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ABSTRACT

As a step in combining three of the Elementary and Secondary Education surveys of the National Center for Education Statistics to produce one database linking local education agencies, schools, and teachers, the merged procedures and collections forms were pretested. Different methods were tested by splitting the pretest sample of 220 public schools and 75 private schools into five treatment subsamples and using a different methodology in each subsample. The different methodologies addressed the following questions: (1) Should the principal designate a school coordinator to coordinate collection activities or should the survey assume that the principal would do this? (2) Should the coordinator be paid for time spent coordinating collection activities? (3) Should telephone or mail prompts remind the coordinator of follow-up? (4) Are there differences between public and private schools? (5) Are there differences by questionnaire type? Focus was on selecting the treatment that will provide a high survey response rate. Results indicate that the designated coordinator was important. Responses to telephone prompts were higher than for mail prompts. Returns from the public sector were higher than from the private sector. Paying coordinators did not significantly improve return rates. The different questionnaires did not produce significant differences in response rates. The full survey will utilize telephone prompts to unpaid coordinators. Eleven tables present pretest data. (SLD)

NATIONAL CENTER FOR EDUCATION STATISTICS

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Schools and Staffing Pretest Methodology Analysis

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Introduction

The Schools and Staffing Survey is the Center's first attempt at combining three of the Elementary and Secondary Education Surveys: the "Teacher Demand and Shortage Surveys," the "Public and Private School Surveys," and the "Teacher Surveys." The idea behind the merger is to produce one database that would allow linkage between the LEAs, schools, and teachers. The first step in this effort was to pretest the merged procedures and collection forms. The next step was to analyze the pretest data and modify the procedures and collection forms using the results from the analysis. This paper represents some of the results from the pretest analysis.

The purpose of this analysis is to find a good collection methodology that will assure a high response rate at minimal cost. To achieve this goal, different methods were tested by splitting the pretest sample into five subsamples (treatments) and using a different collection methodology within each subsample. The different methodologies were designed to answer the following questions:

- Should the school principal be asked to designate a school coordinator to coordinate the various school and teacher collection activities or should we assume the principal will take this responsibility?
- Should the school coordinator be paid for time spent coordinating the collection activities?
- Is it better to remind the coordinator to follow up nonrespondents using a telephone or mail prompt?
- Are there differences between public and private schools?
- Are there differences by questionnaire?

Within each treatment, the same collection forms were mailed to each respondent, and a telephone collection effort was performed for each no-return after a predetermined date. The differences between the treatment final response rates, after the telephone collection effort, did not seem large enough to yield a useful analysis. Since mail collection is cheaper than telephone collection, a logical alternative method to answer the above questions is finding the treatment with the highest mail return rate. This can be accomplished by analyzing the response rates computed after the close out of the mail pretest collection. This is the approach taken in this paper.

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A more complete analysis would include computing estimates for key variables and seeing if there are treatment differences between the estimates. If such differences exist, a further study would be required (possibly another survey) to determine the cause of the differences. This type of analysis was not undertaken because it was not within the survey time constraints. Such an analysis might be done at some future time.

This paper describes the treatments, the measurement methodology, the analysis and assumptions, and the results. The analysis Census did on this problem will also be discussed, as their analysis relates to the analysis of this paper. Finally, the actions taken as a result of the analysis are described.

SASS Sample Selection

The SASS pretest sample was selected using probability proportionate to size sampling with school enrollment as the measure of size. The frame used for sample selection was the QED (Quality Education Data, Inc.) file of public and private schools. A total of 220 public schools were in the sample--10 elementary, 10 secondary and 2 combined schools were independently selected from each of 10 States (California, Connecticut, Georgia, Illinois, Kansas, Oregon, South Carolina, Texas, Virginia and Wyoming). The sample of individual States was a judgmental sample. Seven teachers were selected from each elementary or combined school and 15 teachers were selected from each secondary school. The LEAs corresponding to the selected schools were given the LEA questionnaire.

For private schools, the sampling frame consisted of 42 States and the District of Columbia. (Delaware, Maryland, Michigan, New Jersey, New York, Ohio, Pennsylvania and West Virginia were not included.) These 43 "States" were used because they approximate the Census Regional Offices that contain the 10 public school sample States. A total of 75 private schools were in the sample--10 Catholic schools and 15 non-Catholic schools were independently selected within each of three grade levels (elementary, secondary and combined schools). The 75 selected schools fell into 22 "States" which represent the 43 "States" above. Four teachers were selected from each elementary or combined school and seven teachers were selected from each secondary school. The LEA questionnaire was given to each selected school.

Once the above samples were selected, they were assigned to one of the five "treatments." (See tables A and B for the treatment assignments.) The collection methodology can then be varied within each treatment and later analyzed to find the best method.

Treatments

The following methodology was common to all treatments:

1) All sampled cases were given the same questionnaires and mailed to a contact person (coordinator) within each school.

2) After a specified time period, the coordinator was given a second set of collection materials for nonrespondents, asked to distribute the materials to nonresponding individuals and asked to encourage their cooperation.

and 3) After another time period, the remaining nonrespondents were telephoned and asked to respond to the questionnaire over the phone.

Given the common methodology described above, the individual treatment methodologies differed in the following manner:

1) In one treatment, the collection materials were sent to the school principal. With no prior agreements, the principal was asked to distribute the materials. After a number of weeks, he or she was sent new collection materials and asked in a letter to distribute the new materials to the nonrespondents listed in the letter.

In the remaining four treatments, the principal, before the beginning of collection, was asked to designate a coordinator. If the principal refused to designate a coordinator, then the Census Bureau made the principal the coordinator.

2) Two of the designated coordinator groups were paid $25 for their time and effort. One of these groups was given a mail prompt to follow up on the nonrespondents. The other group received a telephone call asking him or her to follow up on the nonrespondents. The notification of payment was made before data collection, but the actual payment was made in the middle of the telephone collection period.

3) The other two designated coordinator groups were not paid for their time and effort. One of these groups was given a mail prompt to follow up on the nonrespondents. The other group received a telephone call asking him or her to follow up on the nonrespondents.

The resulting two-way treatment table is illustrated below.

	Paid coordinator	Unpaid coordinator	Nondesignated coordinator
Telephone prompt	X1	X2	
Mail prompt	X4	X5	X6

The X3 treatment (Nondesignated Coordinator with telephone prompt) has been excluded because during the original design the idea was to use a No Coordinator group, instead of a Nondesignated Coordinator group. This would imply calling all the individual teachers at school and reminding them to respond. This was not considered to be a practical option, therefore, the X3 group was not generated. However, in the actual implementation, the No Coordinator group was replaced with a Nondesignated Coordinator group. Since a coordinator exists and only one call is required, it should be possible to create a X3 treatment. However, at this point, all schools had been assigned a treatment group, so it was not possible to create a new one.

Measurement Methodology

The goal of this analysis is to select the treatment that will provide a high response rate at minimal cost. A useful analysis cannot be achieved using the final treatment response rates because these rates are so similar. However, the mail return rates are quite different. If we assume: 1) the costs are computed as though each treatment had the entire pretest sample size and; 2) the telephone prompt increases the mail return rate by 1 percent (e.g., 69 vs. 70 percent); then a total of $942 would be saved from the reduction of telephone collection. It therefore seems reasonable to find the treatment with the highest mail return rate, thereby minimizing the amount of telephone collection and reducing the overall survey costs. If paying the coordinator significantly increases the return rates, then a more detailed cost analysis is required.

The formula for the mail return rate can be stated as:

mail return rate=(# of mail returns)/(# of in scope sample cases)

Assumptions

The mail return rates were analyzed using a contingency table analysis that employed generalized logits. Since this procedure uses asymptotic approximation, it is important that the sample sizes are sufficiently large. Using a minimally acceptable sample size of 30 as a general rule, the private sector treatments were pooled into two groups, by questionnaire: teacher; and all other (LEA, Administrator and School). This provided 10 private sector populations--five populations for each of the teacher and all other questionnaires. The smallest private sector population was 42 and the largest was 76.

There was no need to pool the public sector treatments. The smallest treatment (population) sample size was 43 and the largest was 490. There were 15 public sector populations--five populations for each of the administrator, school and teacher questionnaires. The LEA questionnaires were not assigned to treatments, so they are not included in the analysis.

Since the sample weights were not available at the time of this analysis, they were not used. Without weights, inferences can be made about the individuals in the sample, but no inferences can be made about the population that the sample represents. However, since the individuals in the sample represent one of the possible random samples from the design described above, inferences can be made about the unweighted return rates induced from that design. Care must be taken with such inferences, because statements that do not refer back to a specific population can be volatile. For example, changing the sample size or allocation in the design could induce large changes in the unweighted return rates. If we assume that the treatment effects induced from this design are similar to those induced by the final SASS design, then the results from this study should be useful.

An assumption used in contingency table analysis is that the observations within a treatment are independent. This is not true here. One source of dependence is that within a school, the same individual may be completing more than one questionnaire. There are also sample clustering effects that introduce correlations. One way of adjusting for these problems is to reflect the design effects in the analysis -- there were none made here. However, in its analysis of the data, the Census Bureau made adjustments to reflect the design effects. (Their impact will be discussed later.)

Within the paper, an attempt is made to use one model to explain all differences. When a comparison is tested, the smallest significance level that will be rejected (probability, in the tables) is provided. Since only a few comparisons are made, with the smallest significance level provided for each comparison, no adjustment was made to the critical values to reflect multiple comparisons.

Model

The general form of the logit model assuming two effects is:

$$E_A\{\log((1-P_{ij})/P_{ij})\} = U + U_i + U_j + U_{ij}$$

where:

E_A denotes asymptotic expectation

P_{ij} is the mail return rate for the i^{th} level within the first effect and the j^{th} level within the second effect.

U_i, U_j and U_{ij} are constants for the respective effects.

U is the overall average.

The effects included in the linear logit model are:

1) Sector - Public and Private
2) Questionnaire - Teacher Demand and Shortage (Private Sector only), Administrator, School and Teacher
3) Coordinator - Paid, Unpaid and Nondesignated
4) Contact - Mail prompt and Telephone prompt
and 5) Sector/Coordinator and Sector/Contact interactions. Interactions involving both Coordinator and Cost were excluded because of the missing nondesignated coordinator, telephone prompt treatments (X3). The missing interactions, however, are part of the Residual in the Analysis of Variance tables.

The raw data used in the model is provided below in tables 1 and 2.

Table 1.--Mail return rates for public sector

		Paid coordinator	Unpaid coordinator	Nondesignated coordinator
Principal questionnaire	Tel. prompt	0.791	0.860	-
	Mail prompt	0.837	0.860	0.682
School questionnaire	Tel. prompt	0.744	0.791	-
	Mail prompt	0.674	0.744	0.5
Teacher questionnaire	Tel. prompt	0.839	0.788	-
	Mail prompt	0.735	0.749	0.628

- - means that the treatment did not exist.

Table 2.--Mail return rates for private sector

		Paid coordinator	Unpaid coordinator	Nondesignated coordinator
Combined questionnaire*	Tel. prompt	0.619	0.689	-
	Mail prompt	0.667	0.556	0.667
Teacher questionnaire	Tel. prompt	0.714	0.621	-
	Mail prompt	0.632	0.712	0.577

- means the treatment does not exist.

* Combined questionnaire--Combines the Principal and Teacher questionnaires into a single cell.

The log expression in the model was chosen because it fit a normal distribution better than other transformations. For each population, this was verified using a statistical test for normality. Other transformations that were analyzed were log(P) and P. Again, the reason this is important is that the software package used for the analysis uses asymptotic normal approximations. The asymptotic approximations will be better the closer the transformed data is to a normal distribution.

The treatment X3 (nondesignated coordinator receiving a telephone prompt) was not measured in the pretest. It was verified that the software package handles this situation properly.

As table 3 shows, testing the model and data above does not produce any significant interaction terms.

Table 3.--Analysis of variance table with interactions

Source	DF	Chi-Square	Probability
Intercept	1	117.30	0.0001
Sector	1	12.62	0.0004
Questionnaire	3	7.29	0.0631
Coordinator	2	8.26	0.0161
Contact	1	3.67	0.0553
Sector/Coord.	2	2.78	0.2489
Sector/Contact	1	1.78	0.1825
Residual	14	13.89	0.4578

Excluding the interactions and retesting, the model produced Sector, Coordinator and Contact as significant effects; shown below:

Table 4.--Analysis of variance table without interactions

Source	DF	Chi-Square	Probability
Intercept	1	118.82	0.0001
Sector	1	15.43	0.0001
Questionnaire	3	7.27	0.0637
Coordinator	2	25.34	0.0001
Contact	1	9.82	0.0017
Residual	17	21.51	0.2044

Excluding the Questionnaire effect provides the main effects in table 5.

Table 5.--Analysis of variance table

Source	DF	Chi-Square	Probability
Intercept	1	235.73	0.0001
Sector	1	25.18	0.0001
Coordinator	2	24.83	0.0001
Contact	1	10.09	0.0015
Residual	20	28.78	0.0922

The residual is insignificant at the 0.09 level. This means that the model fits reasonably well and will be used to establish the results stated below. However, it would be good to verify the results with a model having a higher probability for the residual. This is discussed at the end of the results section.

The mail return rate by the final significant effects are shown below:

Table 6.--Public sector mail return rate

	Paid coordinator	Unpaid coordinator	Nondesignated coordinator
Telephone prompt	0.827	0.794	-
Mail prompt	0.738	0.757	0.622
	0.781	0.775	

Mail prompt (excluding nondesignated coordinator)	0.748
Telephone prompt	0.810
Mail prompt	0.707

- means the treatment does not exist.

Table 7.--Private sector mail return rate

	Paid coordinator	Unpaid coordinator	Nondesignated coordinator
Telephone prompt	0.679	0.647	-
Mail prompt	0.645	0.653	0.612
	0.661	0.650	

Mail prompt (excluding nondesignated coordinator)	0.649
Telephone prompt	0.662
Mail prompt	0.637

- means the treatment did not exist.

Results

For the analysis of variance table (table 5), it is clear that significant differences exists within the sector, coordinator and contact variables. The corresponding public return rates in table 6 are higher than the corresponding private rates in table 7. This provides evidence that it is more expensive collecting data from private schools. This was true even after the effort was made to get cooperation from private school associations.

Within table 6 and 7, the average telephone prompt effect has a higher return rate than the average mail prompt effect. For the public sector, the average telephone and mail return rates are 0.81 and 0.707, respectively. The private rates are 0.662 and 0.637, respectively. Even when the nondesignated coordinator group is excluded, the public rates are 0.81 for telephone and .748 for mail; the private rates are 0.662 and 0.649, respectively. Therefore, in the full scale survey, coordinators should be called and asked to follow up on nonrespondents.

The coordinator variable has three levels (paid, unpaid and nondesignated). The table below helps determine which levels are contributing to the significance of this effect.

Table 8.--Analysis of variance table

Coordinator test	DF	Chi-Square	Probability
Is the nondesignated return rate equal to the paid return rate?	1	22.09	0.0001
Is the nondesignated return rate equal to the unpaid return rate?	1	18.96	0.0001
Is the paid return rate equal to the unpaid return rate?	1	0.16	0.6934

Based on table 8, there is no significant difference between a paid or unpaid coordinator's return rate (0.781 vs. 0.775 and 0.661 vs. 0.650 for public and private, respectively). The only significant return rates come from the nondesignated coordinator (0.622 and 0.612 for public and private, respectively), which are significantly lower than both the paid and unpaid coordinator's rates. Looking at these, it seems important that the principal designate a coordinator. Paying one doesn't significantly improve the return rates.

Given that the principal must designate a coordinator, the analysis can be repeated excluding the nondesignated coordinator treatments. When this was done, as expected, the coordinator effect is no longer significant. The only significant effects are sector and contact as shown below:

Table 9.--Analysis of variance table

Source	DF	Chi-Square	Probability
Intercept	1	292.62	0.0001
Sector	1	30.84	0.0001
Contact	1	10.33	0.0013
Residual	17	18.82	0.3387

With the nondesignated coordinators excluded, the coordinator/contact interaction can now be measured and included in the model. When this was done, the interaction term was not significant so it was not included in the model.

The advantage of this approach is the residual variance component. Now, the residual has a chi-square of 18.82 with 17 degrees of freedom which is significant at the 0.34 level. This model fits better than the original model with a residual chi-square of 28.78 with 20 degrees of freedom which is only significant at the 0.09 level. Again, the sector and contact effects lead to the conclusions that the return rates for the public sector are higher than the private sector and a telephone prompt is better than a mail prompt.

Census Bureau Analysis

The Census Bureau analyzed the pretest treatments for the teacher survey. Their analysis did not use weighted estimates so they can not make inferences about the entire population. However, they did use Robert Fay's Contingency Table Analysis for Complex Sample Designs, which includes the design effects. Census concluded that: 1) it's important to designate a coordinator (significant at 0.025 level); 2) a telephone prompt is better than mail prompt (almost significant at the 0.1 level); and 3) public return rates are higher than private rates (significant at 0.1 level). In other words, the Census Bureau's results are the same as those presented here. The only differences occur with respect to the levels at which the hypotheses are significant.

For the description of the survey design, the differential coordinator case load (e.g., the number of questionnaires the coordinator must coordinate) was a function of sector and grade level. The Census Bureau could not find a significant school level effect. Therefore, the differential coordinator case load due to grade level did not significantly affect the return rates. The effect of the differential case load to the significance of sector as an important effect is not known, but the model does control for it.

Conclusions

The conclusions from this analysis are as follows:

1) Having a designated coordinator prior to the data collection is important. The lowest mail return rates occur with nondesignated coordinators. This is the strongest finding in both the Center's and the Census Bureau's analysis.

2) Mail return rates are significantly higher from telephone prompts than from mail prompts. This means that in terms of response rates it is worth telephoning all the coordinators.

3) The return rates for the public sector are significantly higher than the private sector. This provides evidence that it's more difficult to collect data from a private school than a public one, given the techniques used. Therefore, if the telephone collection must be reduced either for cost or time considerations, then care must be taken in reducing the private sector telephone collection.

4) The coordinators should not be paid for their time spent on the survey because mail return rates are not significantly improved by doing so.

5) It does not appear that there are any significant differences in response rates produced by the different questionnaires.

In terms of the full scale survey, then, telephone prompts will be given to unpaid designated coordinators.

Table A.--Assignment of treatments to public schools

Grade level	Order of selection	States				
		Ca.	Ga. Or. Ct.	Il. Tx.	Ks. Va. SC.	Wy.
Elementary	1	X6	X2	X4	X5	X1
	2	X2	X4	X5	X1	X6
	3	X4	X5	X1	X6	X2
	4	X5	X1	X6	X2	X4
	5	X1	X6	X2	X4	X5
	6	X1	X5	X4	X2	X6
	7	X5	X4	X2	X6	X1
	8	X4	X2	X6	X1	X5
	9	X2	X6	X1	X5	X4
	10	X6	X1	X5	X4	X2
Secondary	1	X1	X5	X4	X2	X6
	2	X6	X1	X5	X4	X2
	3	X2	X6	X1	X5	X4
	4	X4	X2	X6	X1	X5
	5	X5	X4	X2	X6	X1
	6	X6	X2	X4	X5	X1
	7	X1	X6	X2	X4	X5
	8	X5	X1	X6	X2	X4
	9	X4	X5	X1	X6	X2
	10	X2	X4	X5	X1	X6
Combined-grade	1	X6	X2	X4	X5	X1
	2	X1	X6	X2	X4	X5

Note: In treatment X6, the collection materials were sent to the school principal. With no prior agreements, the principal was asked to distribute the materials. After a number of weeks, the principal was sent new collection materials and asked in a letter to distribute the new materials to the nonrespondents listed in the letter.

In the remaining four treatments, the principal, before the beginning of collection, was asked to designate a coordinator. If the principal refused to designate a coordinator then the Census Bureau made the principal the coordinator.

In treatments X1 and X4, the designated coordinators were paid $25 for their time and effort. One of these groups (X4) was given a mail prompt to follow up on the nonrespondents. The other group (X1) received a telephone call asking the coordinator to follow up on the nonrespondents. The notification of payment was made before data collection, but the actual payment was made in the middle of the telephone collection period.

In treatments X2 and X5, the designated coordinators were not paid for their time and effort. One of these groups (X5) was given a mail prompt to follow up on the nonrespondents. The other group (X2) received a telephone call asking the coordinator to follow up on the nonrespondents.

Table B.--Assignment of treatment codes to private schools

Order of selection	Stratum					
	Catholic			Non-Catholic		
	Elementary	Secondary	Combined	Elementary	Secondary	Combined
1	X6	X4	X5	X1	X6	X2
2	X2	X5	X1	X6	X2	X4
3	X4	X1	X6	X2	X4	X5
4	X5	X6	X2	X4	X5	X1
5	X1	X2	X4	X5	X1	X6
6	X1	X4	X2	X6	X1	X4
7	X5	X2	X6	X1	X5	X2
8	X4	X6	X1	X5	X4	X6
9	X2	X1	X5	X4	X2	X1
10	X6	X5	X4	X2	X6	X5
11				X5	X4	X6
12				X4	X2	X1
13				X2	X6	X5
14				X6	X1	X4
15				X1	X5	X2

Note: In treatment X6, the collection materials were sent to the school principal. With no prior agreements, the principal was asked to distribute the materials. After a number of weeks, the principal was sent new collection materials and asked in a letter to distribute the new materials to the nonrespondents listed in the letter.

In the remaining four treatments, the principal, before the beginning of collection, was asked to designate a coordinator. If the principal refused to designate a coordinator then the Census Bureau made the principal the coordinator.

In treatments X1 and X4, the designated coordinators were paid $25 for their time and effort. One of these groups (X4) was given a mail prompt to follow up on the nonrespondents. The other group (X1) received a telephone call asking the coordinator to follow up on the nonrespondents. The notification of payment was made before data collection, but the actual payment was made in the middle of the telephone collection period.

In treatments X2 and X5, the designated coordinators were not paid for their time and effort. One of these groups (X5) was given a mail prompt to follow up on the nonrespondents. The other group (X2) received a telephone call asking the coordinator to follow up on the nonrespondents.