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# **Propensity Models Versus Weighting Cell Approaches to Nonresponse Adjustment: A Methodological Comparison**

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# Forecast

- When adjusting weights for nonresponse by one of four possible methods and using one or two variables you get almost identical weights.
- When using additional variables, collapsing and interaction terms are required to get almost identical weights.

# Outline of Presentation

- Introduction and Background
- Methods
- Results
- Summary

# The Problem

- Statistical adjustments for nonresponse is deep and pervasive issue for NCES sample surveys.
- Contemporary statistical methods offer three broad classes of approach to nonresponse.
- RTI frequently uses General Exponential Model (GEM) method

# Methods Studied

- Weighting class adjustments
- Raking (iterative proportional fitting)
- Logistic regression model
- Generalized exponential models (GEM)

# Methods Used for Evaluation

- ELS:2002 base year data was used
- Relative root mean square difference was used to evaluate the differences between weights across methods.
- Evaluated the mean, minimum, median, maximum of the adjustment factors and the weights.
- Evaluated the unequal weighting effects (UWEs)

# One variable Model

- Sex was the chosen variable
- All methods gave the same results

# Two variable model

- Sex and race/ethnicity were the variables
- Interactions were introduced
- Once interactions were used all methods gave the same results.

# Two variable model

Comparison	Relative root mean squared difference	
	No interaction in models	Interaction in models
GEM-logistic vs. weighting class	0.00408	0.00000
Logistic vs. weighting class	0.00408	0.00000
Logistic vs. GEM-logistic	0.00000	0.00000
GEM-logistic vs. raking	0.00162	0.00000
Weighting class vs. raking	0.00316	0.00000
Logistic vs. raking	0.00162	0.00000

## Four variable method

- Sex, race/ethnicity, region, and metropolitan status were used.
- Interactions and collapsing among variable levels were incorporated.
- Weighting class required the collapsing between cells due to some small sample sizes.

# Eight variable model

- Metropolitan status, region, number of full-time teachers, percentage of full-time teachers certified, number of part-time teachers, percentage of students with an IEP, total enrollment, number of class periods were the variables used.
- Variables for this model were chosen by the use of Chi-Squared Automatic Interaction Detection (CHAID).
- Only GEM and logistic gave the same results.

# Eight variable model

Comparison	Relative root mean squared difference		
	No collapsing and no interaction in models	Collapsing but no interaction in models	Collapsing and interaction in models
GEM-logistic vs. weighting class	0.13786	0.10087	0.13243
Logistic vs. weighting class	0.13786	0.10087	0.13243
Logistic vs. GEM-logistic	0.00000	0.00000	0.00192
GEM-logistic vs. raking	0.02204	0.03293	0.06289
Weighting class vs. raking	0.13826	0.09634	0.13636
Logistic vs. raking	0.02204	0.03293	0.06289

# Other weight adjustments

- **Extreme weights**
  - Determined by GEM with the variable race.
  - Determined by interquartile range.
  
- **Poststratification**
  - Control totals for sex and race/ethnicity

# Summary

- **Advantages of each method**
- Surveys with small sample size and a small number of known variables for respondents and nonrespondents - weighting class and raking may be preferred.
- Surveys that are complex with large sample size and more candidate variables for nonrespondent adjustment - GEM and logistic may be preferred.
- GEM, logistic, and raking control at the margins allow more complex models.
- GEM incorporates nonresponse adjustments, poststratification, and extreme weight adjustments.

# Summary

- **Disadvantages of each method**
  - Weighting Class becomes more complex as more variables are incorporated.
  - Weighting Class requires the collapsing of variables and cells as more variables are incorporated