# Intro to Hypothesis Testing

Willem van den Boom

February 23, 2016

# Learning goals

- Understand basic ideas of hypothesis testing
- Familiarity with basic jargon
- Interpretation of $p$-values

# What is hypothesis testing?

- What is a hypothesis?

# What is hypothesis testing?

- What is a hypothesis?
- Null hypothesis
  $H_0$: At least 50% of the U.S. registered voters views the president favorable.

# What is hypothesis testing?

- What is a hypothesis?
- Null hypothesis
  $H_0$: At least 50% of the U.S. registered voters views the president favorable.
- Alternative hypothesis
  $H_1$: Less than 50% of the U.S. registered voters views the president favorable.

# How to do hypothesis testing?

# How to do hypothesis testing?

- Based on data, $Y$

# How to do hypothesis testing?

- Based on data, $Y$
  NBC/WSJ poll held from February 14 to 16 among 800 registered voters, 48% favorable

# How to do hypothesis testing?

- Based on data, $Y$
  NBC/WSJ poll held from February 14 to 16 among 800 registered voters, 48% favorable
- Probability of observing $Y$ or more different from $H_1$ under $H_0$

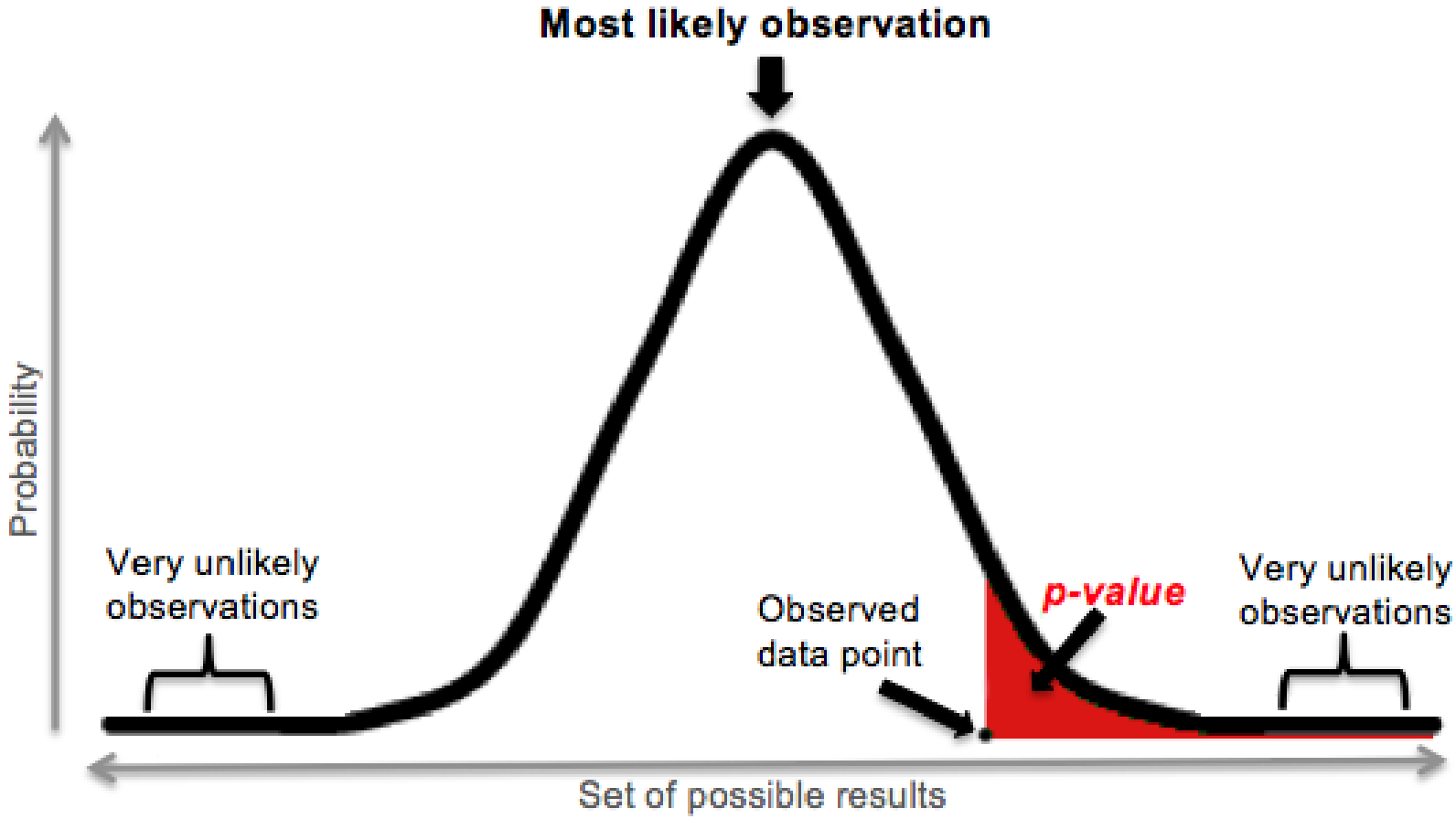
# How to do hypothesis testing?

- Based on data, $Y$
  NBC/WSJ poll held from February 14 to 16 among 800 registered voters, 48% favorable
- Probability of observing $Y$ or more different from $H_1$ under $H_0$
  What is the probability of getting 48% or less in the poll if 50% of the U.S. population views the president favorable.

# How to do hypothesis testing?

- Based on data, $Y$
  NBC/WSJ poll held from February 14 to 16 among 800 registered voters, 48% favorable
- Probability of observing $Y$ or more different from $H_1$ under $H_0$
  What is the probability of getting 48% or less in the poll if 50% of the U.S. population views the president favorable.
  $p$-value
  $p = 0.13$

# How to do hypothesis testing?




**A *p-value* (shaded red area) is the probability of an observed (or more extreme) result arising by chance**

# How to do hypothesis testing?

- Based on data, $Y$
  NBC/WSJ poll held from February 14 to 16 among 800 registered voters, 48% favorable
- Probability of observing $Y$ or more different from $H_1$ under $H_0$
  What is the probability of getting 48% or less in the poll if 50% of the U.S. population views the president favorable.
  $p$-value
  $p = 0.13$
- Reject $H_0$ if $p < \alpha$ where $\alpha$ is the significance level.

# Learning goals

- Understand basic ideas of hypothesis testing
- Familiarity with basic jargon
  $H_0$, $H_1$, $p$-value, significance level
- Basic interpretation of $p$-values