

Using Response Propensity Models to Equally Disperse 2nd Stage Sampled Cases Across Incentive Treatment Groups

AAPOR
May 19, 2018

Kayla Varela (presenter),
Allison Zotti and Stephanie Coffey
Center for Adaptive Design, U.S. Census Bureau

Any views expressed on (statistical, methodological, technical, or operational) issues are those of the author(s) and not necessarily those of the U.S. Census Bureau.

Presentation Overview

- National Teacher and Principal Survey (NTPS) survey background
- Teacher incentives experiment overview
- Propensity model overview
- Teacher incentives experiment – Phase I
 - Methodology
 - Results
- Next Steps

National Teacher and Principal Survey (NTPS)

- National cross sectional survey of public and private schools
- Sponsor: National Center for Education Statistics (NCES)
- Multi-level survey
 - School and principal questionnaires (school level)
 - Teacher listing form (school level)
 - Teacher questionnaires (teacher level)
- 8-9 month data collection (August- May/June)
- Survey cycle is every 2 years
- 2017-18 is the second data collection cycle for public schools and first for private schools

Teacher Incentives Experiment

- Motivation: increase overall teacher's response rate
- Challenges:
 - The teacher's response rate is a two-stage response rate
 - Teachers are sampled in waves
- Plan: incentivize on multiple levels
 - Teacher
 - Principal and/or School Coordinator
 - Targeted contingency incentives

Experimental Design

Experimental Group	1	2	3	4	5	6	7	8
Phase One (Waves 1-12)	Teacher Incentive	Teacher Incentive	Teacher Incentive	Teacher Incentive	No Incentive	No Incentive	No Incentive	No Incentive
Phase Two (Waves 13-21)	Teacher Incentive	Teacher Incentive	No Teacher Incentive	No Teacher Incentive	Teacher Incentive	Teacher Incentive	No Teacher Incentive	No Teacher Incentive
	SC* or Principal Incentive	No SC or Principal Incentive	SC or Principal Incentive	No SC or Principal Incentive	SC or Principal Incentive	No SC or Principal Incentive	SC or Principal Incentive	No SC or Principal Incentive

*School Coordinator (SC)

Models for Predicting TLF Behavior

- Logistic regression:
 - TLF Response Model
 - Binary response variable: returned the TLF vs. did not return the TLF
 - TLF Early vs. Late Response Model
 - Binary response variable: returned the TLF early vs. did not return the TLF early
- Time-to-event Model
 - Predicts the number of days of data collection before a school will return the TLF

Results of Modeling to Equally Disperse Schools

- TLF response rate within each experimental group:

Public Schools	
Incentive Group	Response Rate
1	84.22%
2	84.61%
3	84.99%
4	83.92%
5	85.88%
6	84.93%
7	83.53%
8	85.42%

Private Schools	
Incentive Group	Response Rate
1	73.68%
2	72.73%
3	71.94%
4	71.98%
5	72.19%
6	72.84%
7	75.05%
8	74.10%

Teacher Incentives Experiment – Phase I

- Waves 1-12 of data collection
- All cases are scheduled to receive up to four mailouts
- Cases in the treatment group will receive a \$5 cash incentive with their first mailout
- Cases in the control group will receive no cash incentive

Results – Public Teacher Response Rates

- The incentive was effective overall
- The incentive was effective at increasing response rates for 20 out of the 23 public school domains

***notes significance at p =.05 level
 *notes significance at p=.10 level

Teacher Response Rates - Public Schools		
Public School Domain	Response	
	Incentive	No-Incentive
***All	85.5%	79.8%
Charter	76.6%	76.6%
***Non-Charter	86.5%	80.1%
***Primary (school level)	83.5%	79.1%
***Middle (school level)	85.6%	82.3%
***High (school level)	87.9%	81.0%
***Combined (school level)	85.8%	79.0%
***City	79.8%	72.2%
***Suburban	85.7%	80.6%
***Town	90.3%	86.0%
***Rural	90.5%	86.7%
***Non-Priority	87.5%	83.7%
***Priority	75.4%	65.8%

Results – Private Teacher Response Rates

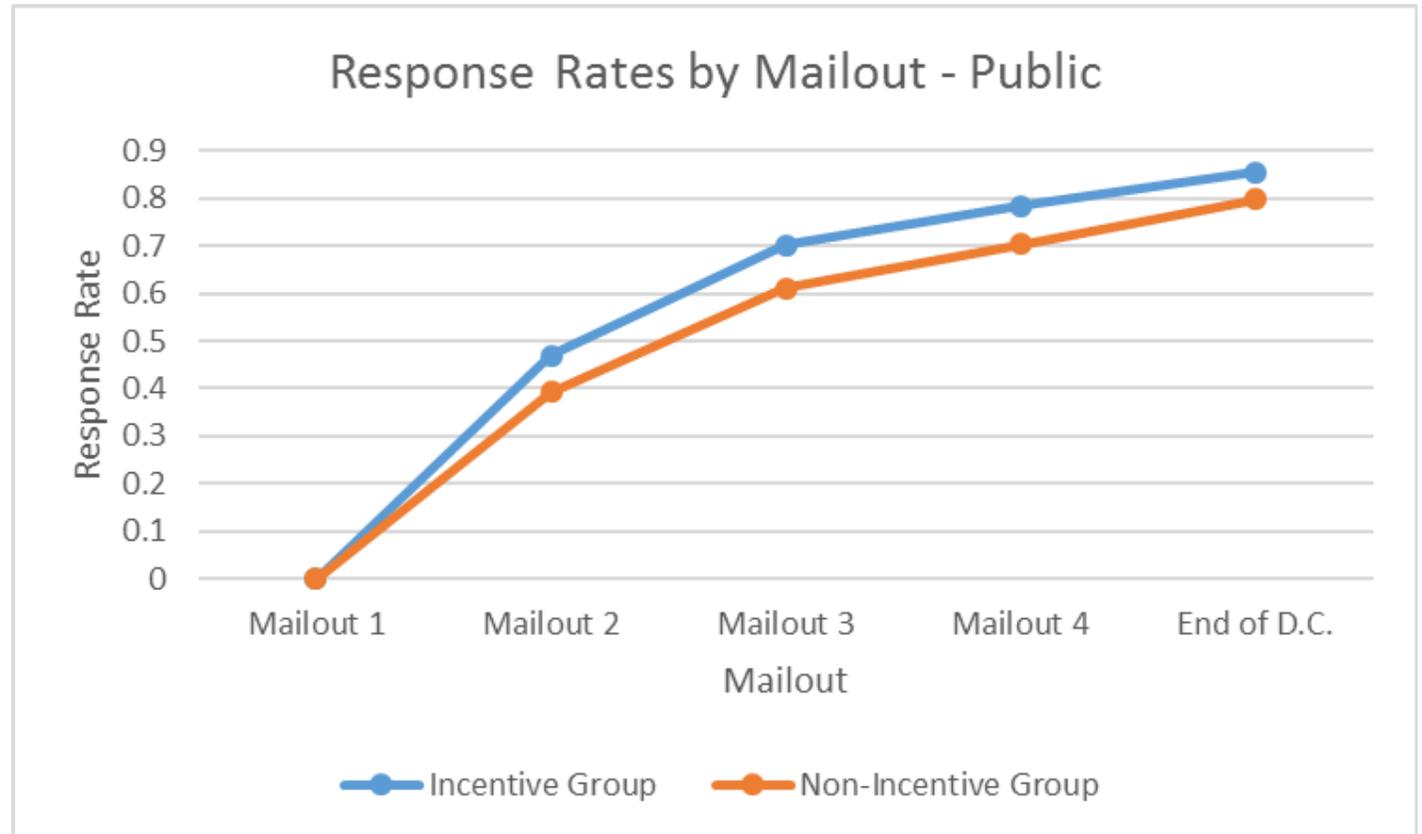
- The incentive was effective overall
- The incentive was effective at increasing response rates for 9 out of the 21 private school domains

***notes significance at p =.05 level
 *notes significance at p=.10 level

Teacher Response Rates - Private Schools		
Private School Domain	Response	
	Incentive	No-Incentive
***All	84.6%	81.0%
Catholic	88.1%	86.1%
***Other Religious (non-Catholic)	80.9%	75.4%
*Nonsectarian	85.5%	82.7%
Elementary	85.7%	85.5%
*Secondary	83.1%	80.3%
***Combined	84.9%	78.2%
***City	83.4%	78.4%
Suburban	86.1%	84.0%
*Town	86.9%	81.0%
Rural	82.5%	80.2%
Non-Priority	87.6%	86.4%
***Priority	83.0%	78.0%

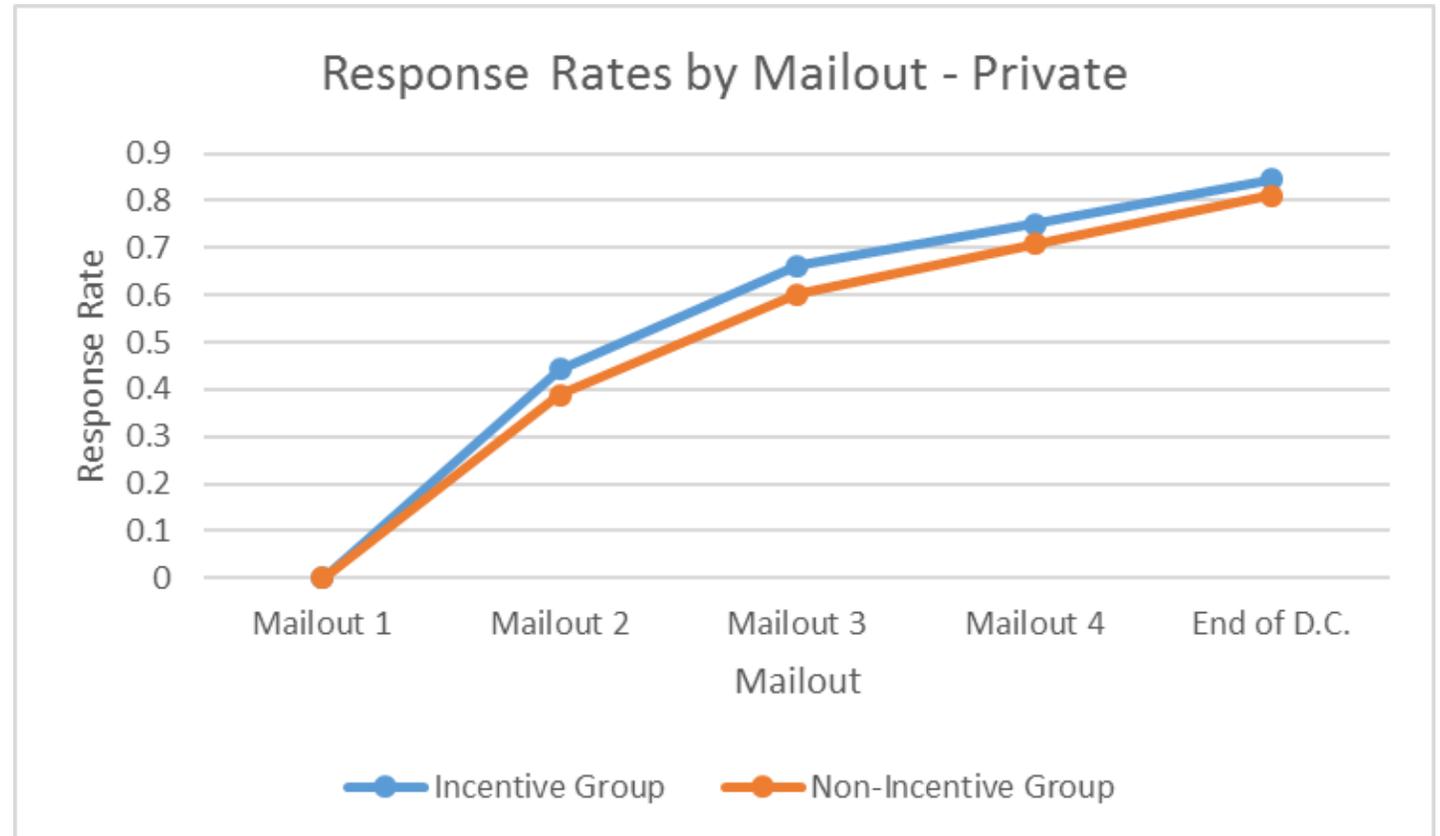
Results – Public Teacher Response by Mailout

- The incentive was significantly effective overall at the time of each mailout for public school teachers
- The incentive was effective for
 - 21 domains at mailout 2
 - 22 domains at mailout 3
 - 20 domains at mailout 4



Results – Private Teacher Response by Mailout

- The incentive was significantly effective overall at the time of each mailout for private school teachers
- The incentive was effective for
 - 14 domains at mailout 2
 - 15 domains at mailout 3
 - 12 domains at mailout 4



Results – Days to Respond

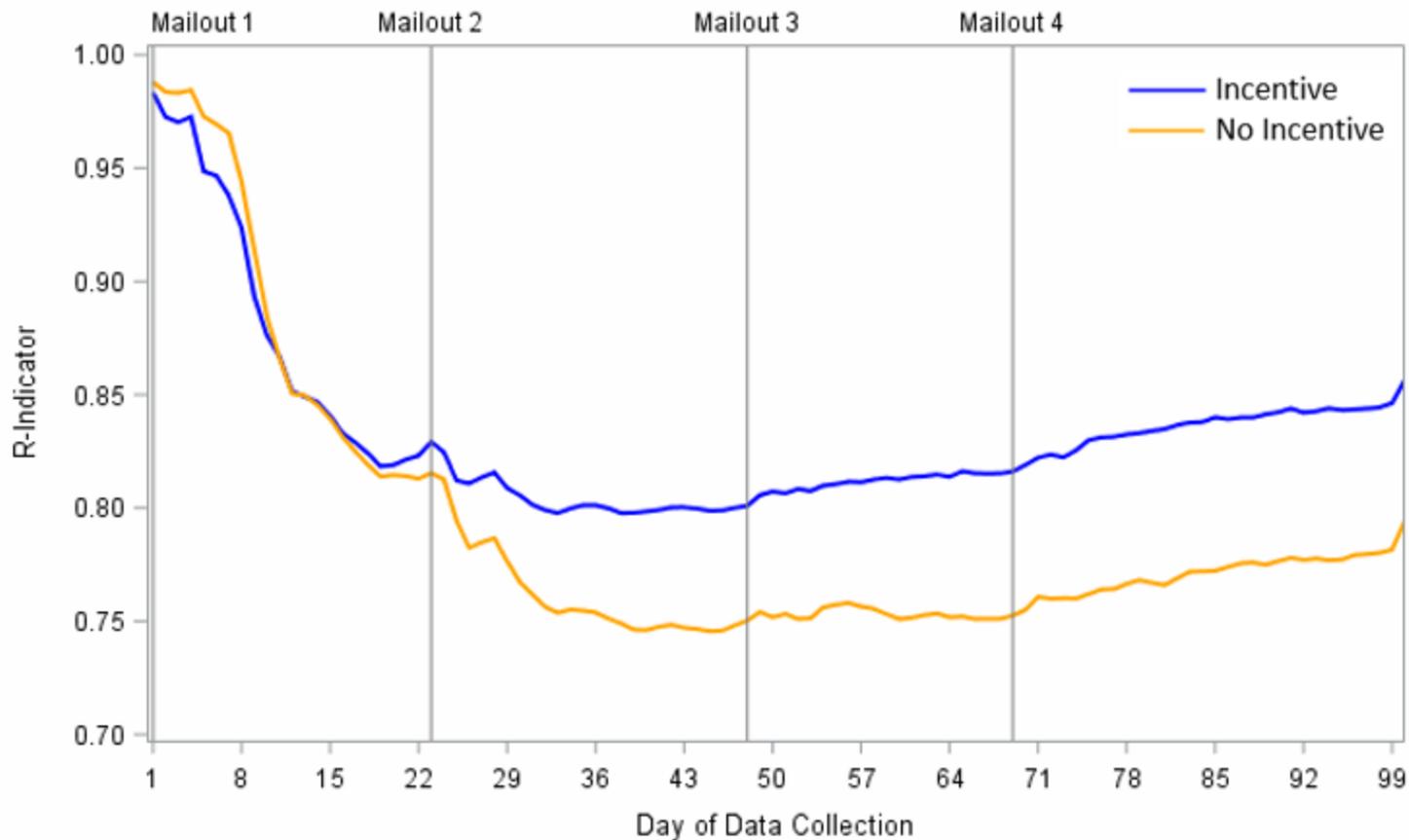
Average Days to Respond			
Domain	Incentive	No-Incentive	Difference
Public	24.6	28.65	4.05
Private	28.21	29.97	1.76

***notes significance at p =.05 level
*notes significance at p=.10 level

- Moods Median Test showed significant difference between medians
- Cox Regression showed the incentive to be a significant indicator of days to respond

Results – Public Teacher Balance

Public Teacher Full Sample R-indicator by Day of Data Collection:



Variables Used in R-Indicator Models - Public Schools

School Type

Special District Indicator

Charter/Non-Charter Indicator

Urban/Rural Locale Code

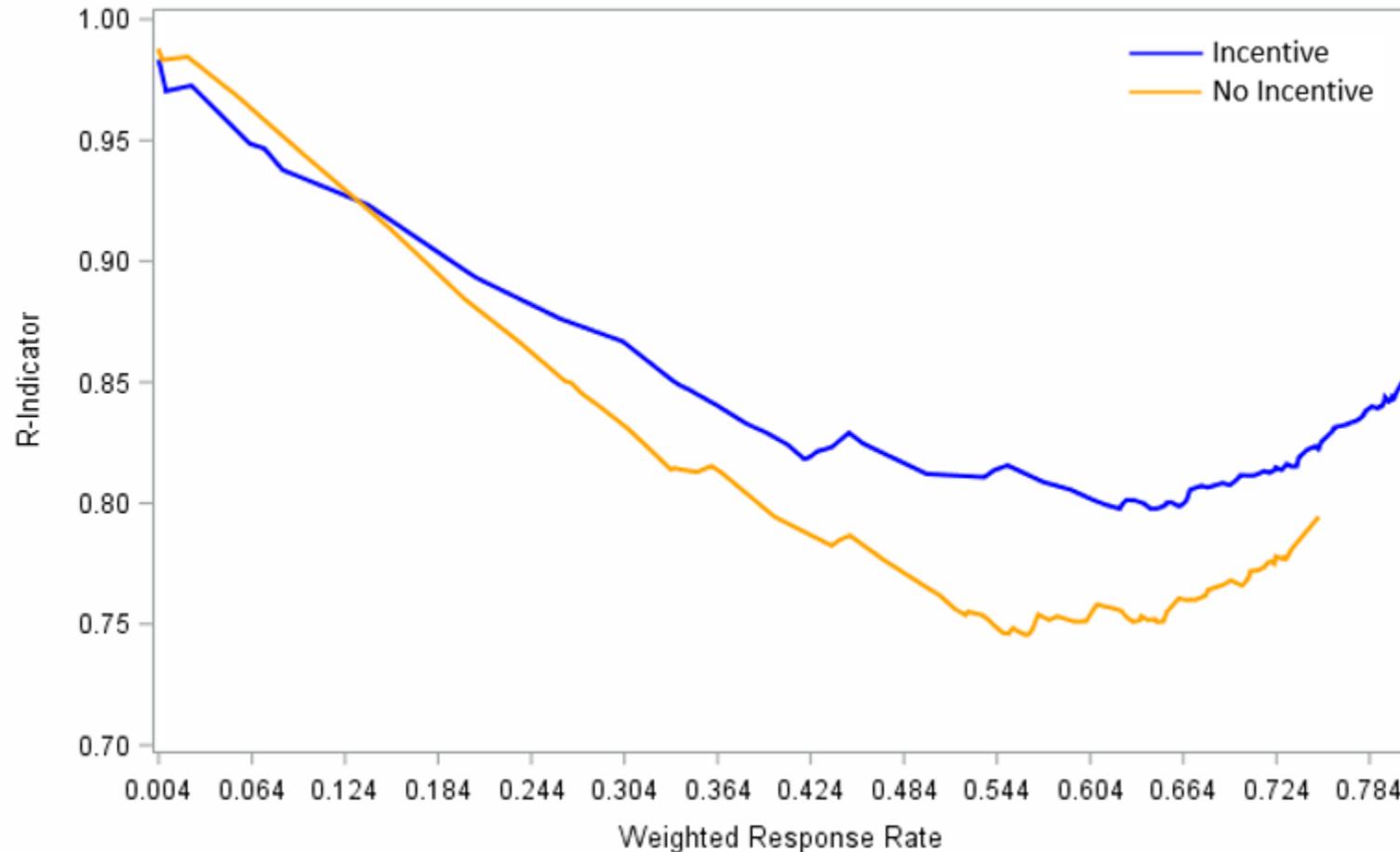
Enrollment

Grade Level

Free/Reduced-Price Lunch Status

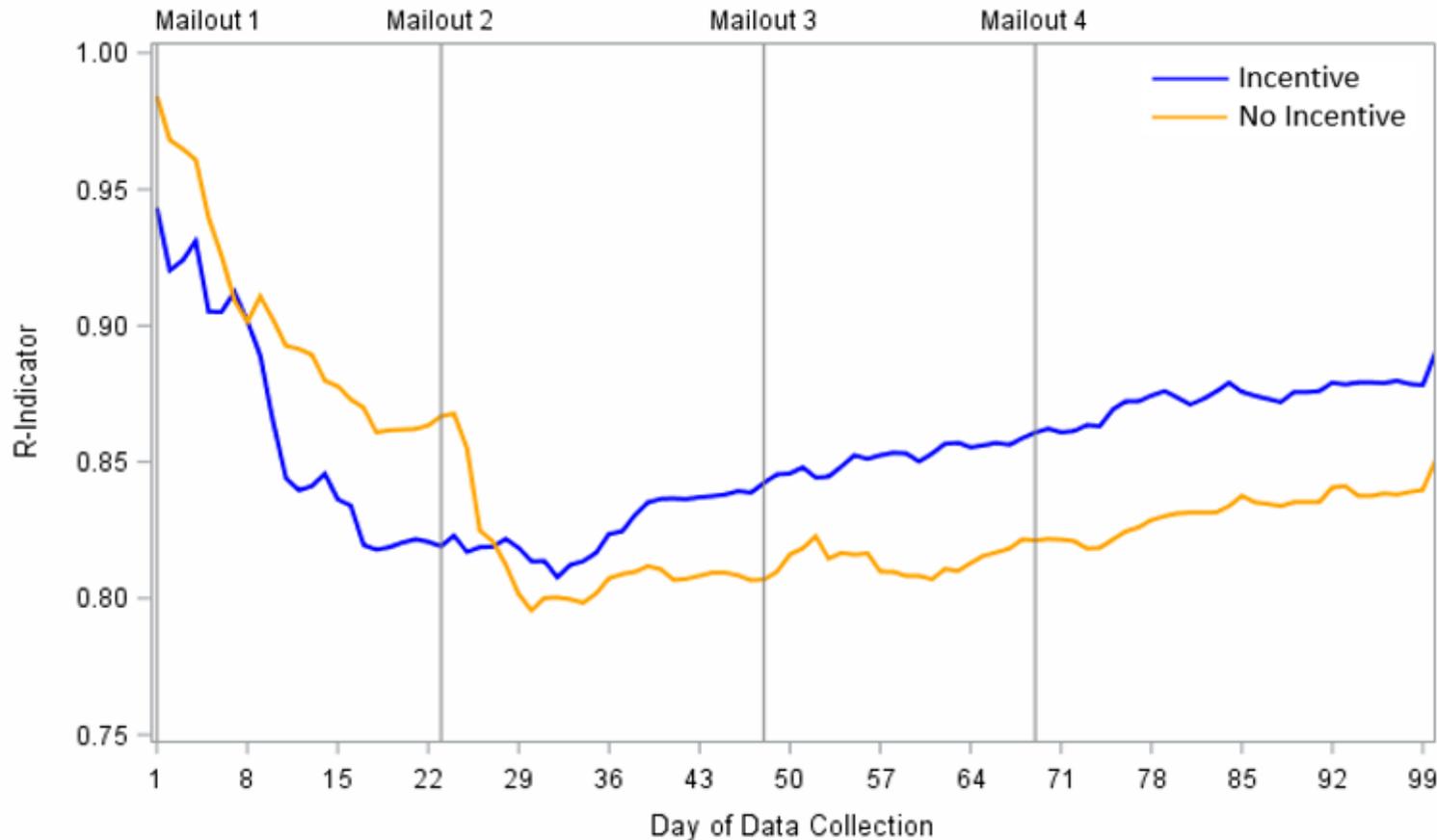
Results – Public Teacher Balance

Public Teacher Full Sample R-indicator by Weighted Response Rate (using Base Weights):



Results – Private Teacher Balance

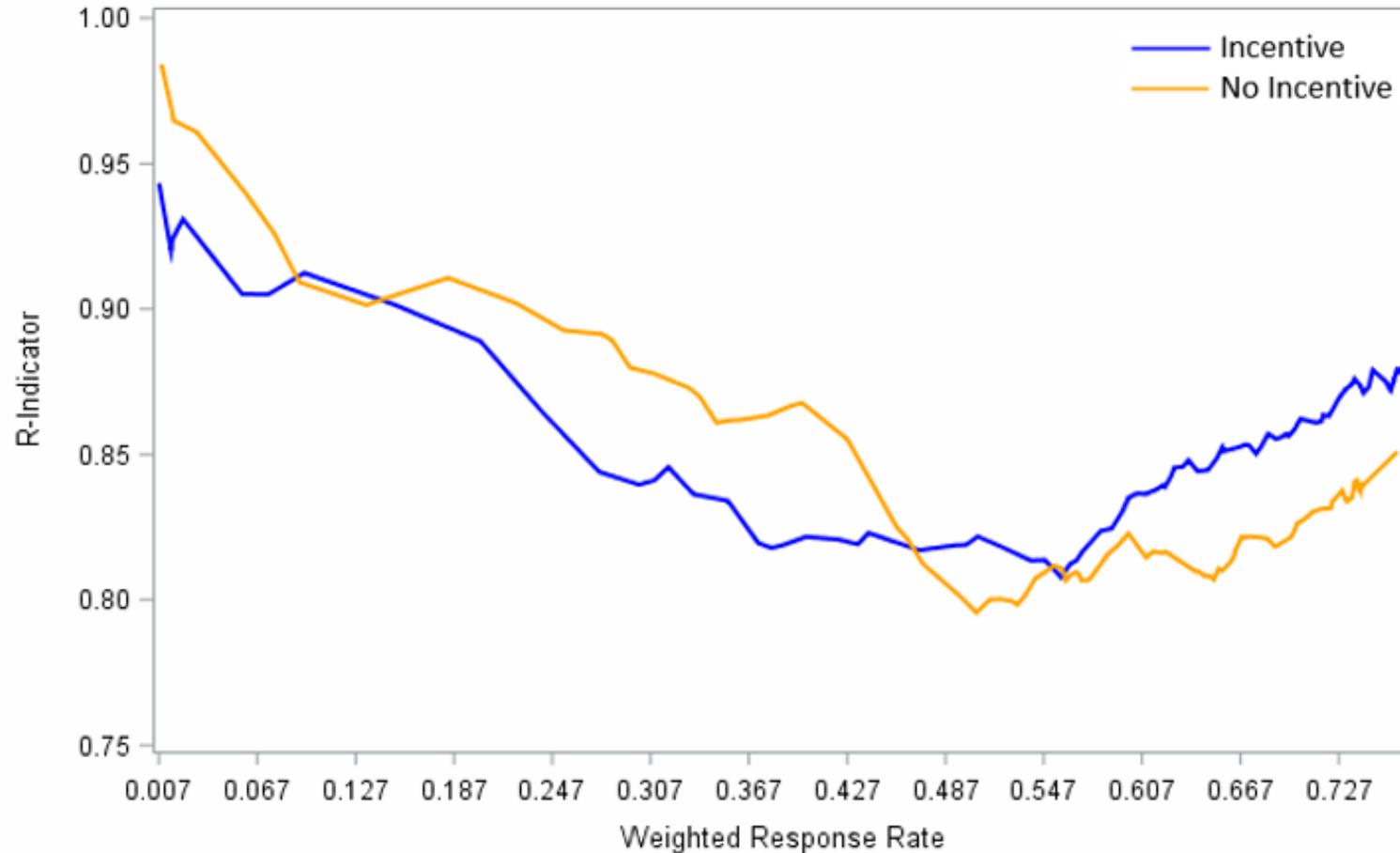
Private Teacher Full Sample R-indicator by Day of Data Collection:



Variables Used in R-Indicator Models - Private Schools
School Type
Urban/Rural Locale Code
Religious Affiliation
Enrollment
Region

Results – Private Teacher Balance

Private Teacher Full Sample R-indicator by Weighted Response Rate (using Base Weights):



Conclusions

- The model was successful at evenly distributing schools
- The incentive was significant overall for both public and private school teacher response rates
- The incentive significantly increased response rates for
 - 20 out of 23 public school domains
 - 9 out of 21 private school domains
- The group that received the incentive was more representative than the group that did not receive the incentive by day of data collection

Next Steps

- Preliminary results from Phase I of the teacher incentives experiment were used to implement Phase II
- Analysis is still ongoing for results of Phase II and for final survey outcomes
- Plans to look into effects of teacher incentive experiment on cost

Questions?

Contact Information

Kayla Varela

kayla.m.varela@census.gov

(301)-763-0517

Thank you!

Extra Slides

Final Model Covariates

TLF Response Model	TLF Early Response Model	Time-to-TLF-Response
Charter Status	Charter Status	Charter Status
Locale Code	Enrollment	Locale Code
Priority Flag	Status	Priority Flag
Special District Flag	State	Special District Flag
Region	Percent Black Students	State
Title I Indicator	Number of Hispanic Students	Status
Enrollment	Vendor Flag	Lowest Grade
Percent Hispanic students		Highest Grade
Vendor Flag		Vendor Flag
		Full-time teachers
		Percent Black Students

Response Rate Calculation

$$\text{Response Rate} = \frac{\text{Interviews} + \text{Out of Scopes}}{\text{All Sampled Cases}}$$

Response Rates for All Domains

Teacher Response Rates - Public Schools		
Public School Domain	Response	
	Incentive	No-Incentive
***All	85.5%	79.8%
Charter	76.6%	76.6%
***Non-Charter	86.5%	80.1%
***Primary (school level)	83.5%	79.1%
***Middle (school level)	85.6%	82.3%
***High (school level)	87.9%	81.0%
***Combined (school level)	85.8%	79.0%
***City	79.8%	72.2%
***Suburban	85.7%	80.6%
***Town	90.3%	86.0%
***Rural	90.5%	86.7%
Enrollment: less than 100	85.4%	84.2%
***Enrollment: 100-199	91.7%	82.9%
***Enrollment: 200-499	87.7%	82.1%
***Enrollment: 500-749	85.4%	78.9%
***Enrollment: 750-999	85.5%	78.3%
***Enrollment: 1000 or more	81.5%	77.4%
***Free/Reduced Price Lunch: 0-34%	86.4%	81.3%
***Free/Reduced Price Lunch: 35-49%	87.4%	82.3%
***Free/Reduced Price Lunch: 50-74%	86.1%	82.3%
***Free/Reduced Price Lunch: 75% or more	81.6%	72.3%
Free/Reduced Price Lunch: DNP	83.0%	80.1%
***Non-Priority	87.5%	83.7%
***Priority	75.4%	65.8%

Teacher Response Rates - Private Schools		
Private School Domain	Response	
	Incentive	No-Incentive
***All	84.6%	81.0%
Catholic	88.1%	86.1%
***Other Religious (non-Catholic)	80.9%	75.4%
*Nonsectarian	85.5%	82.7%
Elementary	85.7%	85.5%
*Secondary	83.1%	80.3%
***Combined	84.9%	78.2%
Northeast	79.7%	77.3%
Midwest	88.6%	87.1%
***South	87.7%	80.5%
West	82.8%	80.1%
***City	83.4%	78.4%
Suburban	86.1%	84.0%
*Town	86.9%	81.0%
Rural	82.5%	80.2%
***Enrollment: less than 100	85.1%	76.4%
Enrollment: 100-199	85.7%	83.4%
Enrollment: 200-499	82.9%	81.8%
Enrollment: 500-749	84.4%	81.0%
Enrollment: 750 or more	85.8%	82.7%
Non-Priority	87.6%	86.4%
***Priority	83.0%	78.0%

R-Indicator Calculations

- Full Sample R-Indicators

$$R(\hat{\rho}) = 1 - 2 \left(\sqrt{\frac{1}{N-1} \sum_{i=1}^N \frac{s_i}{\pi_i} (\hat{\rho}_i - \hat{\rho})^2} \right)$$

- Evaluate representativeness of respondent population as compared to the sample population, given a set of balancing variables

- Unconditional Partial R-Indicators

- Variable-Level

$$R_u(\text{var}, \hat{\rho}) = \sum_{k=1}^K \frac{N_k}{N} (\hat{\rho}_{x,k} - \hat{\rho}_x)^2$$

- Evaluate which variables are driving the variation in response propensities

- Category-Level

$$R_u(\text{var}, k, \rho) = \sqrt{\frac{N_k}{N}} (\bar{\rho}_{x,k} - \bar{\rho}_x)$$

- Evaluate which subgroups of a variable or a cross of variables are over- or under-represented