Assessment of Manual vs Automated Survey Editing and Imputation

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

Introduction

- National Agricultural Statistics Service (NASS)
  - Provides timely, accurate, and useful statistics in service to U.S. agriculture
  - Conducts over 100 surveys and prepares over 400 reports on virtually every aspect of U.S. agriculture
- Census of Agriculture
  - Every five years
  - Detailed census of every farm and agricultural producer in the country

Crops APS

- Acreage, Production, and Stocks (APS)
- These quarters are tied closely to how crops develop across the U.S.
  - March: Planting Intentions
  - June: Planted Acres
  - September: Small Grains
  - December: Row Crops

- Stakeholders use results and estimates created by these surveys via producers' responses

Background

- NASS surveys have a three-step data cycle:
  - Data collection
  - Analysis
  - Publication
- Editing and Imputation
  - Data quality and consistency
  - Manual process: Blaise System
  - Edit logic

IDEAL

- Imputation, Deterministic Edits, Automation and Logic (IDEAL)
  - Editing and imputation are managed in separate steps
  - Greater flexibility
- Generalized System
  - Edit logic and imputation methods can be easily shared across surveys for the same set of variables
- Multiple Components
  - User interface
  - System architecture
  - R engine

What is JIMMY?

- R engine is named JIMMY
- Applies rules and make automated changes to data
  - Deterministic edits
  - Imputation
  - Fellegi-Holt
- Statistics Netherlands R packages (Van Der Loo and de Jonge)

Testing 2023 September Crop APS

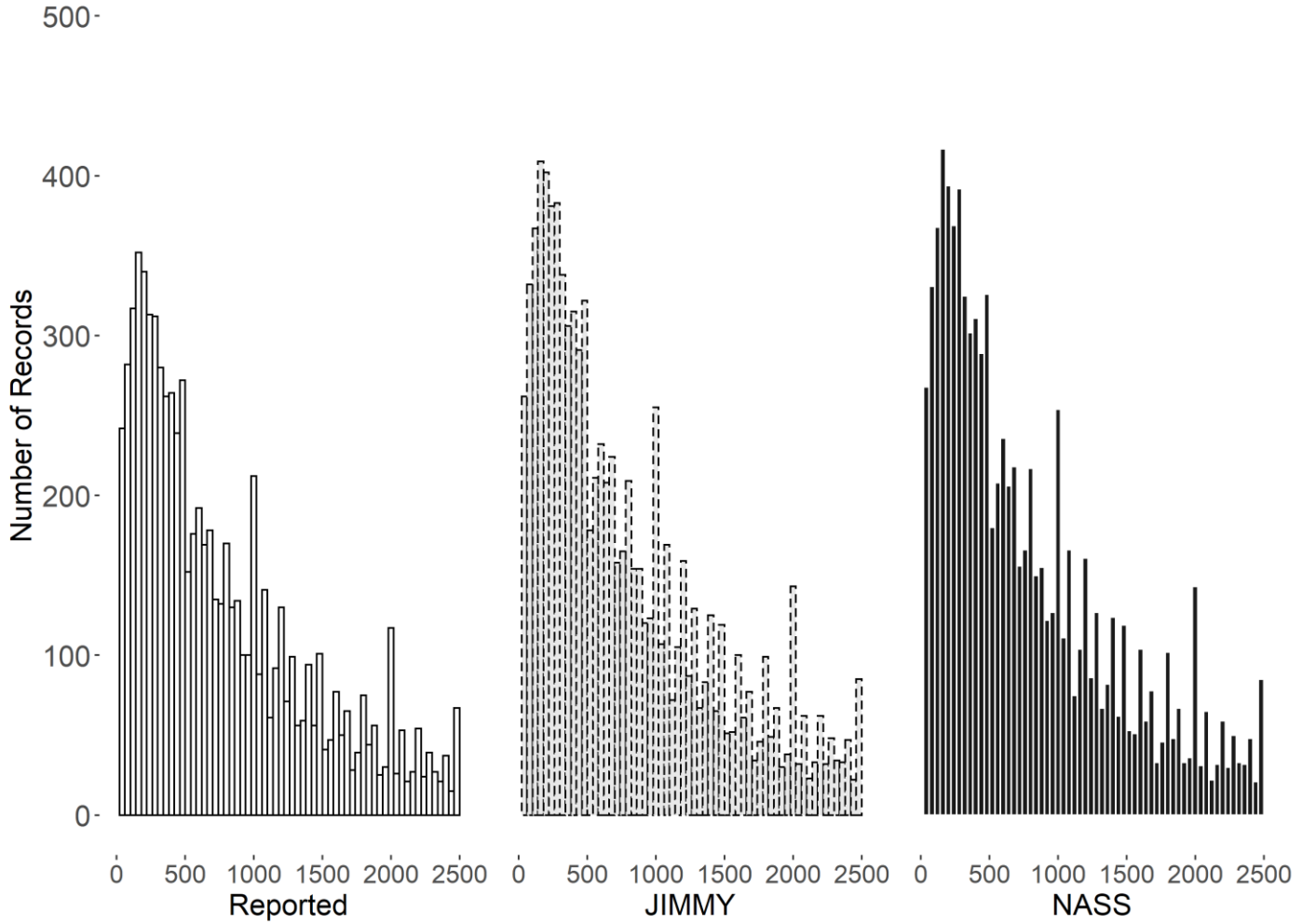
- Utilize previous testing methods
  - Reported, JIMMY, NASS
  - Compare distributions
  - Catalog edits
- New methods
  - Stratified sample
  - Assess
    - Data quality
    - Workload
  - Stakeholder analyst review

Assessing Quality of Data Processed

- Tested JIMMY on whole September Crops APS 2023 sample over 60,000 records
- 11,085 records were chosen
  - Corn Belt: Illinois, Iowa Minnesota, Missouri, Wisconsin
- Results
  - Single variable
  - Unit level
  - Qualitative responses

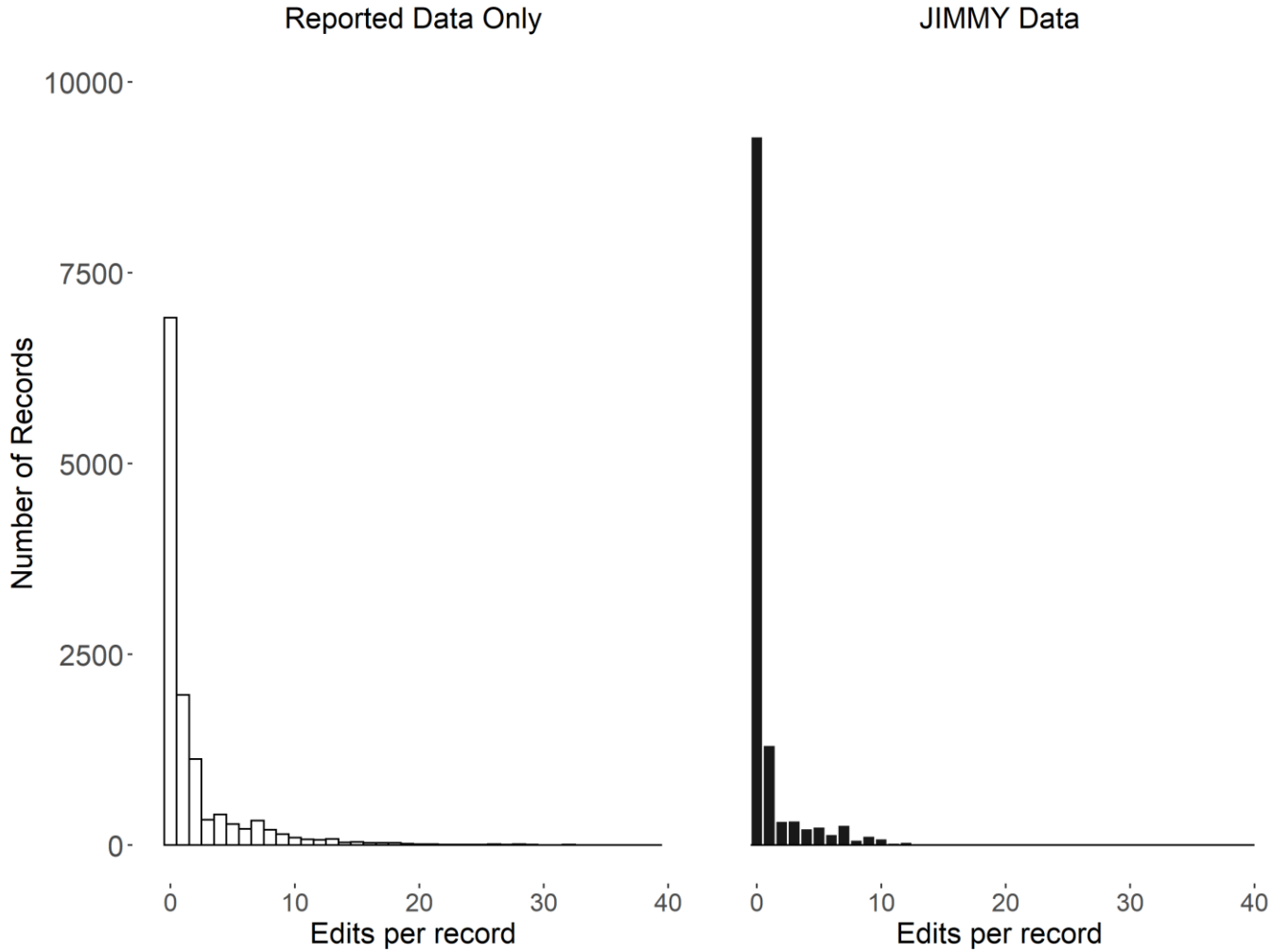
Results: Total Land Operated

- Similar distributions
- JIMMY data was produced by automated edits and imputation to the reported data
- Distributions do not follow a normal distribution



Results: Workload and Data Quality

- Number of edits per record
  - Reported
  - JIMMY
- Positively skewed towards zero
  - Require little to no manual editing
- Large number of records are closer to zero due the automatic editing



Results: Workload and Data Quality

- Reduction of edits required by an RFO analysts with and without JIMMY automatic editing
- Total number of edits were aggregated for the sample
- Almost 50% reduction in the number of edits due to JIMMY's automatic editing

Results: Workload and Data Quality

- RFO analysts completed reviews of 76 records over nine-week period
- Produced deeper insight into complex records
- For many records, analysts found JIMMY data to be reasonable
- For edits thought to be unreasonable, extensive insight was gained through discussion

RFO Weekly Review

Week	Number of Records
1	15
2	9
3	13
4	9
5	18
6	10
7	6
8	10
9	9

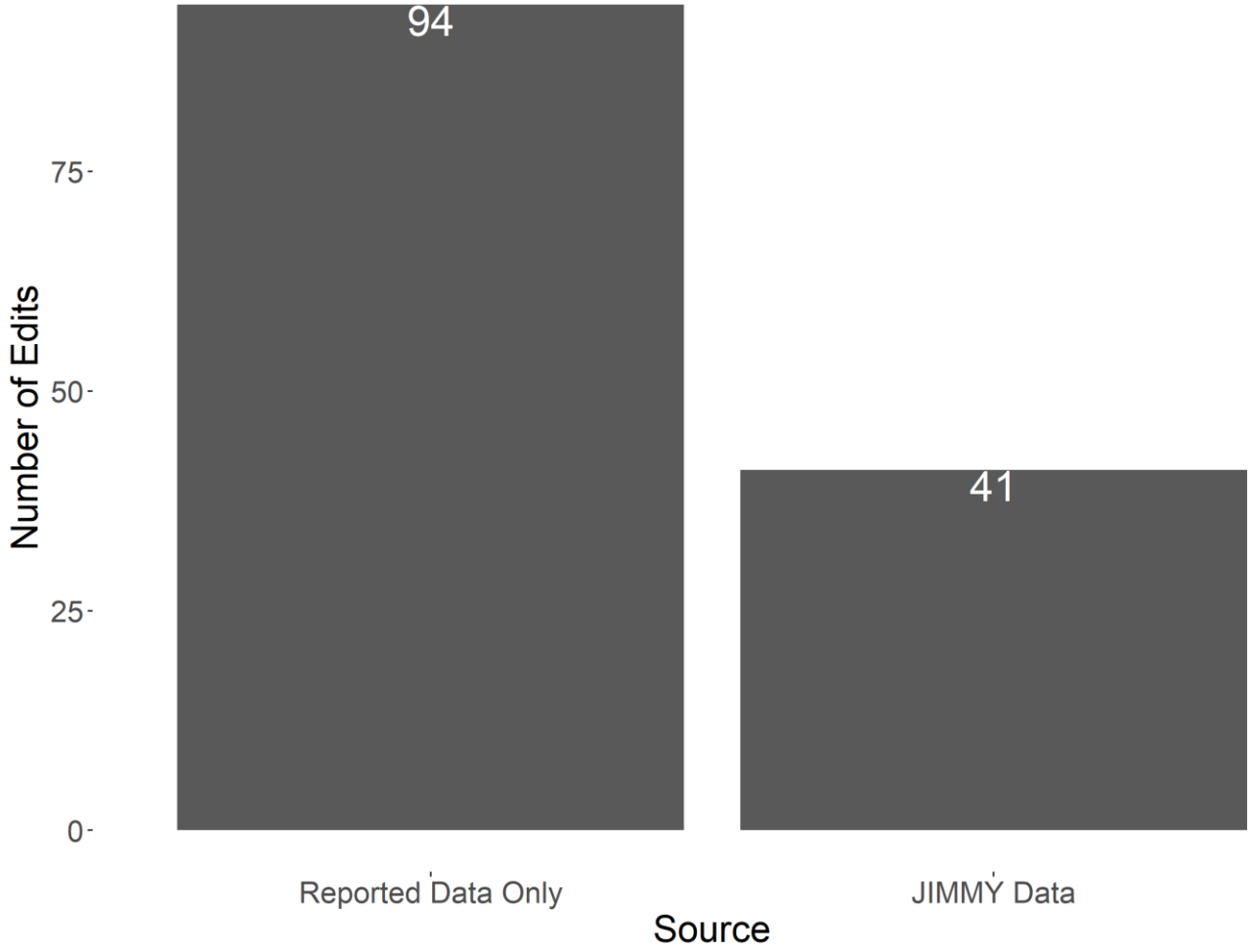
Conclusions

- Successes
  - Results of testing on historical data are promising
  - Results have shown incorporation of additional testing techniques have been advantageous
    - Stratified sample
    - Blaise system
    - RFO qualitative feedback

- Challenges
  - Number of edits to evaluate
  - Relationships between edits
  - Defining edits to be reasonable

September 2024 Results

- Random sample of 50 records from September APS 2024
- Total number of edits were aggregated for the sample
- Over 50% reduction in the number of edits due to JIMMY's automatic editing



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Thank you!

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