HYPERGEOMETRIC DISTRIBUTION

A set contains N items, M of which are "successes" and the rest are "failures." A sample of n items is selected without replacement (each subset of size n is equally likely to be chosen). Let X be the number of successes in the sample. Then $X \sim \text{Hypergeometric}(n, M, N)$.

pmf: $$P(X = x) = \frac{\binom{M}{x}\binom{N-M}{n-x}}{\binom{N}{n}}$$

QUESTION: What values of x have nonzero probability?

- Number of successes bound: $x \leq M$
- Sample size bound: $x \leq n$

$\left. \right\}$ $x \leq \min(M, n)$

- Nonnegative sample: $0 \leq x$
- Number of failures bound: $n - x \leq N - M$ or $n - N + M \leq x$

$$\max(0, n - N + M) \leq x$$

R: $\text{dhyper}(x, M, N-M, n)$

value $\nearrow$
successes $\nearrow$
failures $\nearrow$
sample size $\nearrow$

Mathematica: $\text{PDF}[\text{HypergeometricDistribution}[n, M, N], x]$