Why Bayes

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Why Bayes?

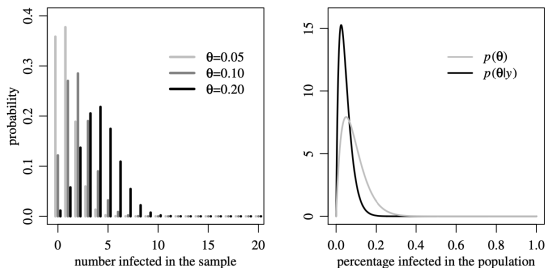# Why Bayes?

Estimating the probability of a rare event

Description of problem

TODO

From prior to posterior

Fig. 1.1. Sampling model, prior and posterior distributions for the infection rate example. The plot on the left-hand side gives binomial$(20, \theta)$ distributions for three values of θ. The right-hand side gives prior (gray) and posterior (black) densities of θ.

Prior

$$\theta \sim \text{Beta}(2, 20)$$
$$\mathbb{E}[\theta] = 0.09$$
$$\text{mode}[\theta] = 0.05$$
$$P(\theta < 0.10) = 0.64$$
$$P(0.05 < \theta < 0.20) = 0.66$$

Posterior

$$\theta \mid \{Y = 0\} \sim \text{Beta}(4, 20)$$
$$\mathbb{E}[\theta \mid \{Y = 0\}] = 0.048$$
$$\text{mode}[\theta \mid \{Y = 0\}] = 0.025$$
$$P(\theta < 0.10 \mid \{Y = 0\}) = 0.93$$