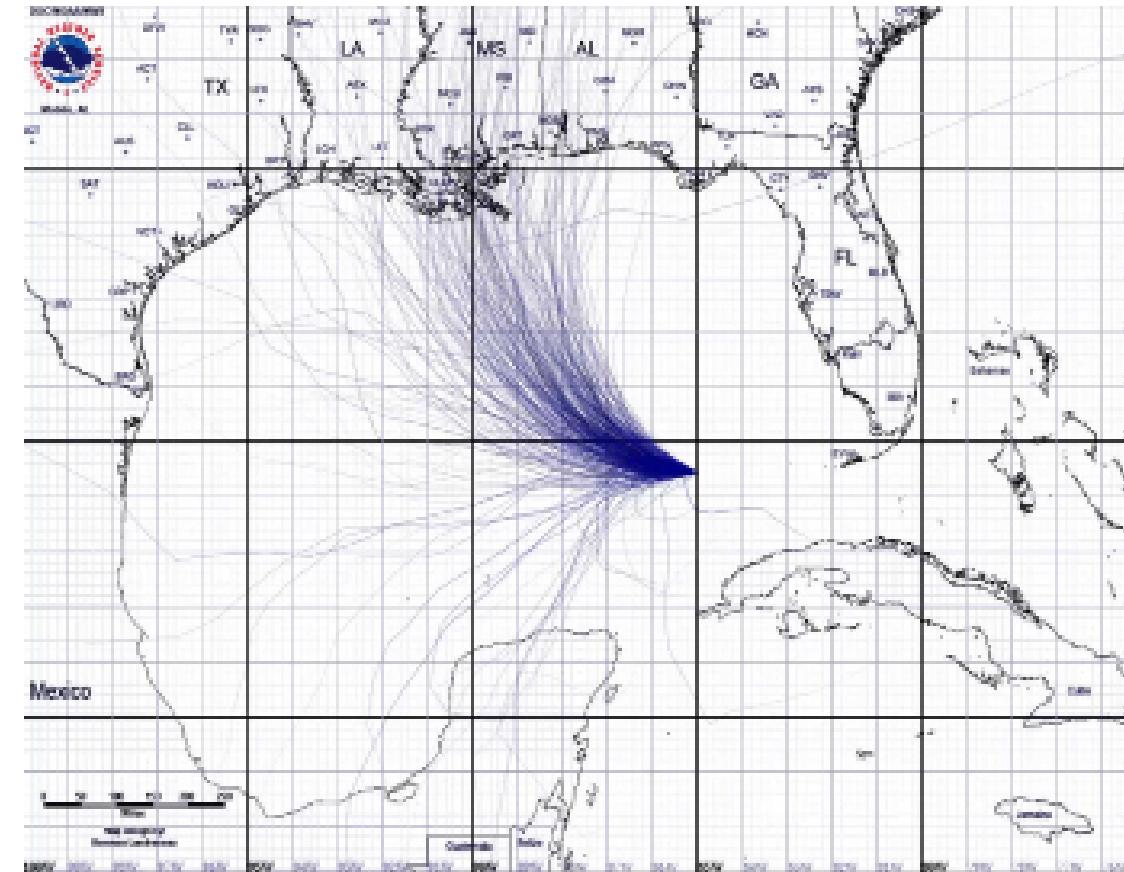
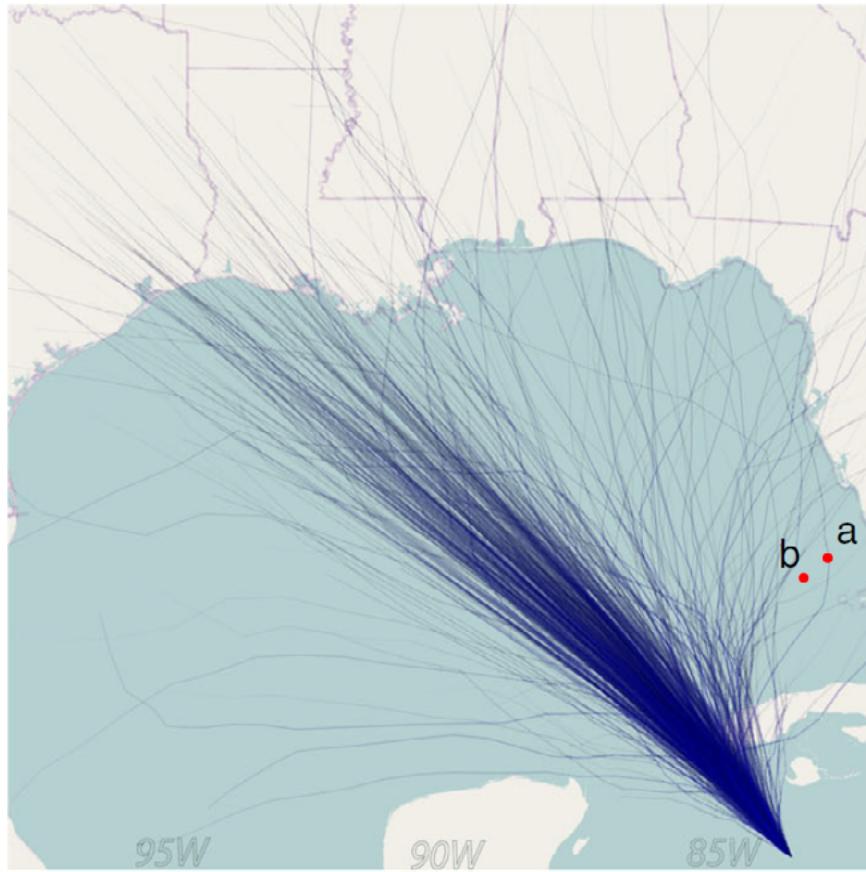
# HOPs might aid deterministic construal errors

[Cox, House, Lindell. Visualizing Uncertainty in Predicted Hurricane Tracks.  
International Journal for Uncertainty Quantification, 3(2), 143–156, 2013]



# HOPs might aid deterministic construal errors

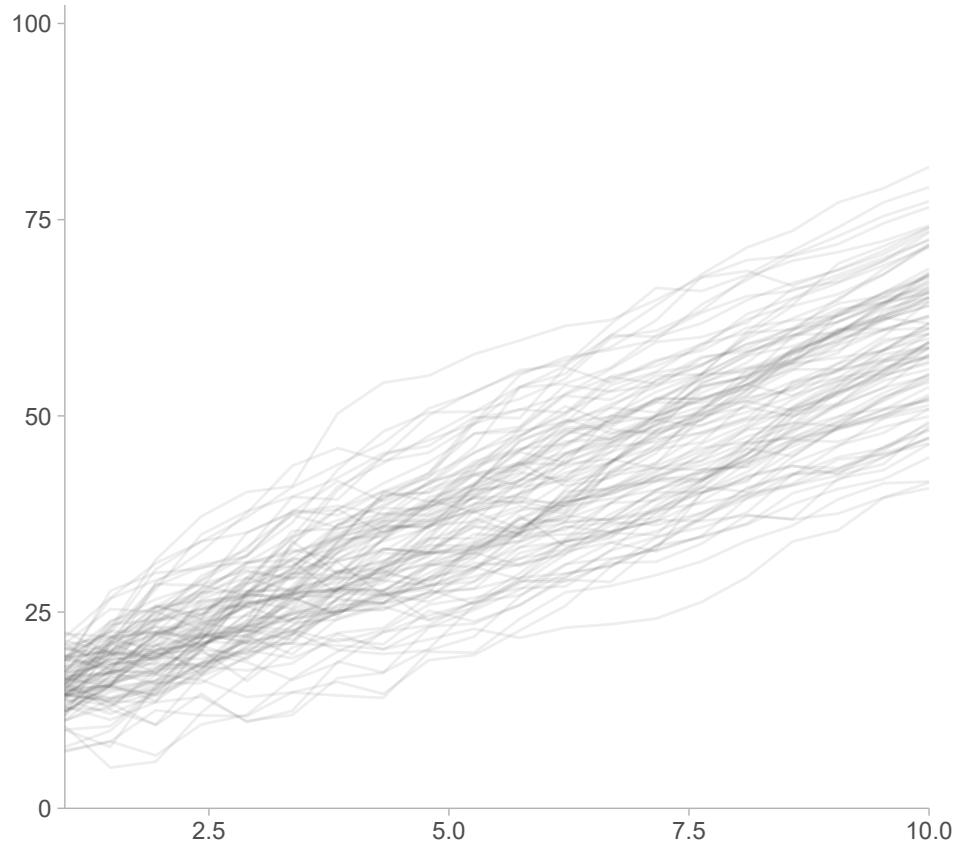
[Cox, House, Lindell. Visualizing Uncertainty in Predicted Hurricane Tracks.  
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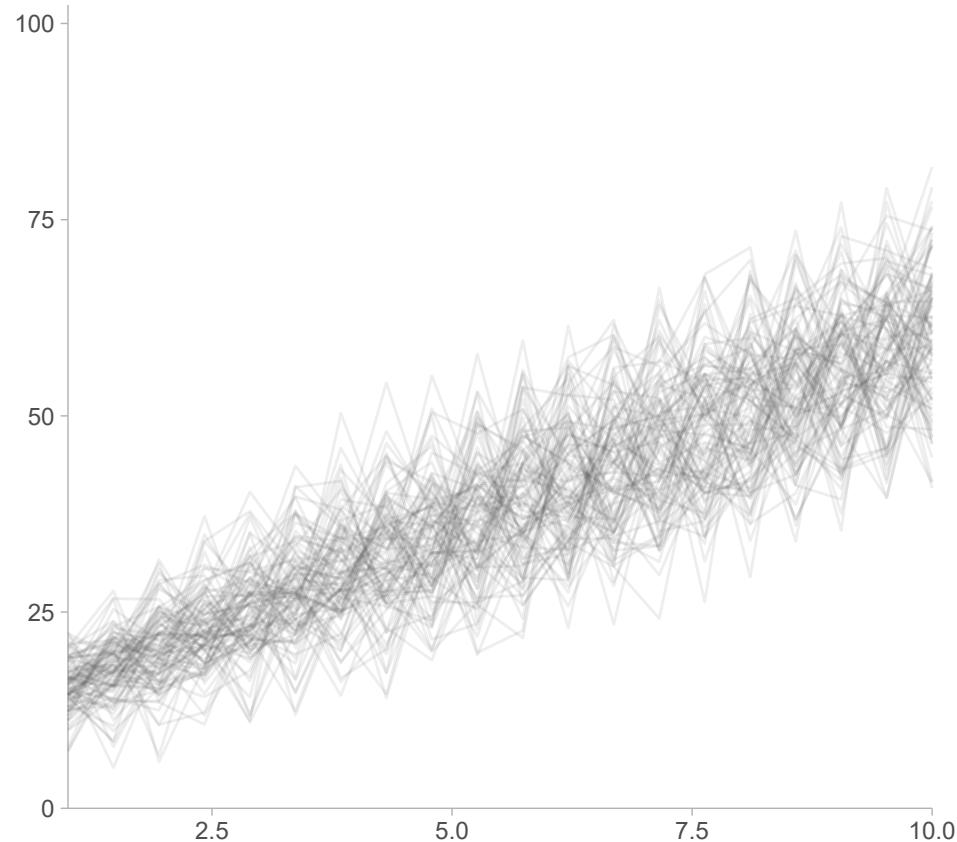
HOPs can also help when you have correlated distributions...

# Intervals obscure correlation

High correlation

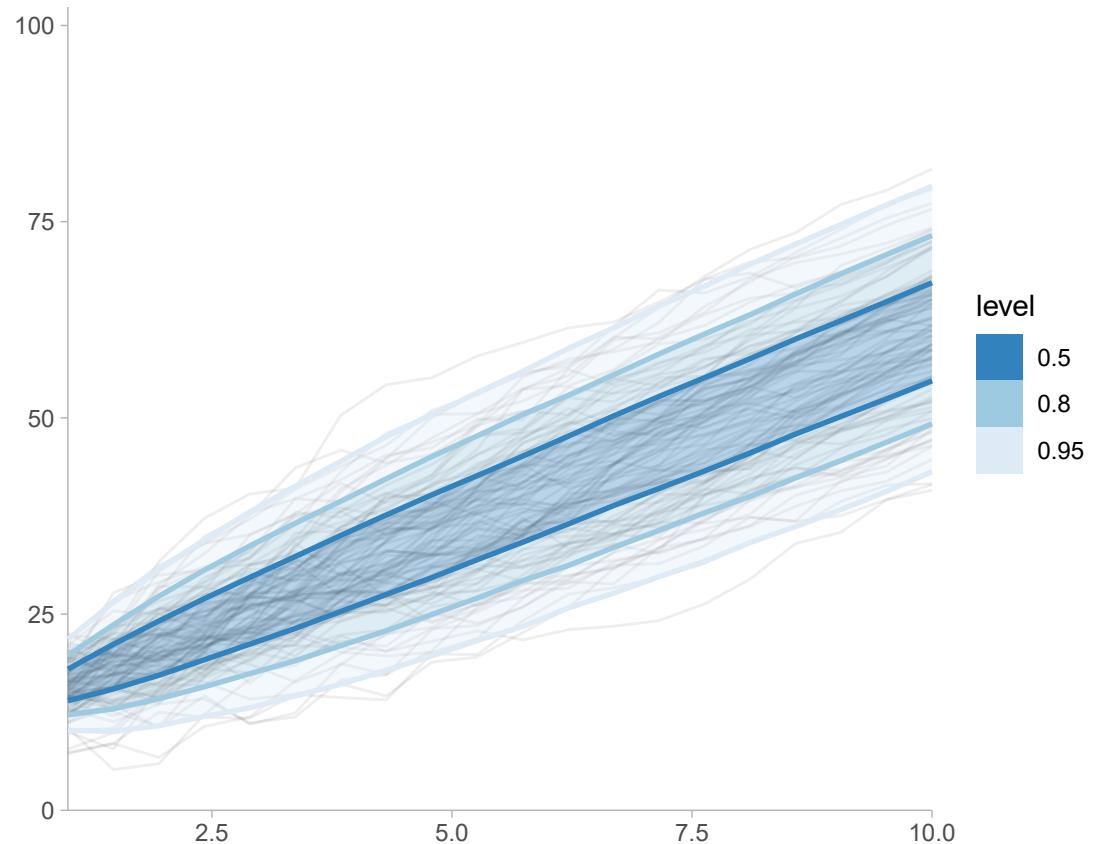


No correlation

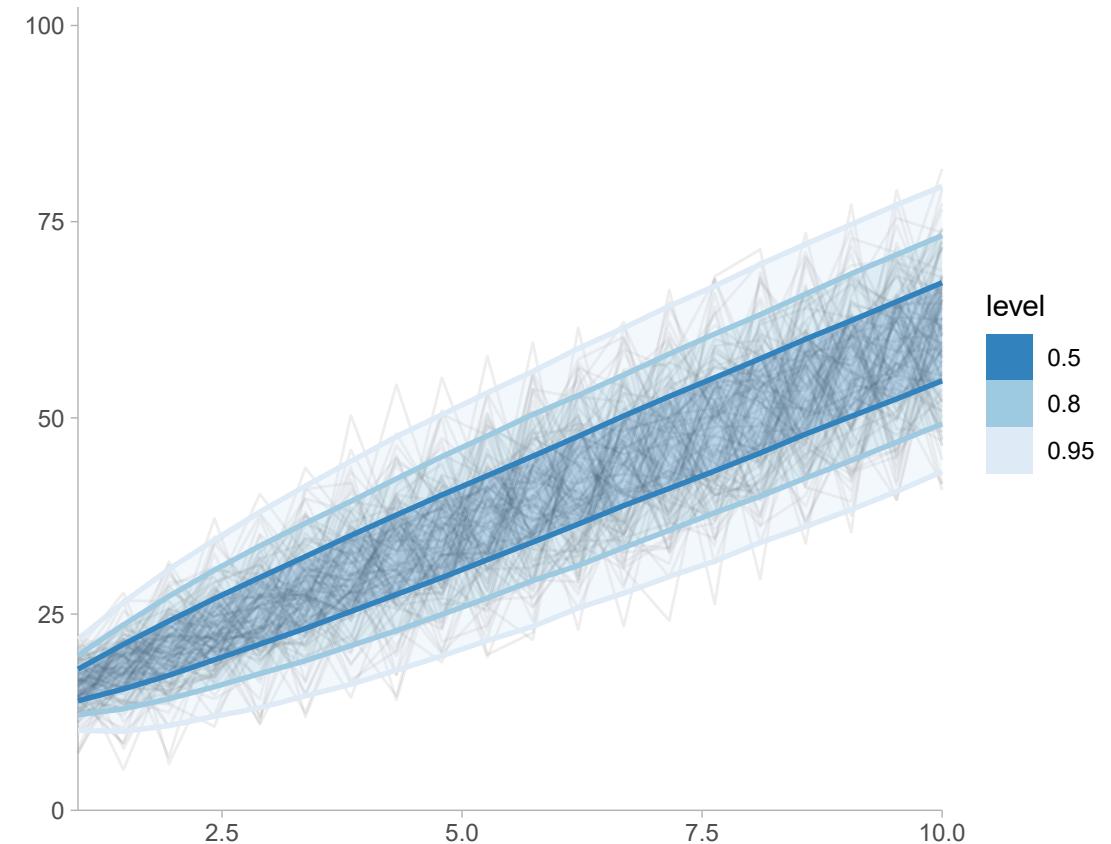


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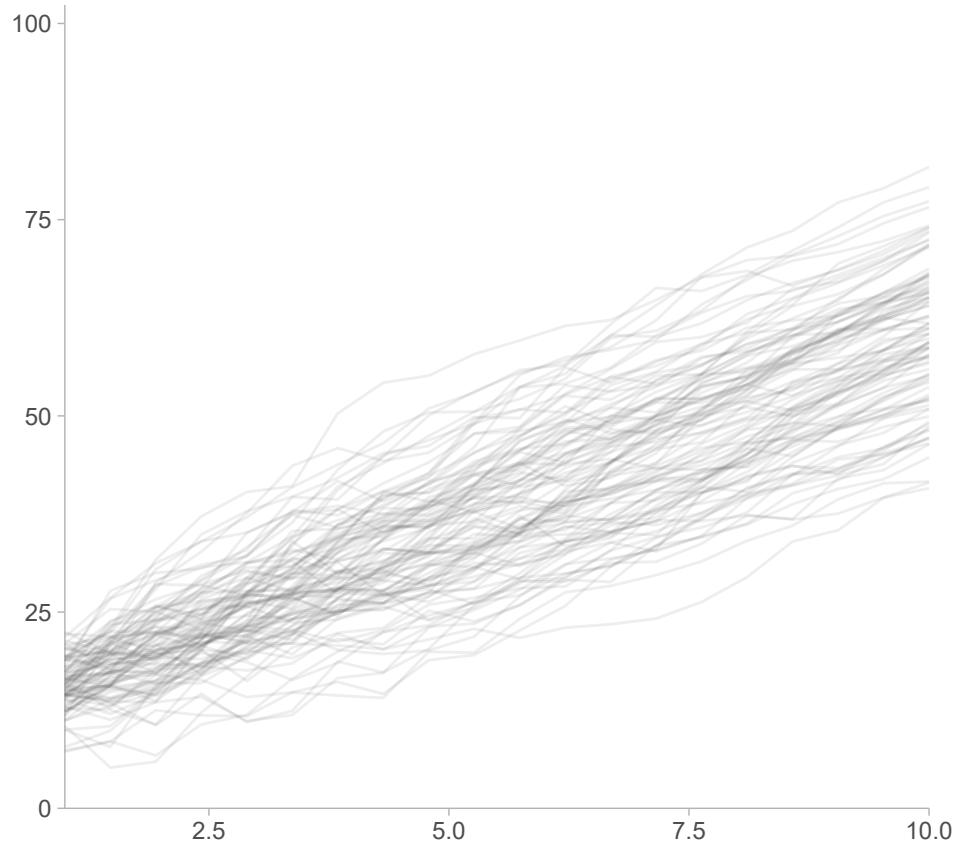


No correlation

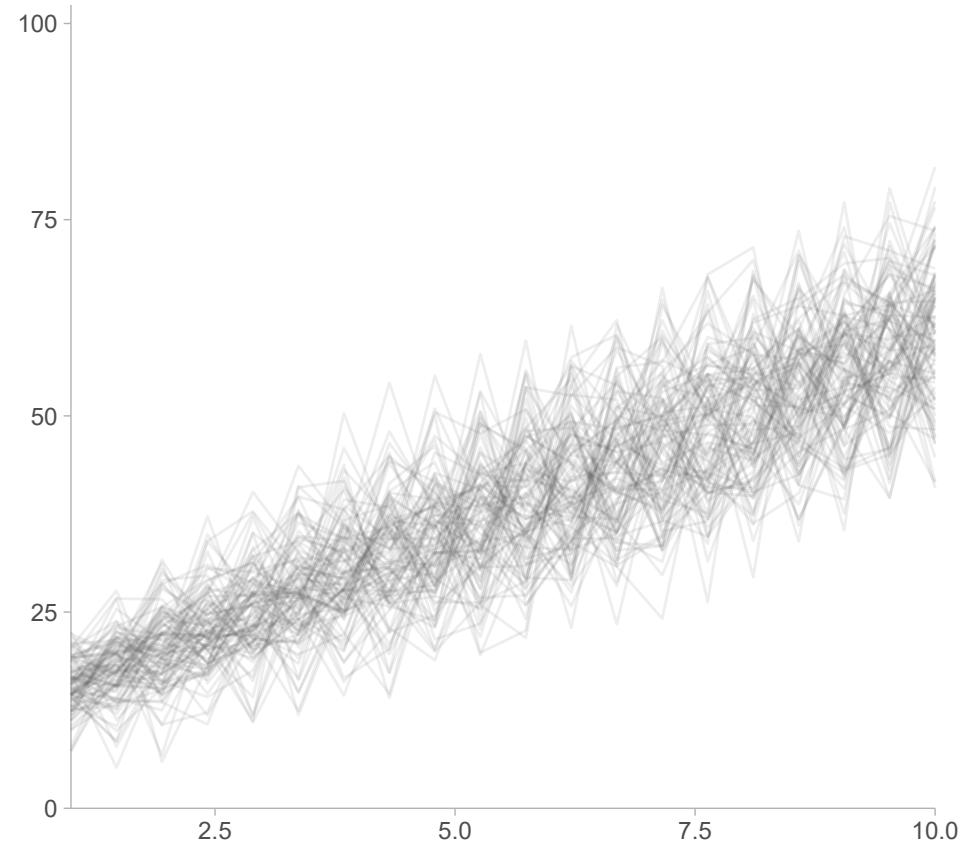


# Intervals obscure correlation

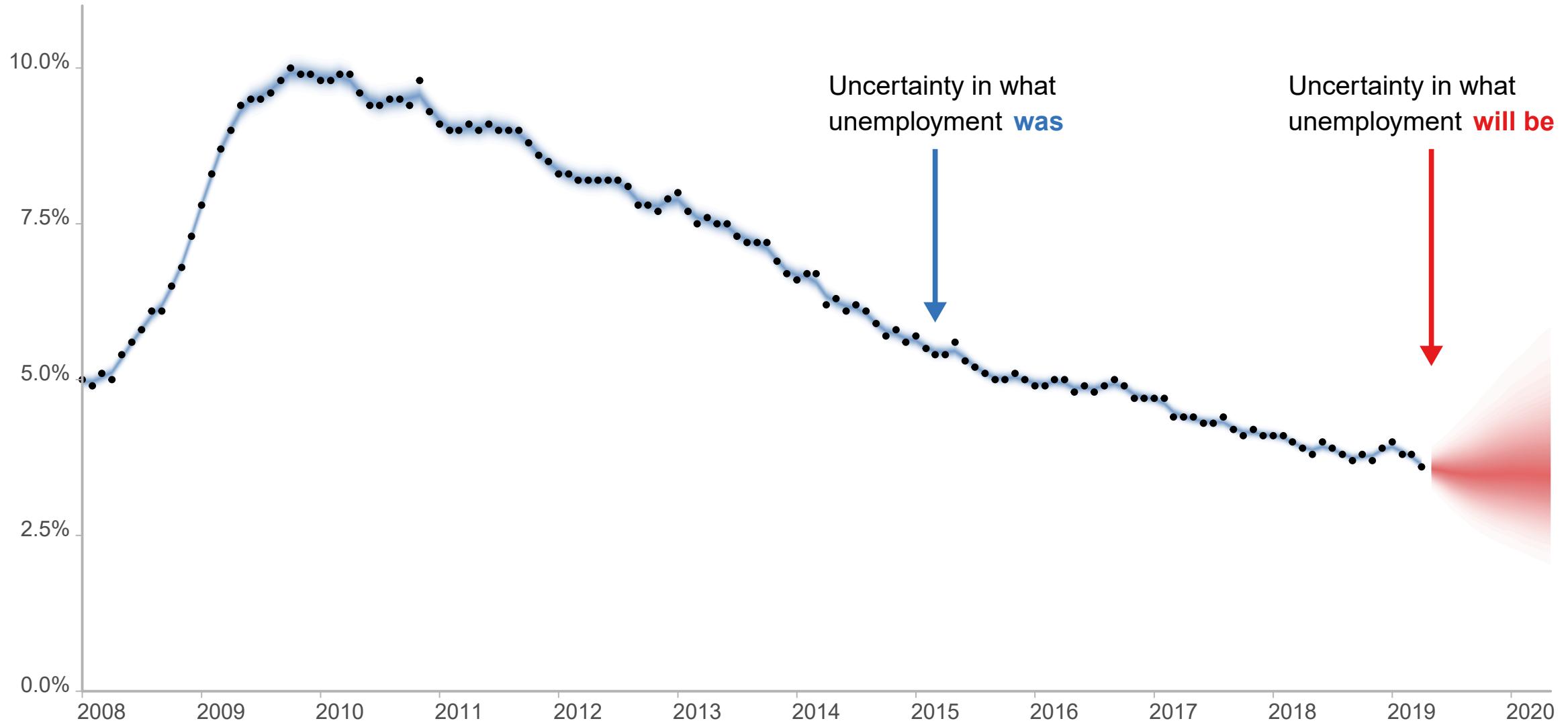
High correlation



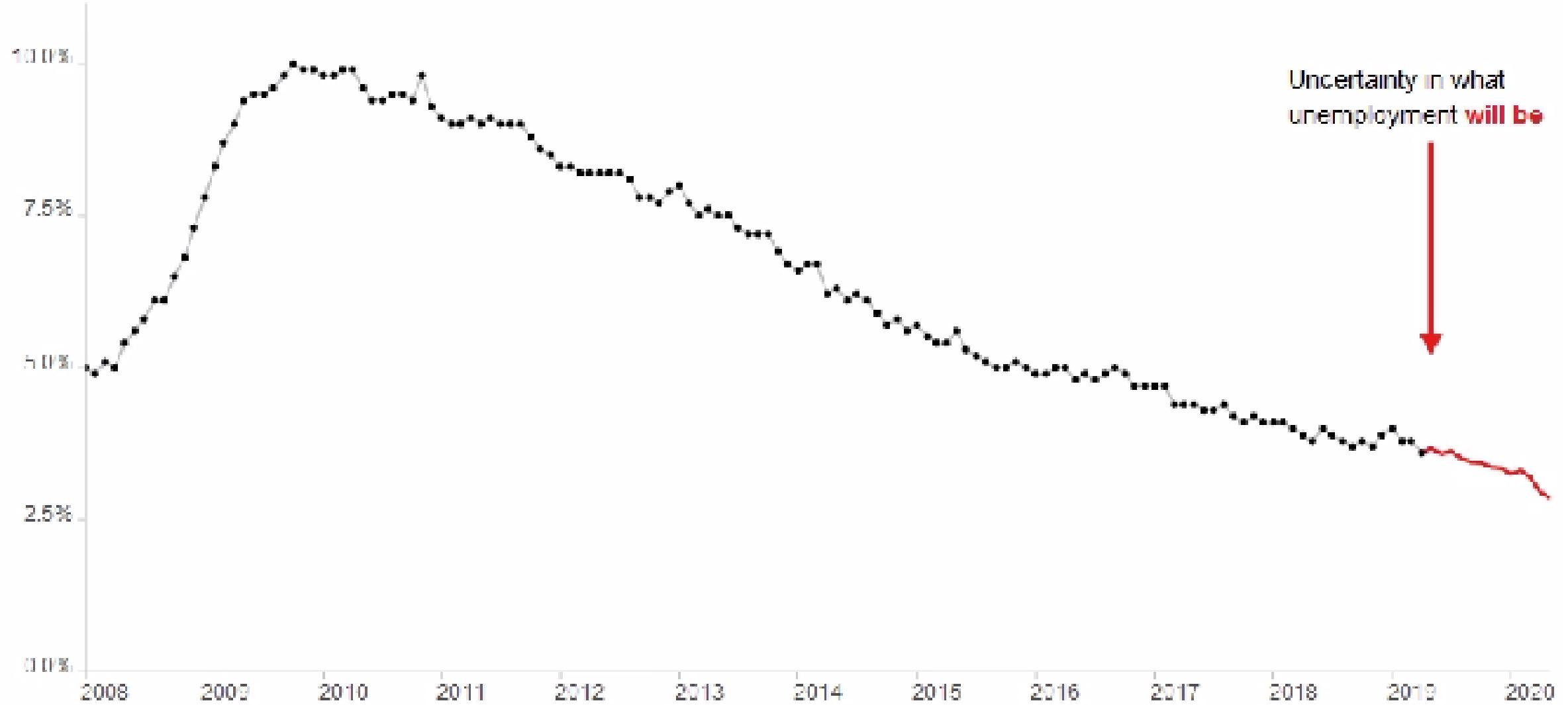
No correlation



## US unemployment over time

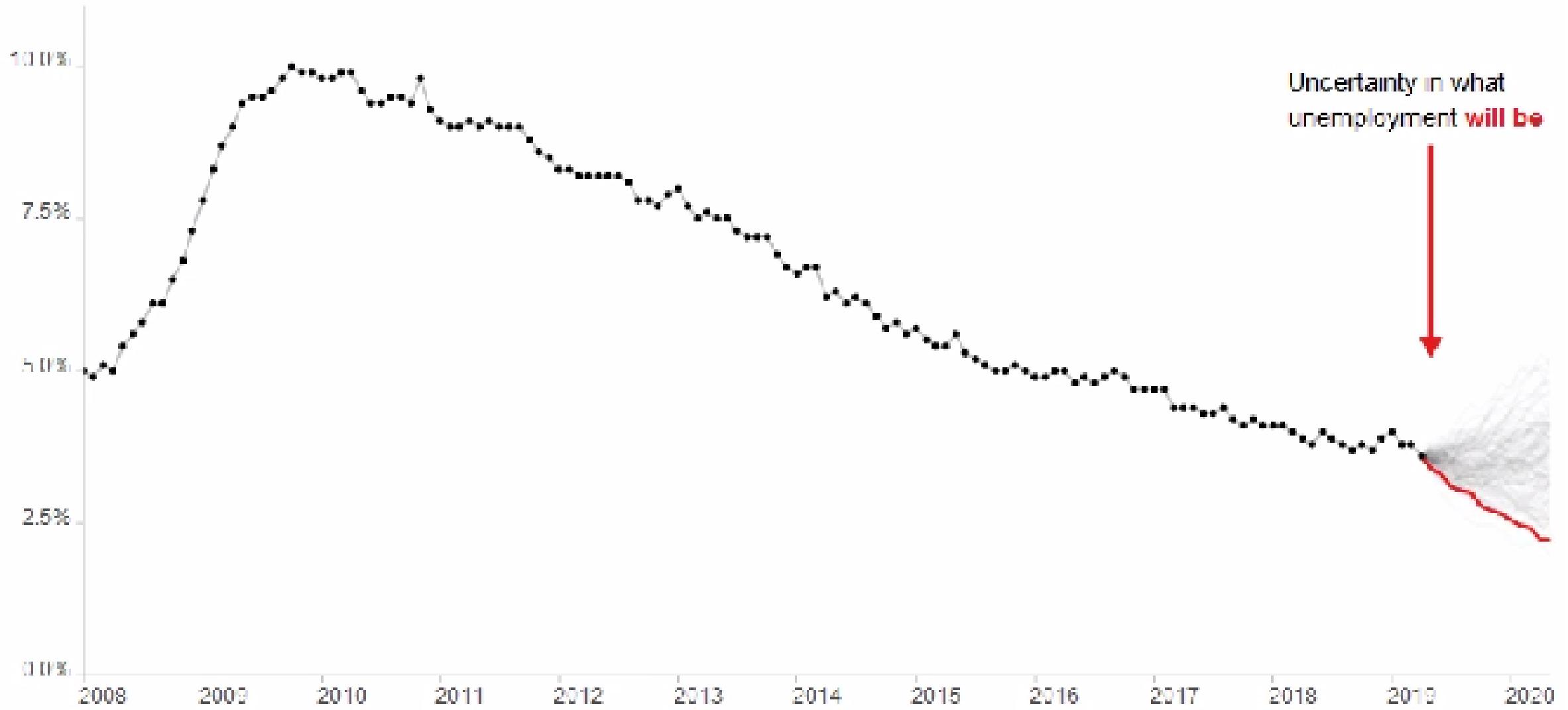


## US unemployment over time



Uncertainty in what  
unemployment **will be**

## US unemployment over time



# Summing up

# Hypothetical outcome plots (HOPs)

Implicit encoding for HOPs is temporal frequency  
(contrast to spaghettis, which are spatial frequency)

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HOPs mitigate deterministic construal errors

...and help show correlation between distributions  
(sometimes in ways spaghetti plots can't)

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