

Stat 8801 Case Study 5: Lead

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Recap of Situation

In this case study, the clients worry about children playing in soil contaminated by lead and possibly eating it. Attorneys want to sue the companies, gasoline or paint manufacturers, whose products caused this contamination. The clients would like to estimate how much lead is in the soil to decide whether it came from house paint or from car exhausts.

Possible Issues with Study

- How to deal with the issue that people change or add soil?
- Are there other sources causing soil contaminated by lead?

Questions for Client

- How to sample soil? How much amount of soil do the clients want to sample? How deep to get soil?
- Are there better ways to estimate the amount of lead except measuring it in soil?
- How many samples can we take within time and money constraints?
- Do we need permission from homeowners or business owners before taking these samples? This may affect sampling scheme.
- Does soil composition matter for soil analysis?

Methods to Analyze the Data

Sampling scheme: we would like to propose stratified sampling in this case. First, we can use GPS coordinate to find proportional of roads, houses, parks, schools, freeways and shops to this neighborhood. Second, we can calculate the relative size of the six samples by using sampling fraction. Third, after we have the relative size of the six samples, we can do the random sampling.

Statistical analysis: we calculate the descriptive statistics of contamination by gasoline or paint manufacturers and then do two-sample t-test to determine which company caused the contamination. Also, we can do completely randomized design (CRD) to see gasoline or paint manufacturers effect is significant.