Focalization of surveillance in control of infestation

March 3, 2015

1 Introduction

We consider the problem of optimization of control of chirimachas in a given area. The setting is as follows.

- Chiris were detected in the area.
- In the initial response, the focus of infestation within the area is attacked with persticides. The infested houses are sprayed, and neighboring houses are also checked and sprayed going to potentially to the entire manzano and beyond.
- The next phase is unclear and needs optimization.
  - Complete inspection and spray of the area (CI): this strategy would systematically visit every house in the area and spray.
  - Focal attack and Spray (FS): Spray the focal area but active a systematical multi-year surveillance program which would detect and attack it.
- CI promises to find any possible infested house, but it is obviously very costly and, becase of the scale, might not allow sufficiently high sensitivity to detection. FS promises to be targetted and efficient, but might miss infestation.
- Our study would help decide which strategy would be best based on
  - Total cost
  - Probability of failed detection

2 Methods

The model will consider the following factors

- distribution of infested premises in the landscape
  - q, the prevalence density in the area
- p_c and p_f, the sensitivity (probability of detection per house) under CI and FS. Because of the large scale of the CI efforts, p_c would involve less trained staff thus generally $p_c < p_f$.
- c_i and c_s cost of inspection and spray per house, under both strategies
- r_c, r_p under FS, cost of a eliciting a report and the probability of it being positive (assumes optimal strategy of elicitation, such as posters, public advertisement, etc)
- v_f and y_f in FS, mean number of houses visited per focus and the number of houses yielding detection.

Question: what's the relationship between p_f, y_f and q?

3 Results

We will use decision-theoretic methods to determine the outcomes, and identify threshold values of the parameters. At those values, the optimal strategy switches.

4 Discussion

Cogito ergo sum.