Closed and Exact Sequential and Multistage Inference with Binary Response

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We consider closed sequential or multistage sampling, with or without replacement, from a lot of N items, where each item can be identified as defective (in error, tainted, etc.) or not. The goal is inference on the proportion π of defectives in the lot, or equivalently on the number of defectives in the lot $D = N\pi$. Until just a few years ago, inference on π was typically done approximately, even with a fixed sample size (binomial for hypergeometric, normal or Poisson for binomial, Monte-Carlo based boundaries/inference, etc). In this talk we show that exact inference on using closed (bounded) sequential or multistage procedures with general pre-specified elimination boundaries is completely tractable and not at all inconvenient using modern statistical software. Functions for this purpose written in `R` (`www.R-project.org`) are demonstrated. Our focus is on frequentist inference, but exact Bayesian approaches are readily available. Examples provided are (1) a sharpening of Wald's (1947) SPRT used in industrial acceptance sampling; and (2) two-stage sampling for auditing Medicare healthcare providers.

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