

Evaluation of a New Edit Methodology for the Common Core of Data (CCD) Nonfiscal Surveys

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Conference

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Disclaimer: The views expressed are those of the authors and not necessarily those of the U.S. Census Bureau or the National Center for Education Statistics.



Agenda

- CCD Overview
- Editing Process
 - Prior Method
 - New Method
- Results
- Conclusions and Next Steps



CCD OVERVIEW



CCD Overview

- Set of annual surveys sponsored by the National Center for Education Statistics (NCES)
- Data submissions by State Education Agencies (SEAs) from:
 - All public schools and local education agencies (LEAs)
 - 50 states, District of Columbia, territories and dependent agencies



CCD Overview

1. Universe surveys of various staff counts and student enrollment numbers at the state, agency, and school level
2. Universe counts of dropouts and high school completers at the state and school district level
3. Universe enumeration of finance data for each state (NPEFS) and school district (F-33)



CCD Overview

- Conducted since the 1950s
- In its current form since 1986
- Only annually updated comprehensive directory of U.S. public elementary and secondary schools and LEAs
- Data used to allocate funds from many federal grant programs
- Sampling frame for federal and non-federal surveys



CCD Universe Characteristics

CCD Universe Frequencies for 2010-11

States	School Districts (LEAs)	Schools
58 states and territories	18,478 LEAs	103,813 schools

CCD Numeric Data Items for 2010-11

States	School Districts (LEAs)	Schools
240	244	253

Source: National Center for Education Statistics, 2010-11 School Year Common Core of Data State, Local Education Agency, and School Surveys, <http://nces.ed.gov/ccd/ccddata.asp>



CCD Universe Characteristics

- Detailed information published for every school and agency, not summary statistics
- Information generally publicly available from other sources
- Information of great interest to general public and others



CCD EDITING PROCESS



Editing Process

- Directory match
 - Comprehensive annual reconciliation of current year to prior year for all LEAs and schools
- Cross File Checks (Membership and Staff)
 - State total < LEA totals, State totals < School totals, LEA totals < School totals
 - Differences in State vs. LEA, State vs. School, or LEA vs. School by more than 5%
- Current Year vs. Prior Year Checks

CCD Numeric Data Edits

- Many items have associated sub-items

School	Agency
Total Student Membership	Total Student Membership
Membership by Grade for grades PK-12	Membership by Grade for grades PK-12
Membership by Race	Membership by Race
Membership by Race/Grade/Gender	Membership by Race/Grade/Gender

- Each detailed data item has a CY/PY data check associated with it
 - For example, compare 2011 AM01F vs. 2010 AM01F



Prior Method

$$\mathbf{Ratio} = \frac{|current\ year - prior\ year|}{prior\ year}$$

or

$$\mathbf{Difference} = |current\ year - prior\ year|$$

where the data item fails the edit based on comparison of Ratio and/or Difference to a predetermined cutoff



Prior Edit Method

- Compares 2 years at a time
- Does not factor in historic variability of a data item
- Looks at each data item in isolation
- Subject to issues with prior year data as well as current year data

New Multi-Year Edit Method

- Designed to detect unusual variability in a school or agency vs. a broader historical context
- Based on classic statistical process control techniques
- Looks at data items in pairs vs. one data element at a time
- Reduces respondent and analyst burden

Multi-Year Edit Variables

- Agency
 - Membership and Pupil Teacher Ratio
 - Total classroom teachers and Pupil Teacher Ratio
- School
 - Membership and Pupil Teacher Ratio
 - Total classroom teachers and Pupil Teacher Ratio
 - Free and reduced lunch edit
 - Gender breakdown edit
 - Race breakdown edit
 - Elementary / high school membership edit



Agency Variables

Edit Type	Edited Items
Agency Membership	Total student membership Pupil Teacher Ratio = MEMBER / TOTTC
Total Teachers	Total classroom teachers Pupil Teacher Ratio = MEMBER / TOTTC



School Variables

Edit Type	Edited Items
School Membership	Total student membership (MEMBER) Pupil Teacher Ratio = $\text{MEMBER} / \text{FTE}$
Total Teachers	Total classroom teachers (FTE) Pupil Teacher Ratio = $\text{MEMBER} / \text{FTE}$
Free/Reduced Lunch Membership	Total free and reduced lunch membership (TOTFRL) $(\text{TOTFRL}/\text{MEMBER}) * 100$



New Method

For 2011-12, the multiyear method compares 2011 to 2010-2007

VARIABLE Y1

= mean(*all* $|VARIABLE Y_i - VARIABLE Y_j|$) *for all years i and j*
≠ to current year

When using 4 prior years of data, VARIABLE Y1 is the mean of 6 differences 2010 to 2009, 2010 to 2008, 2010 to 2007, 2009 to 2008, 2009 to 2007, and 2008 to 2007

VARIABLE Y2

= mean($|VARIABLE Y_{current\ year} - VARIABLE Y_j|$) *for all years j*
≠ to current year

When comparing current year to 4 other years, VARIABLE Y2 is the mean of 4 differences (so 2011 to 2010, 2011 to 2009, 2011 to 2008, and 2011 to 2007)



New Method

A school or agency is flagged as an edit failure when **both** variables in each edit “pair” fail **both** criteria below:

$$\text{VARIABLE Y2} \geq \text{MINDIF}$$

$$\text{VARIABLE Y2} \geq \text{VARIABLE Y1} * \text{LIMIT}$$

Where MINDIF and LIMIT are determined and set by Census staff for each variable of interest.



Example Scenarios

Total Student Membership	2007-08	2008-09	2009-10	2010-11	2011-12
School 1	81	54	43	65	85
School 2	5	8	15	2	13
School 3	1100	1300	1250	1000	1400
School 4	245	300	275	28	295



RESULTS



Method Comparison

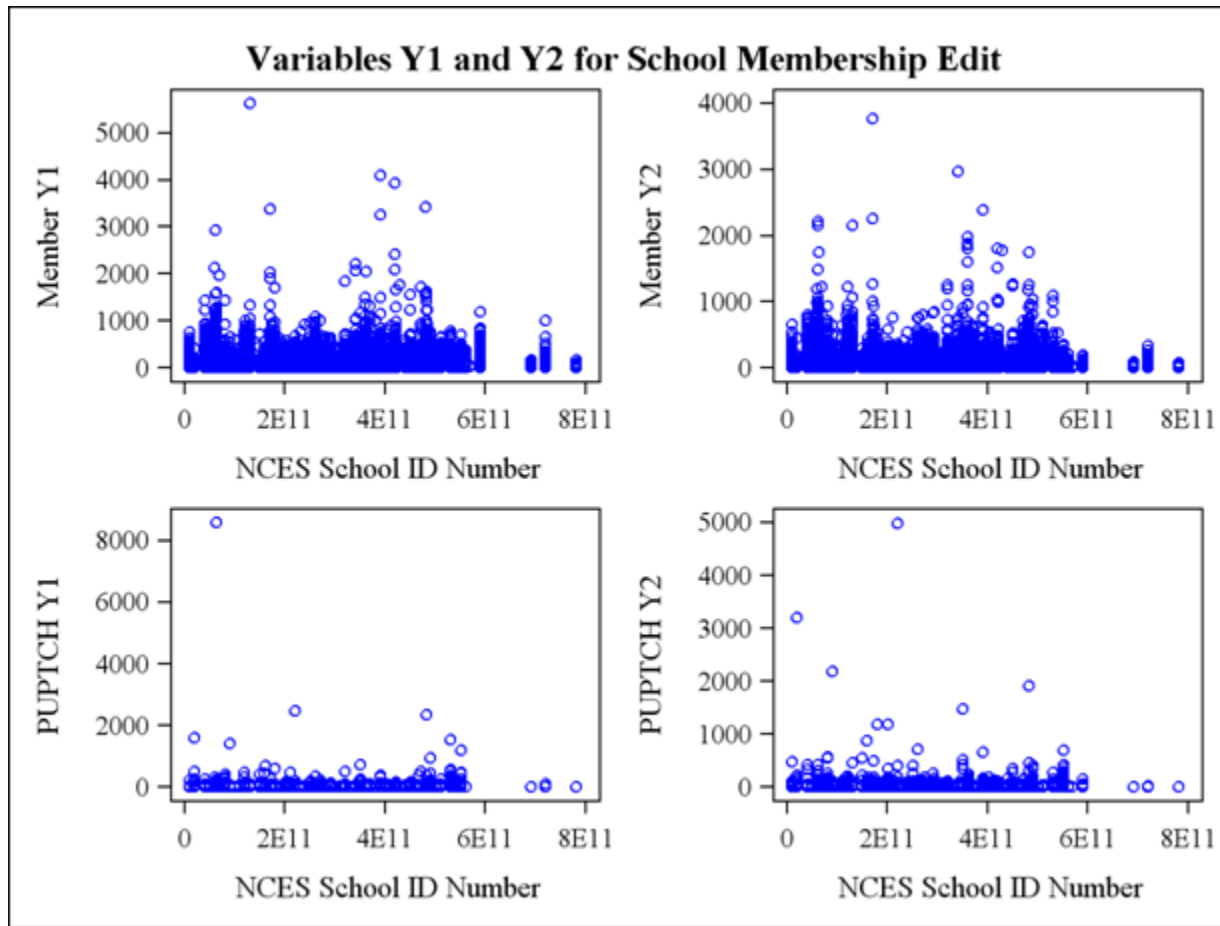
- 2011-12 Comparison of Agency Failures by Method

	Frequency of Failures		Percentage Failed	
	Old Method	New Method	Old Method	New Method
Agency Membership	980	75	5.4%	0.5%
Teachers	477	102	2.6%	0.6%

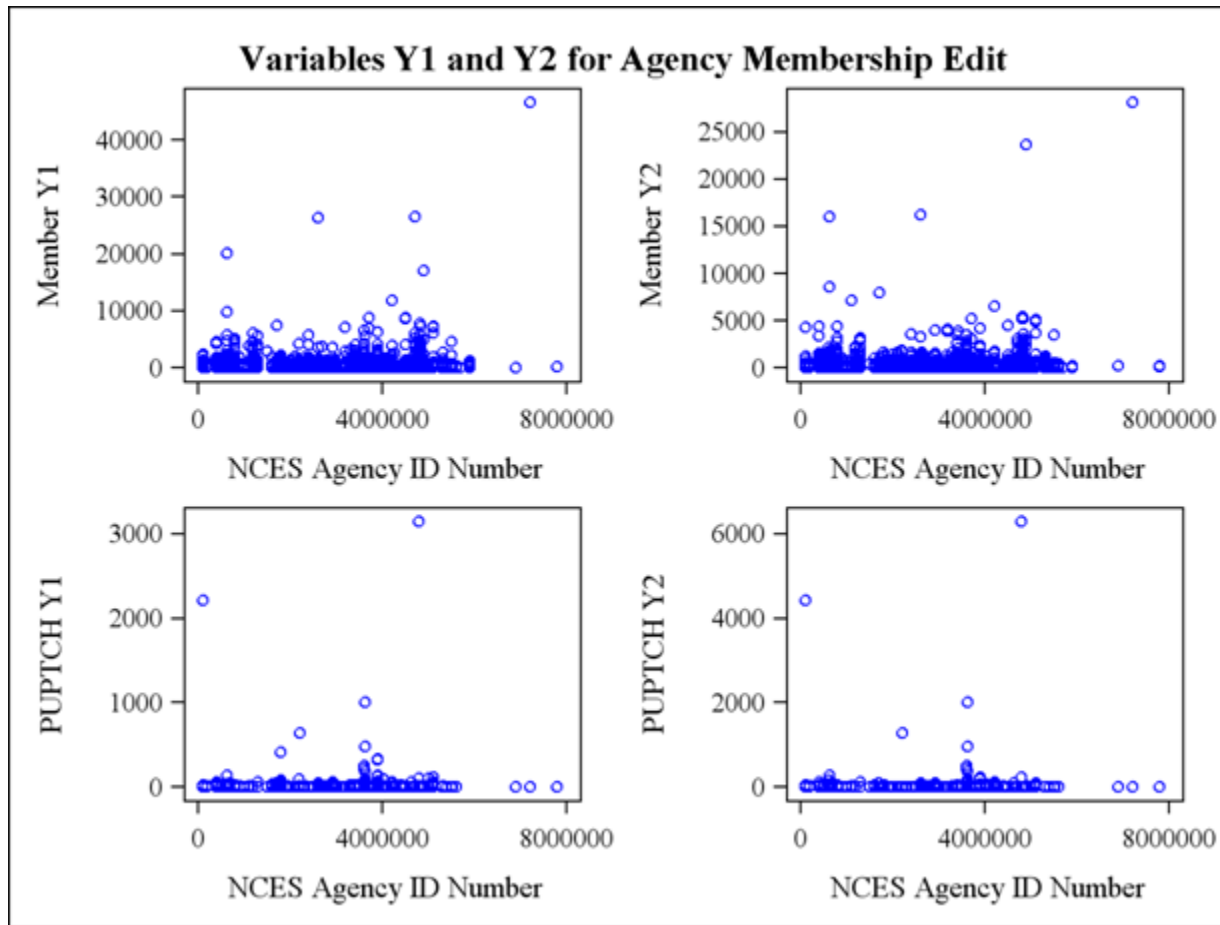
- 2011-12 Comparison of School Failures by Method

	Frequency of Failures		Percentage Failed	
	Old Method	New Method	Old Method	New Method
School Membership	4,585	216	4.6%	0.1%
Teachers	14,571	836	14.5%	0.2%
Free/Reduced Lunch	3,977	3571	4.0%	3.6%

School Membership Edit



Agency Membership Edit



Suppression

- Prior to 2011-12 CCD survey cycle, data not corrected by respondent were published as reported
- For 2011-12, data flagged using the new method not given an assignable cause is suppressed
- Suppression decision based on results analyst research and respondent follow-up
- Suppression of top level data item and also associated lower level detail items



Suppression Results

- 2011-12 Agency Suppression Results

	Identified	Suppressed	% Suppressed
Membership	75	38	50.7%
Teachers	102	34	33.3%

- 2011-12 School Suppression Results

	Identified	Suppressed	% Suppressed
Membership	216	93	43.1%
Teachers	836	212	25.4%
Free/Reduced Lunch	3571	3527	98.8%



Conclusions

- CCD Staff and respondents consider the new method a success:
 - Reduces analyst and respondent burden
 - Streamlines editing process with fewer edit referrals
 - Requires more complex method to program
 - Requires larger historical database to be maintained concurrently
 - Requires at least 2 years of data or alternative edit methodology

Looking Ahead

- Adding new data groups to agency for 2012-13: administrative staff counts, support staff counts, ELL student membership, and special education membership
- Alternative methodologies being considered
- Addition of selective criteria for editing
 - For example, editing using school and agency size as a classification variable for edit limits
- Imputation vs. suppression

References

- Keaton, Patrick (National Center for Education Statistics), June 2012, “Documentation to the Common Core of Data State Nonfiscal Survey of Public Elementary/Secondary Education: School Year 2010–11, Final Version 1a”, <http://nces.ed.gov/ccd/pdf/STnonfis101agen.pdf>
- Keaton, Patrick (National Center for Education Statistics), September 2012, “Documentation to the NCES Common Core of Data Local Education Agency Universe Survey: School Year 2010–11, Version Provisional 2a,” <http://nces.ed.gov/ccd/pdf/pau102agen.pdf>
- Keaton, Patrick (National Center for Education Statistics), June 2012, “Documentation to the NCES Common Core of Data Public Elementary/Secondary School Universe Survey: School Year 2010–11, Version Provisional 2a”, <http://nces.ed.gov/ccd/pdf/psu102agen.pdf>
- Methodology and Statistics Council (2012). U.S. Census Bureau Statistical Standards. Washington, DC: U.S. Census Bureau.
- NCES Common Core of Data (2011) website: <http://nces.ed.gov/ccd/ccddata.asp>



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