Evaluating Publication Rules for the County Agricultural Production Survey Using Simulation

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Disclaimer

- The findings and conclusions in this presentation are those of the author and should not be construed to represent any official USDA or U.S. Government determination or policy.

County Agricultural Production Survey

- Annual Survey
  - Small Grains
  - Row Crops

- Publication of county level estimates of planted and harvested acreage – yield and production

- 2019 and earlier publication rule:
  - 30 reports
    OR
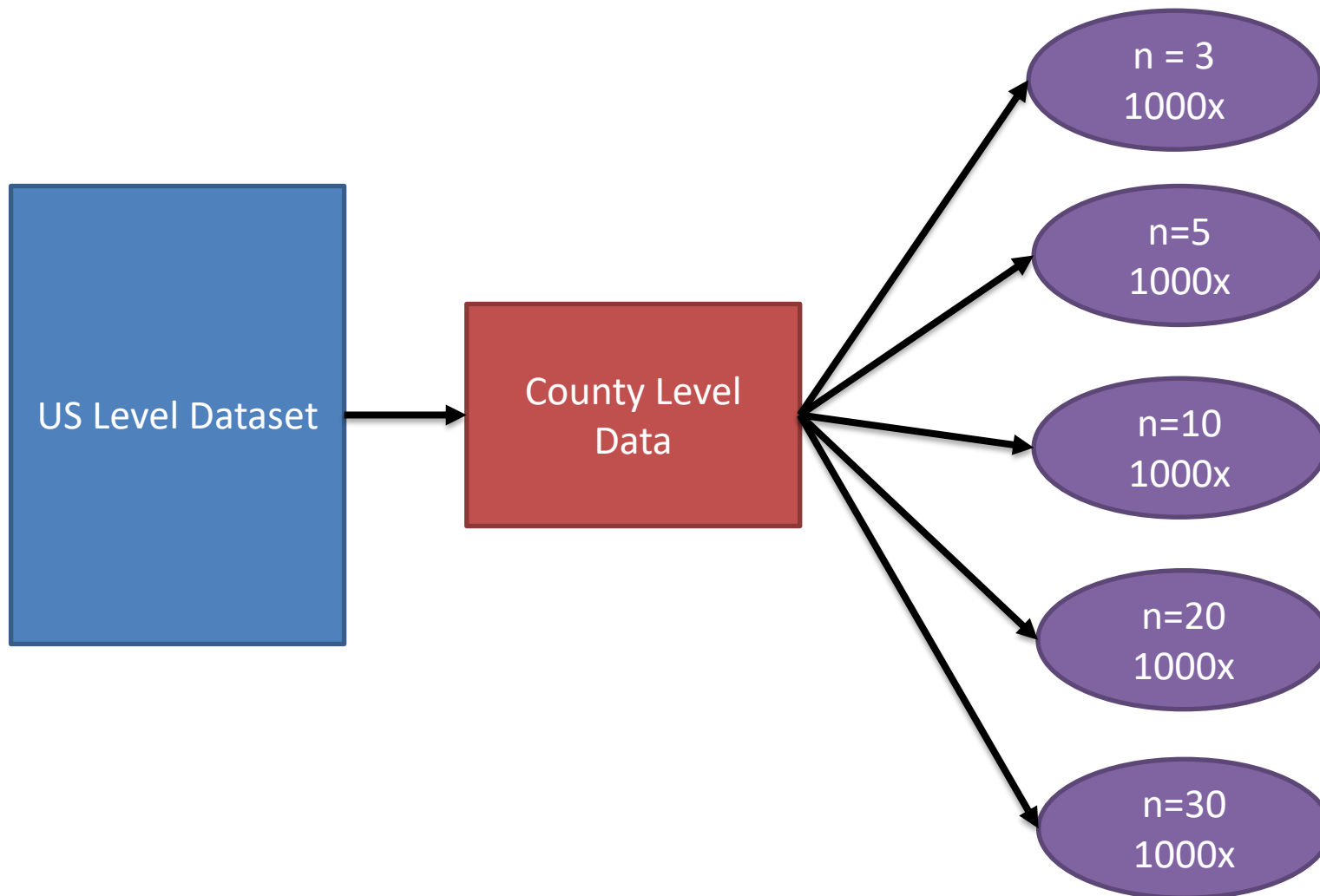 - 3+ reports AND >= 25% coverage.

Goals/Objectives

- Publish accurate estimates

- Publish as much as possible

Administrative Data

- USDA program

- Excellent Coverage

- For this simulation, treating as the population.

Monte Carlo Simulation

US Level Dataset → County Level Data →

- n = 3 1000x
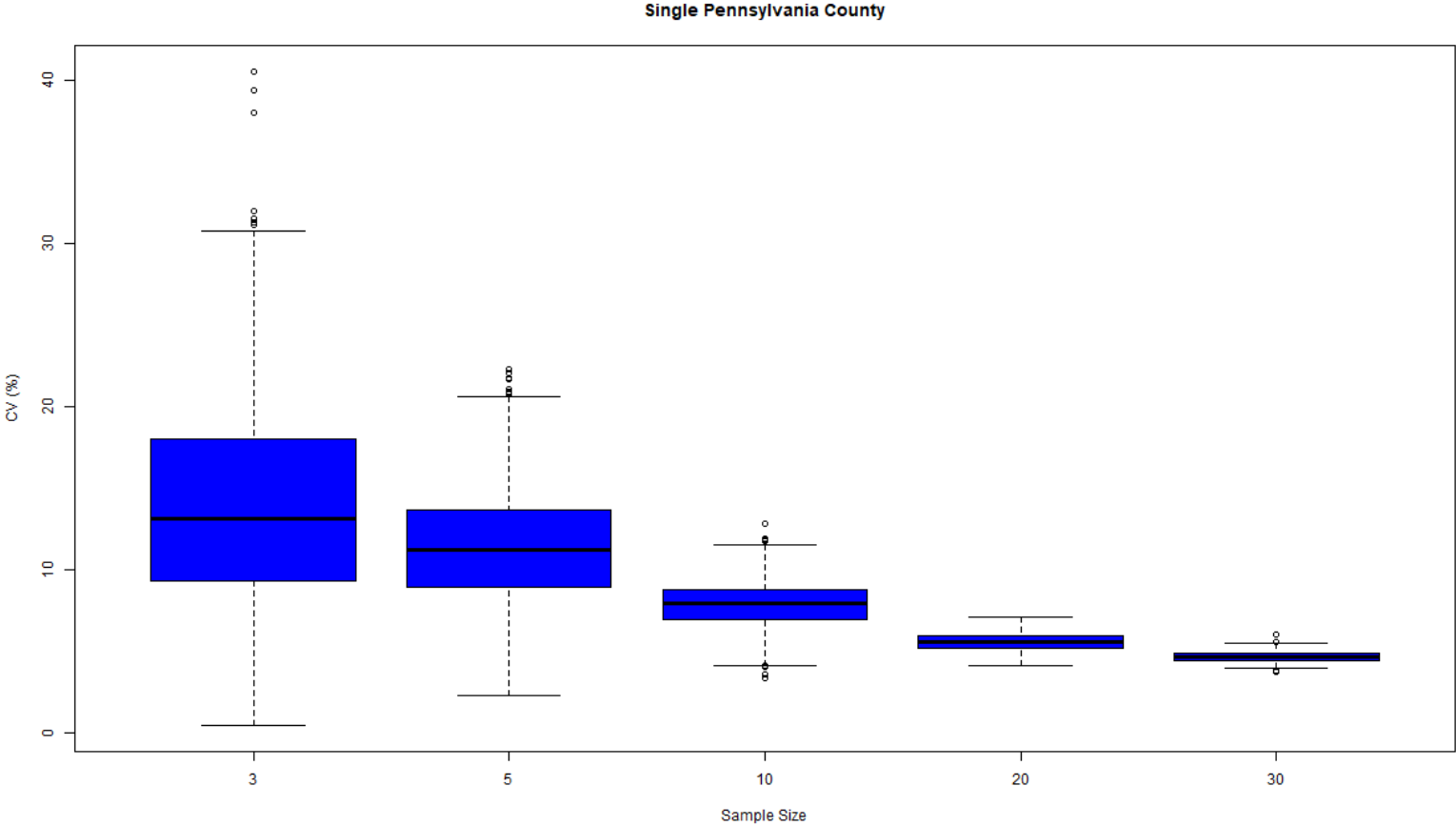- n=5 1000x
- n=10 1000x
- n=20 1000x
- n=30 1000x

Simulation Design

- Probability Proportionate to Size (PPS)

- Weighted Yield (Ratio Production/Acres)

- Variance Estimated

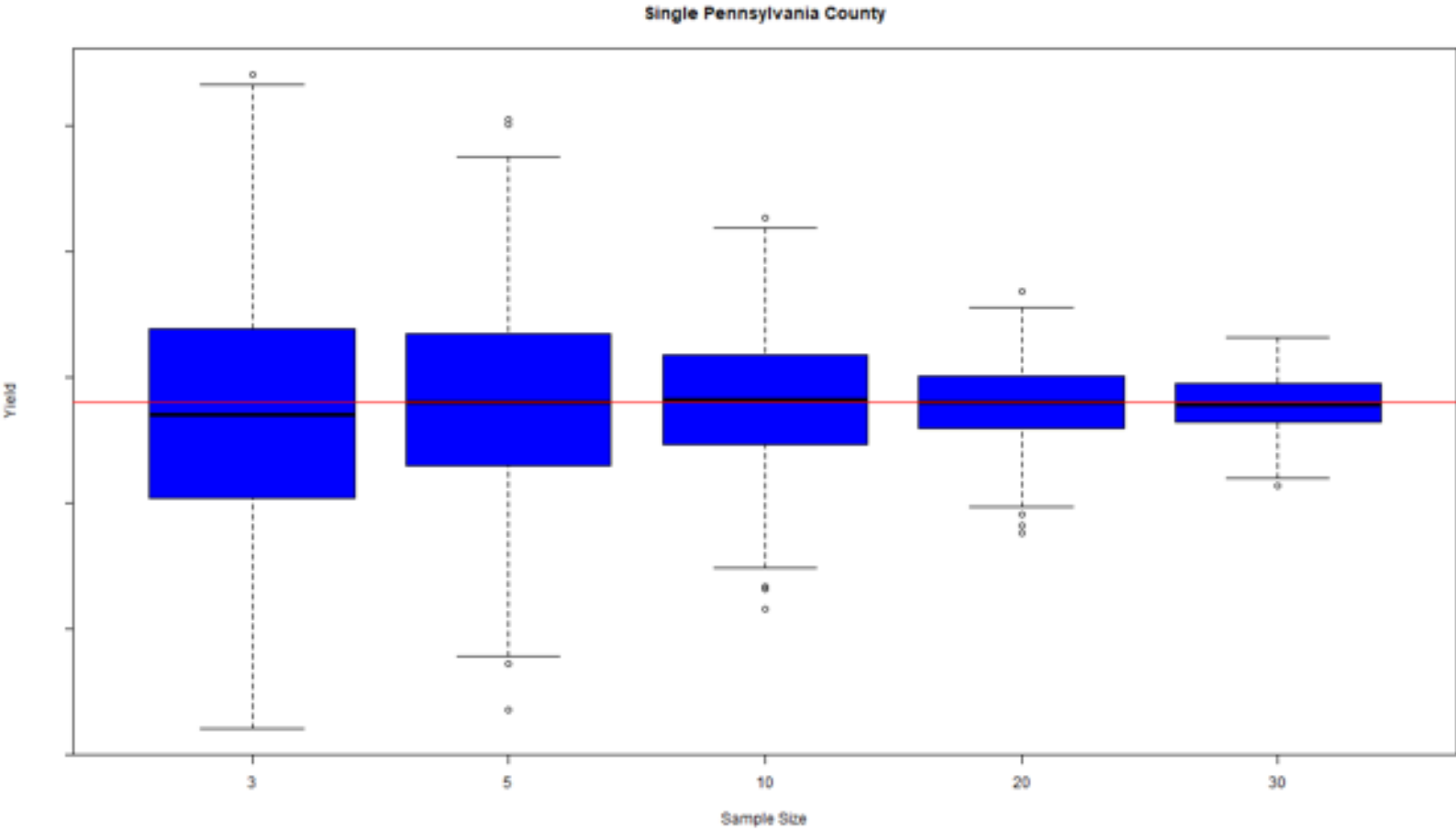- Coefficient of Variation Calculated

Pennsylvania County Example
Coefficient of Variation (CV)

Single Pennsylvania County
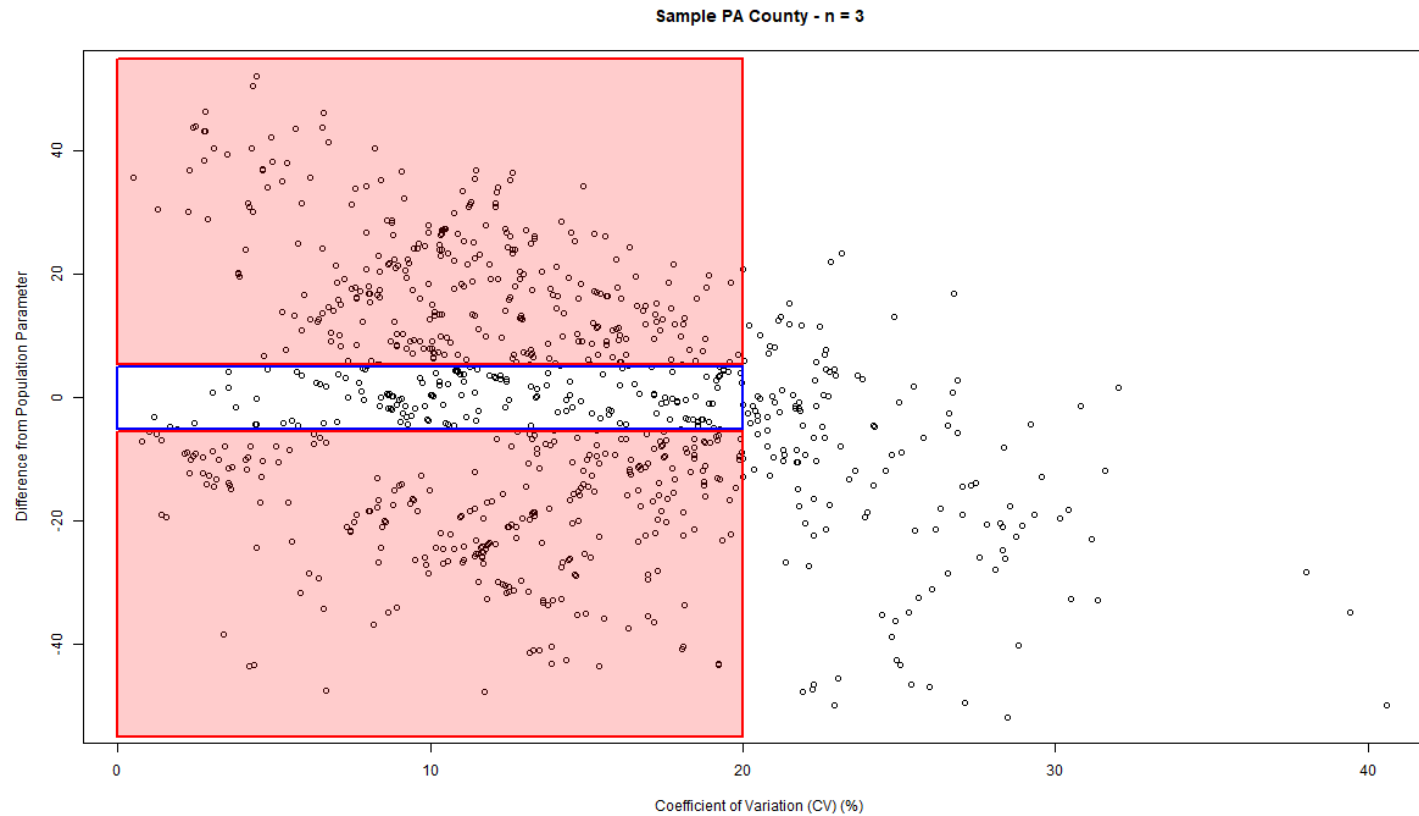
Pennsylvania County Example
Yield

Low CV & Far From Truth

- ## What is a "low" CV?

  – For this example, we will use 20%

- ## What is "far" from population parameter?
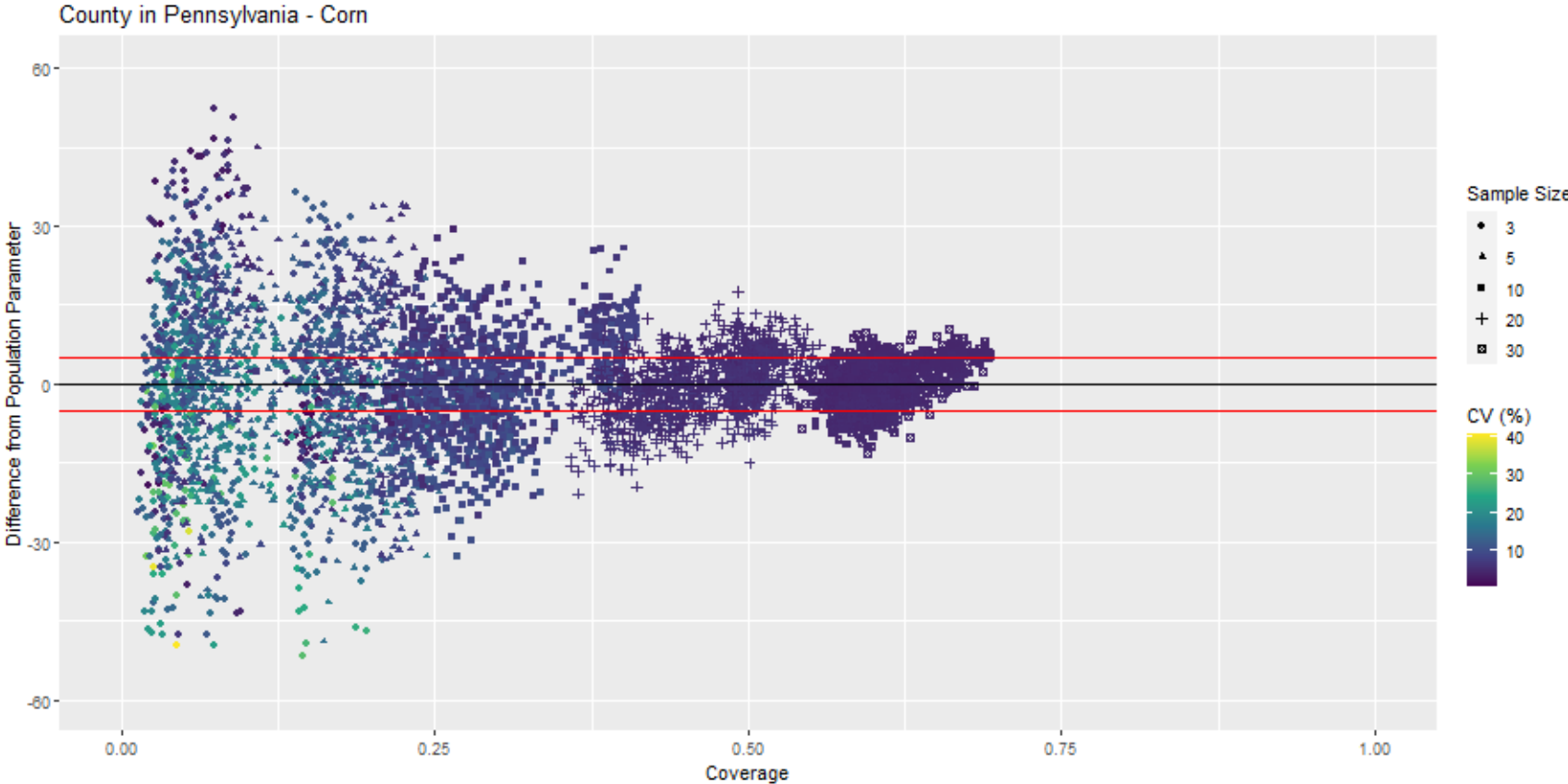
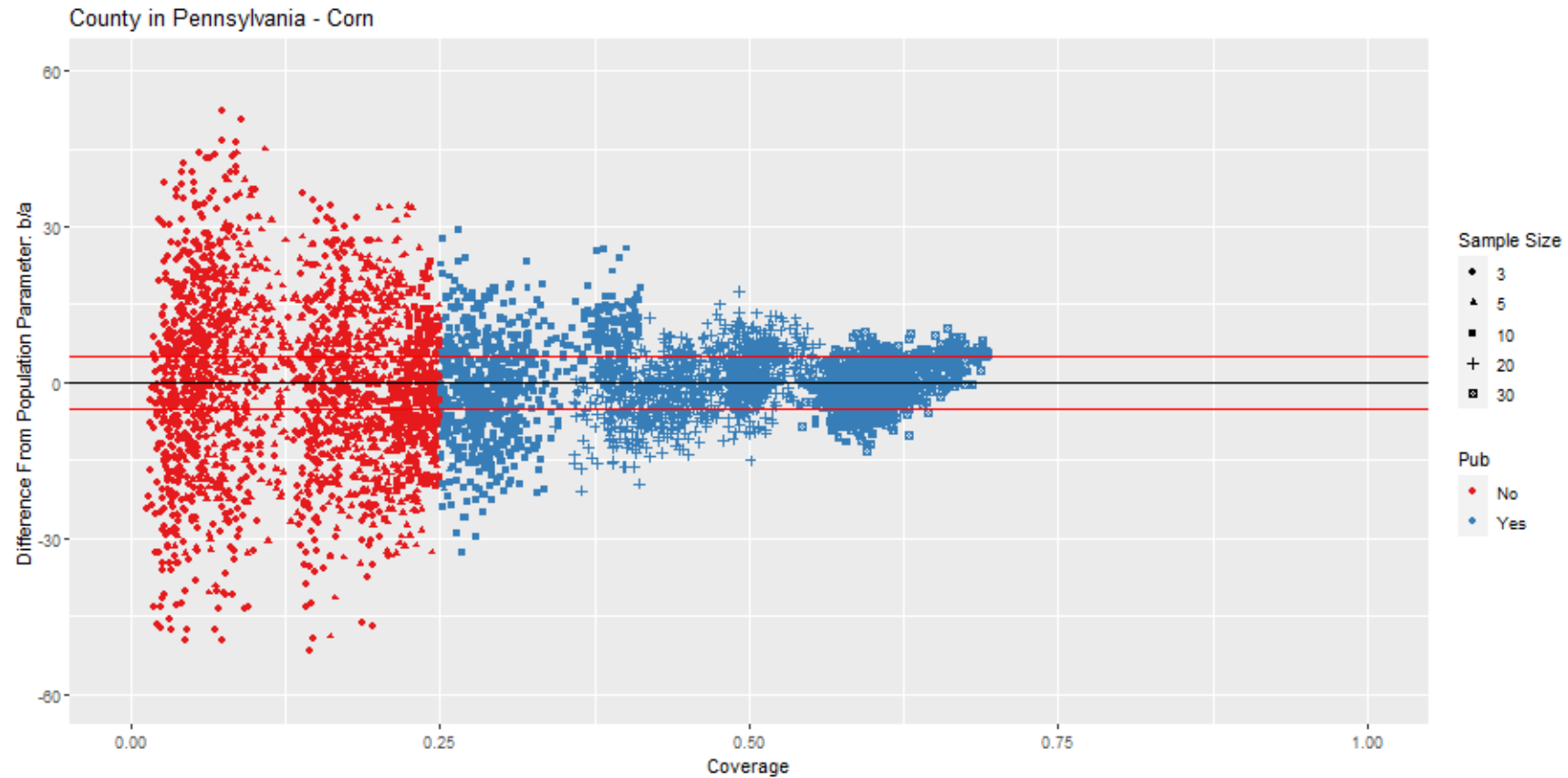 – For this example, we will use 5 bushels/acre

Pennsylvania County Example
n=3

Sample PA County - n = 3

Pennsylvania County Example
difference, coverage, cv, and sample size

County in Pennsylvania - Corn

Pennsylvania County Example

Old Publication Rule
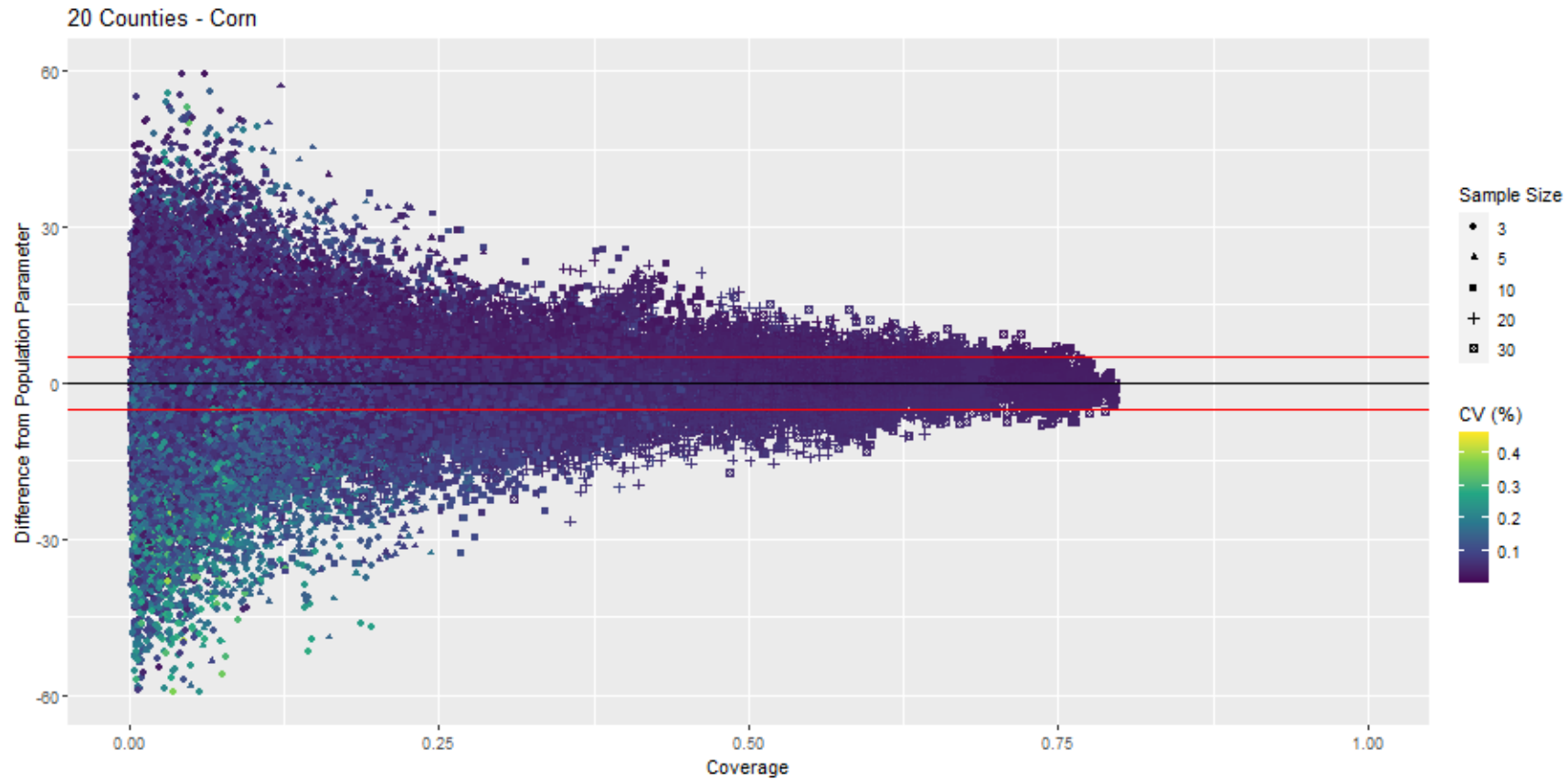

County in Pennsylvania - Corn

Expanding

- For visualization purposes
  - 20 random counties
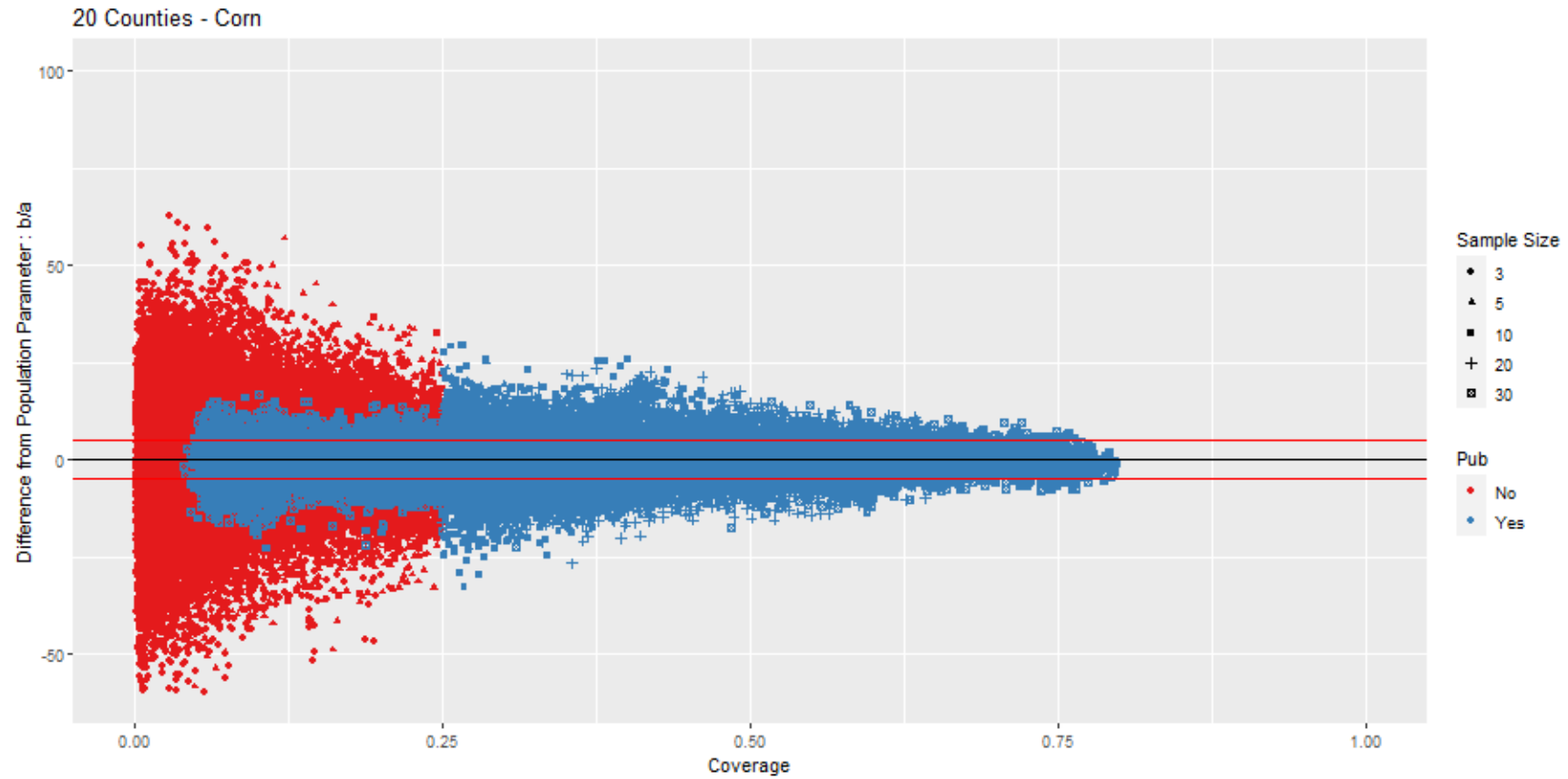 - 10 different states

20 Counties

Difference, Coverage, CV, and Sample size
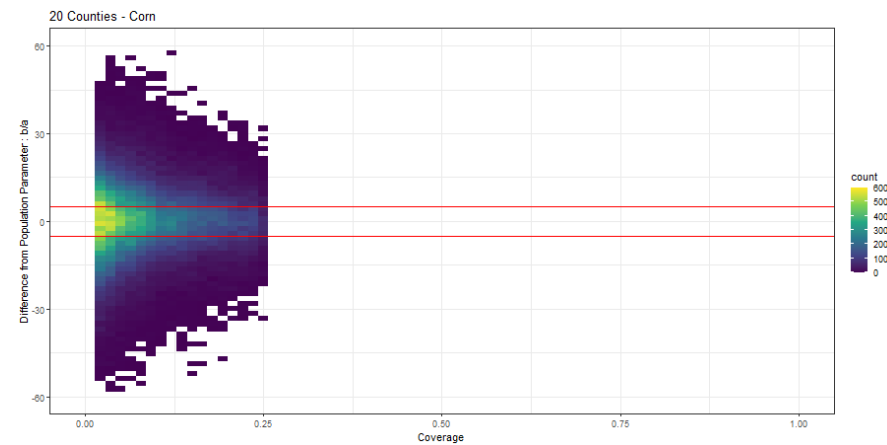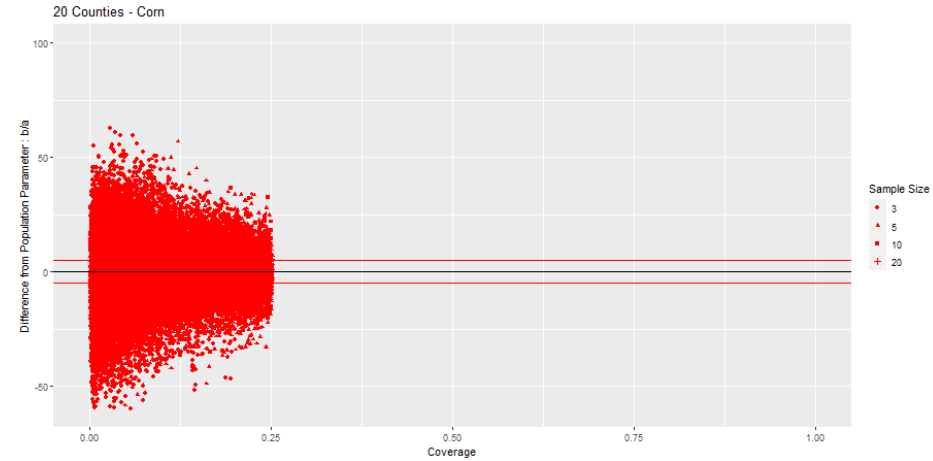
20 Counties

Old Publication Standard

20 Counties - Corn

20 Counties
Old Publication Standard – Not Published
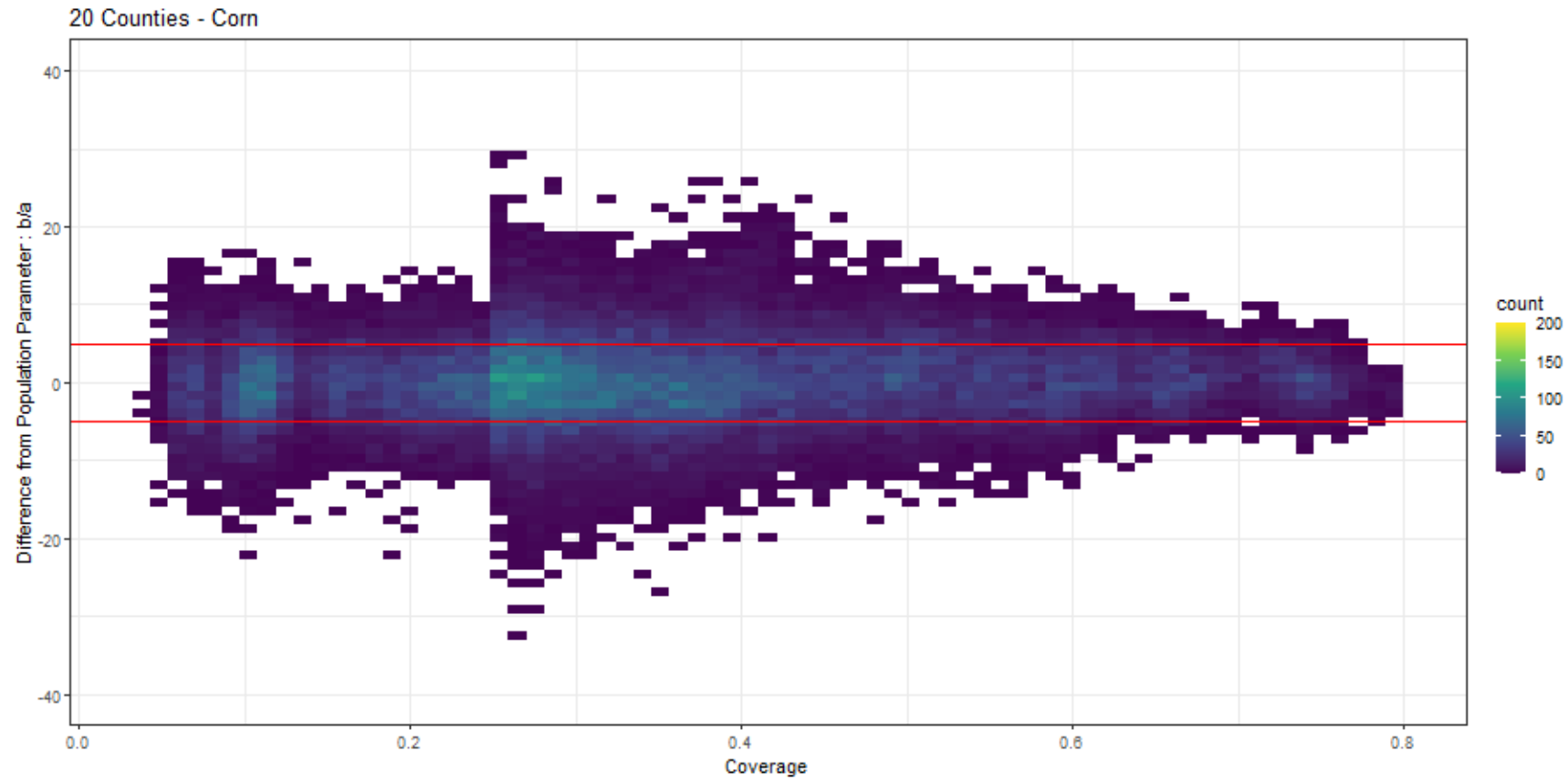
20 Counties

old publication standard
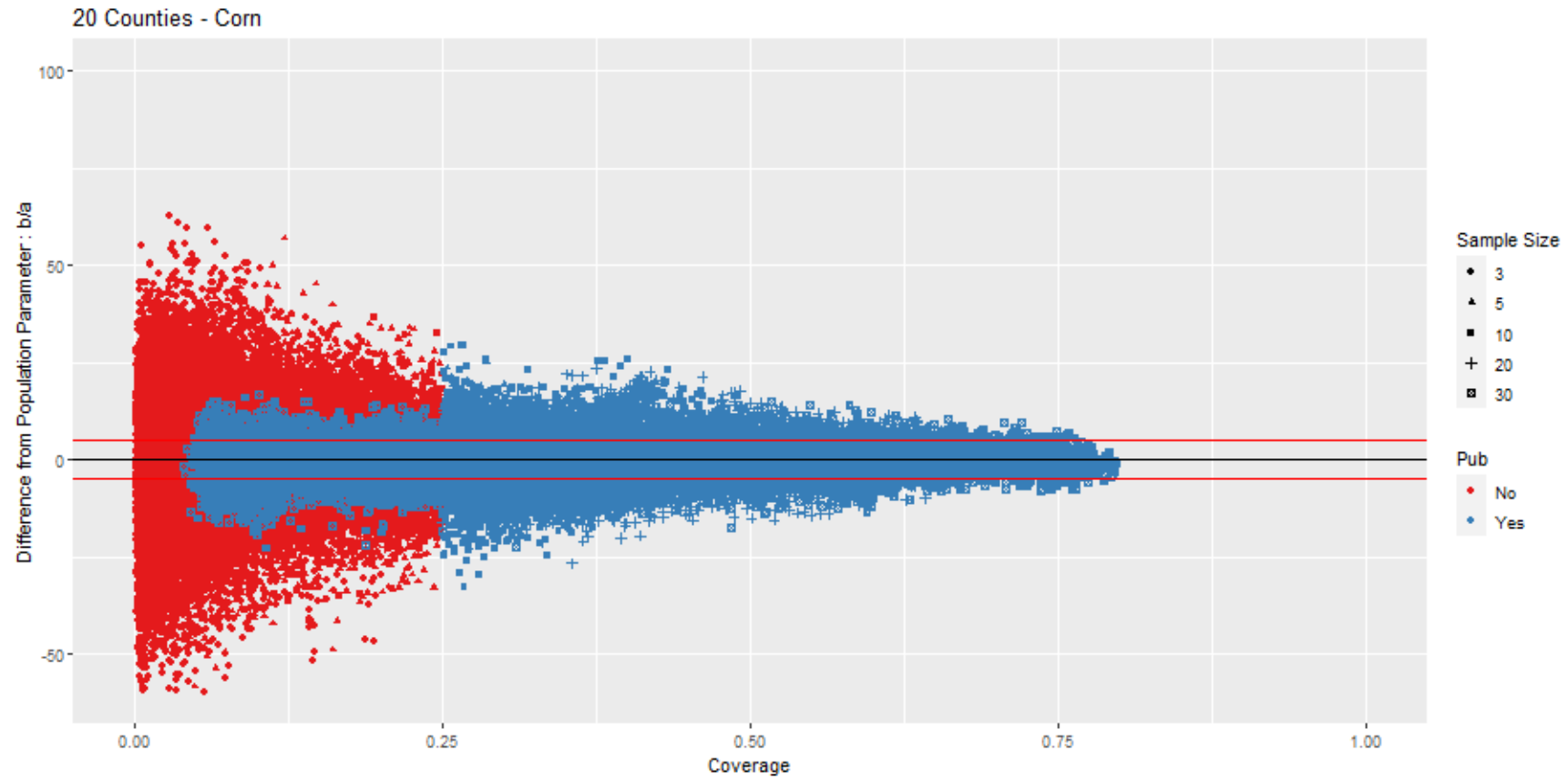
20 Counties - Corn

20 Counties
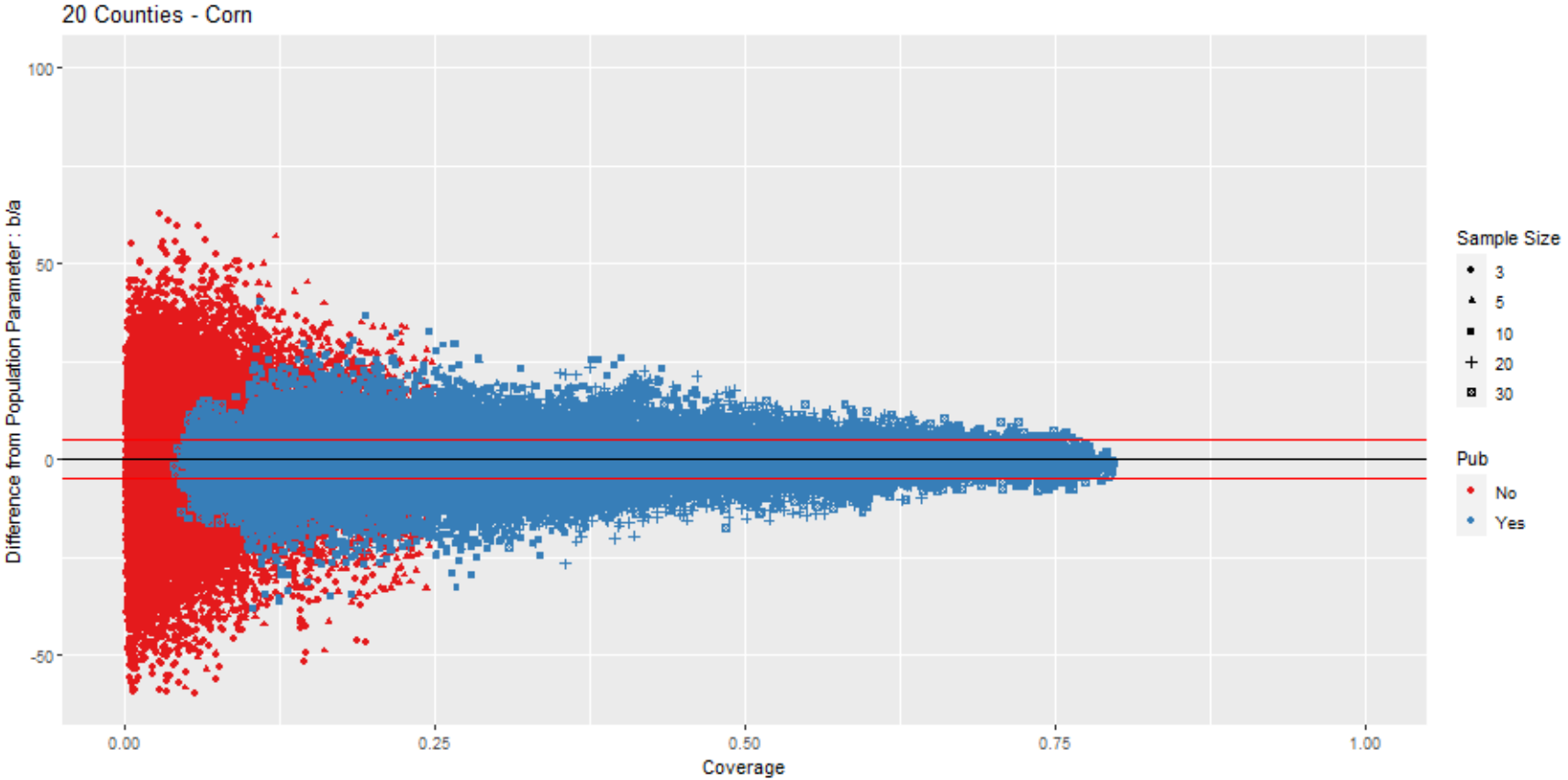
Old Publication Standard = "Yes"

A new standard

- 30 reports

    OR

- 3 reports and 25% coverage
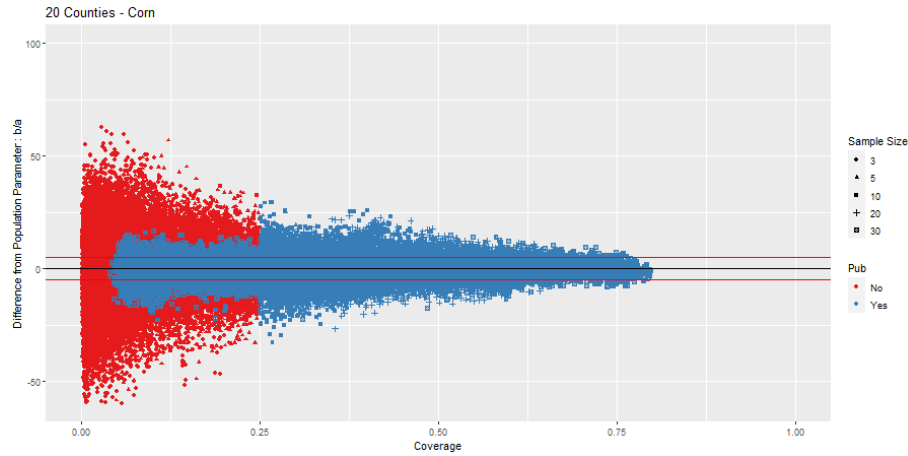
    OR

- 10 reports and 10% coverage ***new***

20 Counties
New Publication Standard
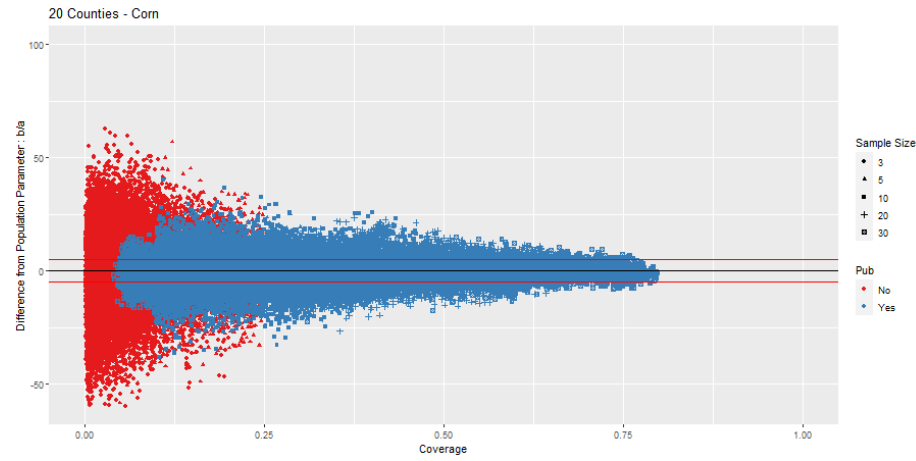

20 Counties - Corn
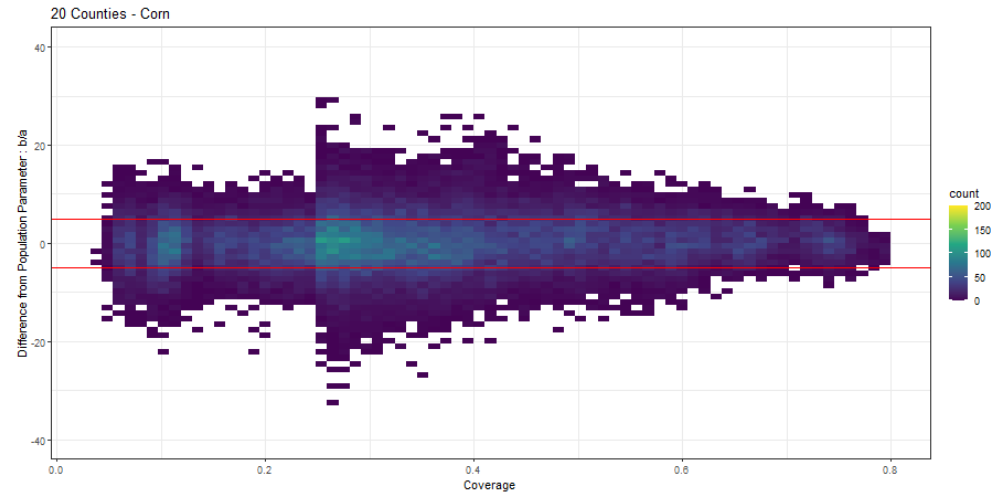
Old vs New

Old
Publication
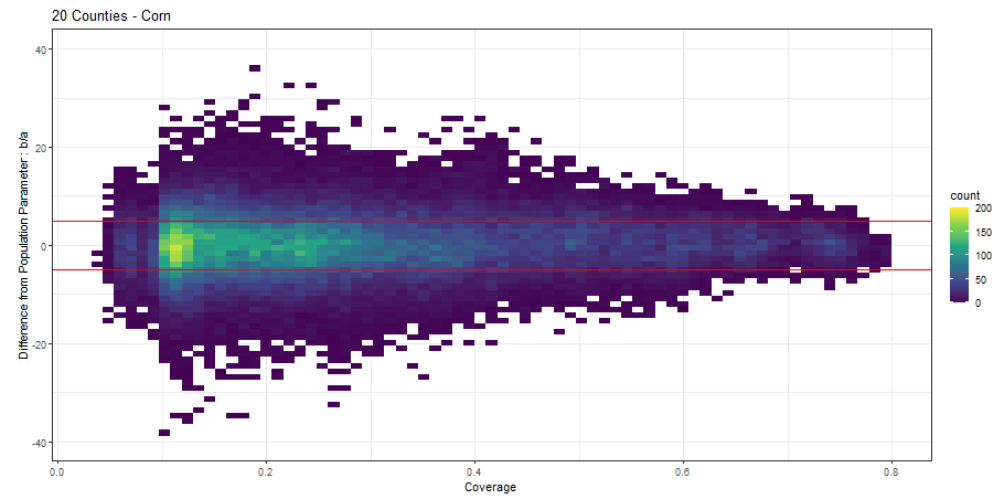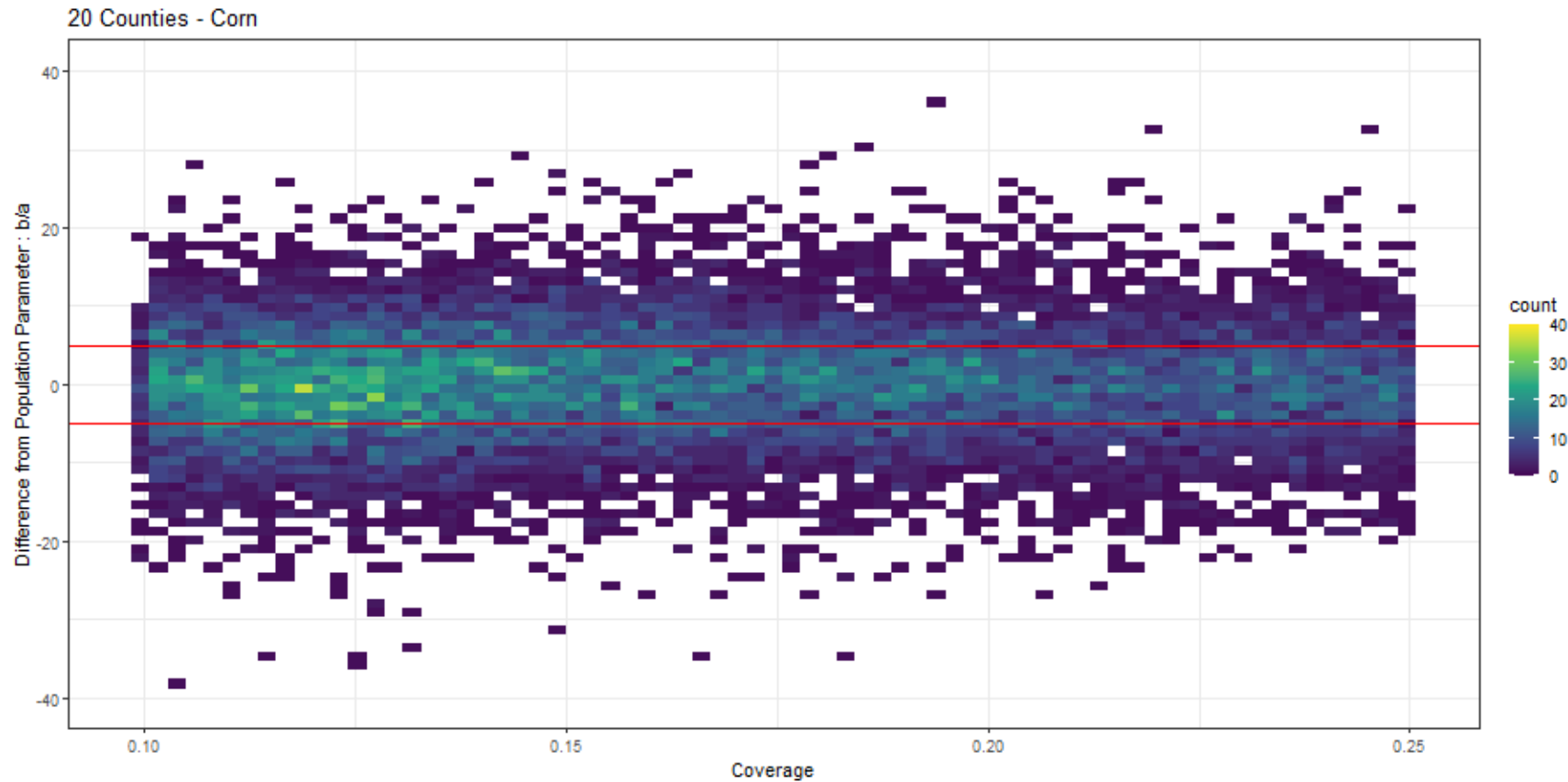Standard

New
Publication
Standard

Old vs New

Old
Publication
Standard

New
Publication
Standard

New Publication Standard

Simulation estimates published under new standard, but not old

20 Counties - Corn

Summary

Pub Rule	Total Simulations	Number Published	Number Published With Greater than 5 Bushels/Acre from Population	Good Pub Rate (% published within 5 bushels/acre of Population)	Absolute Average Difference from Population bushels/acre
Old Rule	100,000	30,869	9,458	0.69	4.09
Proposed Rule	100,000	46,583	16,453	0.65	4.57
CV < 20%	100,000	98,268	50,313	0.49	12.02

Additional Factors

- County Agricultural Production Survey modeled indications
  - Cruze et all (Statistical Science 2019 vol 34)
  - Strength added to yield indication from National Commodity Crop Productivity Index (NCCPI) and location
- Additional References
  - Bell and Barboza (2012) ICES proceedings
  - Cruze et al (2018) JSM proceedings
  - Cruze and Young (2019) JSM proceedings
  - National Academies Report (2017)

Conclusion

- One size fits all is difficult

- Simulation allows for a variety of different rules to be explored.