

The likelihood and friends

The probability of each value of y

- What does this mean?

$$y_i \sim N(\mu, \sigma)$$

- We can also write this as:

$$P(y | \mu, \sigma)$$

The likelihood of y



- By the product rule:

$$P(\mu, \sigma | y) \propto P(y | \mu, \sigma)P(\mu, \sigma)$$

- $P(\mu, \sigma) = P(\mu)P(\sigma)$: the prior distribution
- $P(\mu, \sigma | y)$: The posterior distribution
- ~~$P(y)$~~ : A constant, the "evidence" Not necessary for inference, usually ignored

The posterior distribution

The encoding of our inference

- We can use the posterior distribution to understand what our data says about our parameter values
- By finding the posterior $P(\mu, \sigma | y)$, we can infer the most probable values for the parameters.
- So, we just need to define the ingredients:
 - $P(\mu), P(\sigma), P(y_i | \mu, \sigma)$

- A full model:

$$y_i \sim N(\mu, \sigma)$$

$$\mu \sim N(0, 1)$$

$$\sigma \sim \text{Exp}(1)$$