CHOOSING THE RIGHT FORMULA

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My Journey to London

- Census undercount adjustment
- Small area estimation
Census Undercount Adjustment

- Effects on
  - Accuracy of population estimates
    - (JASA, December 1987, with Samuel H. Preston)
  - Congressional apportionment
    - (JASA, June 1991)
Small Area Estimation

- State estimates of
  - Poverty rates
  - Food Stamp Program participation rates

- Evaluation of relative accuracy
WIC Program

- Very popular
- Dissatisfaction with allocations
WIC Program

- Formula revised
- State estimates of eligible infants and children
NAS/CNSTAT Panels

- Panel on Estimates of Poverty for Small Geographic Area
- Panel on Formula Allocations
Panel on Estimates of Poverty for Small Geographic Areas

- Small-Area Income and Poverty Estimates: Priorities for 2000 and Beyond
- Small-Area Estimates of School-Age Children in Poverty: Evaluation of Current Methodology
Panel on Formula Allocations

- Choosing the Right Formula
- Statistical Issues in Allocating Funds by Formula
“Interactions Between Survey Estimates and Federal Funding Formulas,” with Alan M. Zaslavsky.
Scope of Presentation

- Discuss how allocate funds
- Not
  - Why funds are allocated
  - How much is allocated
  - How funds are spent
  - Effects of expenditures
- Focus on statistical, not political issues
- Focus on allocations by federal government in U.S.
Outline

1. Contextual issues
2. Components of formulas
3. Special features of formulas
4. Data sources and estimation methods
5. Errors, interactions, and unintended consequences
6. Recommendations
Themes

- There are many tradeoffs
  - Political
  - Programmatic
  - Statistical

- Choices can have unintended consequences
Definitions

- **Allocation**
  - National to States, Counties, School Districts
  - States to Counties, School Districts

- **Formula**
Why Use a Formula?

- Automatic response to changing need
- Help build political consensus
- Transparency
Political Context

- Congress
- Executive branch agencies
Congressional Authority

- Congress can specify
  - Amounts
  - Formula, components, estimates
  - Formula, components
  - Formula
  - Program goals
Basic Features of Fund Allocation Programs

- Recipient units
- Frequency of allocations
Components of Formulas

- Measures of
  - Need
  - Fiscal capacity
  - Effort
- Which include and how combine?
Special Features of Formulas

- Why?
  - Promote efficient use of funds
  - Stabilize funding
  - Negotiate political compromise
Special Features of Formulas

- Thresholds
- Limits
- Hold-harmless provisions and caps
- Step functions
- Bonuses and penalties
Data Sources for Estimating Formula Components

- Decennial census
  - Short-form
  - Long-form
- Intercensal population estimates
- Current household surveys
  - Current Population Survey
  - American Community Survey
- Administrative records
- Other statistical programs
Methods for Estimating Formula Components

- Direct estimation
- Indirect estimation
Panel on Estimates of Poverty for Small Geographic Areas

- **Small-Area Income and Poverty Estimates: Priorities for 2000 and Beyond**

- **Small-Area Estimates of School-Age Children in Poverty: Evaluation of Current Methodology**
Use of Model-Based Small Area Estimates for Fund Allocation

- Title I education program
- WIC nutrition program
Assessing Quality of Data Sources and Estimation Methods

- Conceptual fit
- Level of geographic detail
- Timeliness
- Statistical accuracy
  - Bias
  - Variance
- Susceptibility to manipulation
- Cost
Errors, Interactions, and Errors

- Errors in inputs (components)
- Interactions with special features
- Errors in outputs (allocations)
Interactions and Unintended Consequences

- Threshold
  - Average more than deserve if true need is below threshold
  - Average less than deserve if true need is above threshold
  - As sampling error increases, sharp cutoff implied by threshold is replaced by increasingly smooth relationship between true need and expected allocation
Interactions and Unintended Consequences

- Hold-harmless provision
  - Sampling variability ratchets up allocations over time
  - Moving average estimation greatly reduces ratcheting effect
Interactions and Unintended Consequences

- Larger distortion in allocations for smaller areas
Recommendations

1. Congress should consider giving some flexibility to program agencies, especially to determine data sources and estimation methods.
Recommendations

2. Conduct periodic evaluations of fund allocation performance at several points in time and over time (including before implementation).
   - Examine relationships between inputs and outputs
   - Identify misallocations and their causes
   - Assess tradeoff between stability of funding and responsiveness to changing need
   - Examine effects of special features
   - Assess tradeoffs pertaining to accuracy of estimates
   - Weigh costs and benefits of improving data sources and estimation methods
3. Evaluate the effects of special features before implementation and on an on-going basis.
   - Consider a weaker hold-harmless provision or moving average estimation
   - Consider replacing a threshold by a smoother alternative
4. Expand the use of simulations to evaluate fund allocation performance.
   – Focus on the effects of special features.
   – Conduct longitudinal analyses, examining the effects of changes in funding levels and need distributions.
5. Evaluate the potential for unintended behavior responses by recipient jurisdictions.

6. Make detailed information about fund allocation programs readily available.
Recommendations

7. Establish a standing interagency committee on formula allocations to:
   – Disseminate information
   – Foster collaboration
   – Improve practices, especially in evaluation and quality control
   – Conduct or sponsor research
   – Develop a handbook