Identifying entitlement to share in a class action settlement

Abraham D. Flaxman and Steven E. Pav

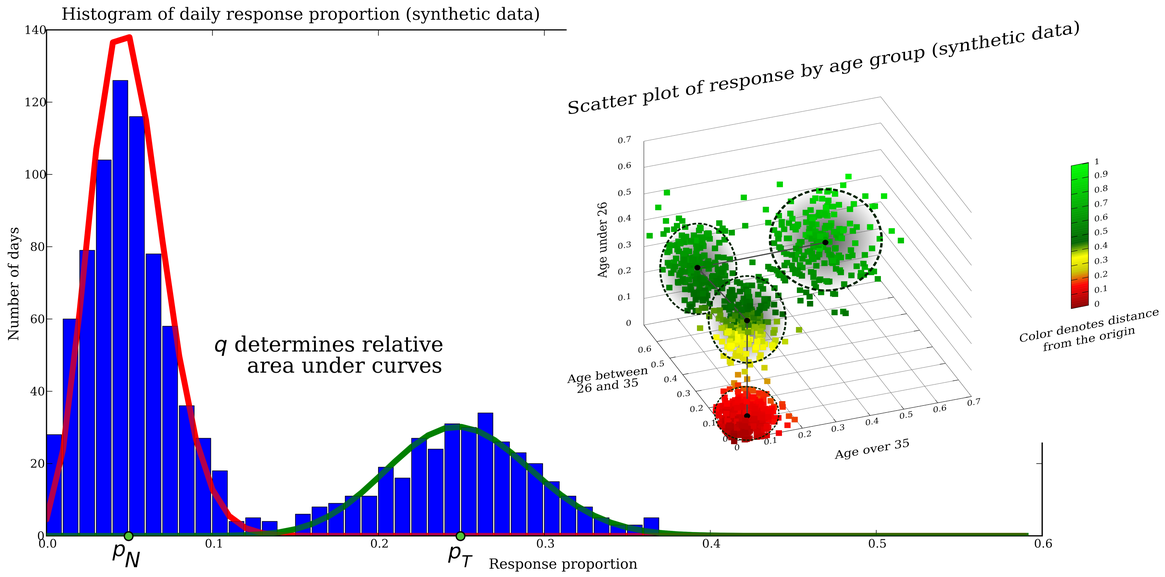
Cook County settles jail suit for $3.2 million, lawyers must distribute settlement

Photo of an arrest in progress. Between June, 2004 and January, 2007, around 20% of the men arrested in Cook County, IL received forced STD testing.
(Photo from http://www.flickr.com/photos/striatic/4081481/)

- Over a 3 year period, men processed in the Cook County (IL) jail were often forced to undergo a urethral swab STD test.
- In 2007, the county settled a class action lawsuit about this testing, agreeing to pay out about 3.2 million dollars.
- It is unknown who exactly is entitled to a portion of the settlement. We will use non-linear optimization to find out.

Available data

- There were approximately 250,000 admittances to the jail between 2004 and 2007. For each, we know the admit date, birth date, and a number identifying the arrestee.
- Each STD test required a separate swab kit and about 32,000 test kits were purchased.
- The official policy varied:
  - During one period, most men under age 36 were tested.
  - During another period, most men under 26 were tested.
- In practice, sometimes the policy was followed and sometimes it was not
- On some days, there is an official record of how many tests were performed.
- Soon, we will know who claims to be a member to the class.



Simulation showing possible response-per-day results for men who were arrested once during the 3 year period. The histogram above shows under-36-year-olds arrested once with testing on 30% of days, 25% response rate for tested, and 5% response rate for non-tested. The scatter plot above shows 20% testing days for each age range, 40% response rate for tested, 5% response rate for non-tested.

Objective function and constraints:

- Maximize number of class members who receive their portion of settlement.
- Give portion of settlement to at most 32,000 people.

Optimization may provide a superior alternative to the traditional approach...

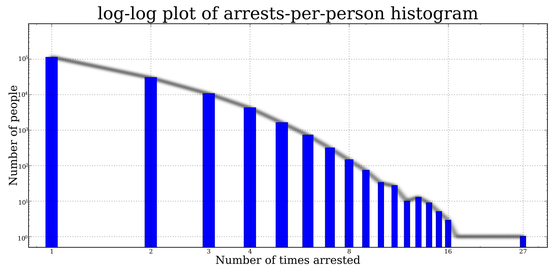
Three parameter model

- Each day, with probability q, some of the men processed are tested, and, with probability $1\text{-}q$, no testing occurs.
- Each man responds independently, identically at random, saying he was tested with probability p_T if he was tested and with probability p_N if he was not tested.
- The probability that, of n men processed on a given day, k respond to the letter saying that they were tested is given by

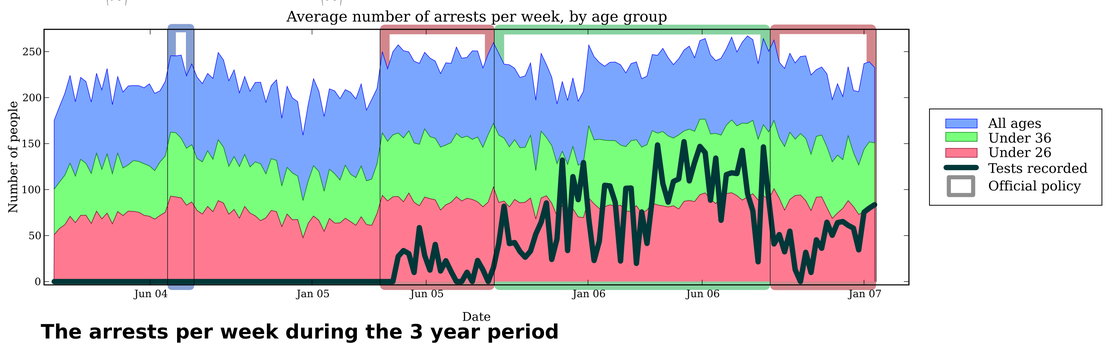
$$q\binom{n}{k}p_T^k(1-p_T)^{n-k}+(1-q)\binom{n}{k}p_N^k(1-p_N)^{n-k}$$

Why the three parameter model and its direct extensions might not work

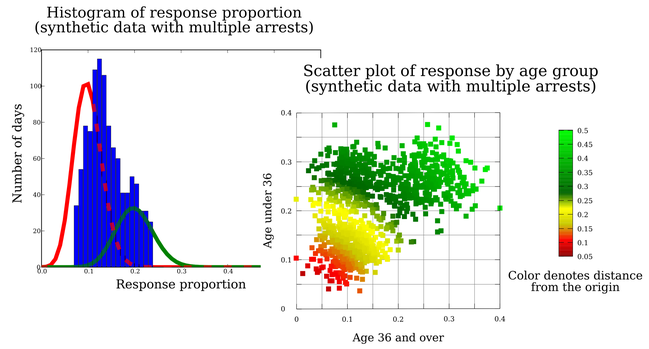
- Many arrestees were arrested more than once during the 3 year period.
- Each arrestee only receives one questionnaire, so a response from a multiple-arrestee does not indicate on which day the search occurred.
- This introduces a positive correlation between the response rates.



The number of times arrested during the 3 year period has a heavy-tailed distribution



The arrests per week during the 3 year period



The effects of multiple arrests are to introduce noise and bias in the response-per-day statistics. The histogram above shows under-36-year-olds with testing on 30% of days, 20% response rate for tested, 10% response rate for non-tested. The scatter plot above shows testing on 30% of days for 50% of under-36-year-olds, 30% of days for 50% of all, with 40% response rate for tested and 5% response rate for non-tested.

Beyond the three parameter model

A four parameter model that is more difficult to deal with:

- Each day is a testing day or non-testing day, randomly with probability q_D.
- On a testing day, each arrestee is tested with probability q_M.
- Each arrestee responds independently at random, saying he was tested with probability p_T if he was tested and with probability p_N if he was not tested.

The probability of a response profile can still be calculated for given parameters, but the calculation is considerably more difficult, requiring *belief propagation*.

A urethral swab used to diagnose chlamydia. 32,000 test swabs were purchased by the Cook County jail during a 3 year period.

When the claims of class membership are available, we will determine what level of analysis is necessary to identify entitlement