Bayes' Rule for Single Event

- single hypothesis H, single event E
  $P(H|E) = (P(E|H) * P(H)) / P(E)$
  or
- $P(H|E) = (P(E|H) * P(H) /$
  $(P(E|H) * P(H) + P(E|\neg H) * P(\neg H))$

Bayes Example: Diagnosing Meningitis

- Suppose we know that
  - Stiff neck is a symptom in 50% of meningitis cases
  - Meningitis (m) occurs in 1/50,000 patients
  - Stiff neck (s) occurs in 1/20 patients
- Then
  - $P(s|m) = 0.5$, $P(m) = 1/50000$, $P(s) = 1/20$
  - $P(m|s) = (P(s|m)\ P(m))/P(s)$
    $= (0.5 \times 1/50000) / 1/20 = .0002$
- So we expect that one in 5000 patients with a stiff neck to have meningitis.