

Technical Notes

Distance Education Courses for Public Elementary and Secondary School Students: 2009–10

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Data perturbations were conducted on some background data to preclude identification of individuals and institutions.

Fast Response Survey System

The Fast Response Survey System (FRSS) was established in 1975 by the National Center for Education Statistics (NCES), U.S. Department of Education. FRSS is designed to collect issue-oriented data within a relatively short time frame. FRSS collects data from state education agencies, local education agencies, public and private elementary and secondary schools, public school teachers, and public libraries. To ensure minimal burden on respondents, the surveys are generally limited to three pages of questions, with a response burden of about 30 minutes per respondent. Sample sizes are relatively small (usually about 1,200 to 1,800 respondents per survey) so that data collection can be completed quickly. Data are weighted to produce national estimates of the sampled education sector. The sample size permits limited breakouts by classification variables. However, as the number of categories within any single analysis variable increases, the sample size within categories decreases, which results in larger sampling errors for the breakouts by analysis variables.

Sample and Response Rates

The sample for the FRSS survey of *Distance Education Courses for Public Elementary and Secondary School Students: 2009–10* consisted of 2,305 public school districts in the 50 states and the District of Columbia. The nationally representative sample was selected from the 2008–09 NCES Common Core of Data (CCD) Local Education Agency (School District) Universe file, which was the most current file available at the time of selection. The sampling frame included 13,563 regular districts and 2,191 charter school districts. For purposes of this study, “regular” school districts included any local school district that was not a component of a supervisory union (i.e., Education Agency type 1 on the CCD) or was a local school district component of a supervisory union sharing a superintendent and administrative services with other local school districts (i.e., Education Agency type 2 on the CCD). A district is a “charter agency” if all schools associated with the agency are charter schools (i.e., Education Agency type 7 on the CCD) or if the district is an “other education agency” (i.e., Education Agency type 8 on the CCD) and the district has at least one charter school when matched against the corresponding 2008–09 CCD school file. Excluded from the sampling frame were districts in the outlying U.S. territories and regular districts with no enrollments or missing enrollments.¹

To select the sample, the sampling frame was stratified by district type (regular vs. charter), district enrollment size (six categories for regular districts and four categories for charter districts), and poverty status (up to five categories for regular districts only)² to create 30 sampling strata. Within each of the two categories of district type, the sample was allocated to size strata in rough proportion to the aggregate square root of the enrollment in the stratum. To improve the representativeness of the sample, an implicit stratification was induced by sorting the districts within each stratum by community type³ and region prior to sampling. Within each stratum, districts were selected systematically and with equal probabilities.

Questionnaires and cover letters were mailed to the superintendent of each sampled school district in November 2010. The letter stated the purpose of the study and asked that the definition of distance education be reviewed to determine who in the district would be best suited to provide the requested information. Respondents were offered the option of completing the survey via the web or by mail. Telephone follow-up for survey nonresponse and data clarification was initiated in late November 2010 and completed in March 2011.

Of the 2,305 districts in the sample, 13 districts were found to be ineligible for the survey because they were closed, were an administrative entity that did not operate any schools, or served only adult or special education students. For the eligible districts, the response rate was 94 percent (2,149 responding districts divided by the 2,292 eligible districts in the sample). The weighted response rate was 95 percent. Of the districts that completed the survey, 68 percent completed it via the web, 18 percent completed it by mail, 8 percent completed it by telephone, and 6 percent completed it by fax or email.

Although item nonresponse was very low (less than 1 percent for any item), missing data were imputed for the items with a response rate of less than 100 percent. Table 1 shows the weighted percent of districts with imputed data for each questionnaire item. The missing items included both numerical data, such as enrollment in distance education courses, and categorical data, such as the reasons for having distance education in a district. The missing data were imputed using a “hot-deck” approach to obtain a

¹ Charter school districts were included even if enrollment data were missing.

² Poverty status was based on district-wide estimates of the percent of children 5–17 years of age in families living below the poverty level, discussed further in the Definitions of Selected Analysis Variables section of this document.

³ The community type variable is based on the urban-centric district locale variable from the 2008–09 CCD (ULOCAL08), discussed further in the Definitions of Selected Analysis Variables section of this document.

Table 1. Weighted percent of districts with imputed data, by questionnaire item: 2009–10

Questionnaire item		Percent imputed (weighted)
Question 2. For the 12-month 2009–10 school year, report the number of enrollments in distance education courses of students regularly enrolled in your district:		
Q2a	Total number of enrollments in distance education courses	0.28
Q2b	Number of enrollments in distance education courses in elementary schools	0.02
Q2c	Number of enrollments in distance education courses in middle or junior high schools	0.14
Q2d	Number of enrollments in distance education courses in high schools	0.28
Q2e	Number of enrollments in distance education courses in combined or ungraded schools	0.02
Question 6. In 2009–10, did your district monitor students’ progress in any distance education courses in the following ways?		
Q6a	Attendance report	0.20
Q6b	Log-on activity	0.20
Q6c	Time spent online	0.20
Q6d	Completion and submission of assignments	0.20
Q6e	Interim course grades	0.20
Q6f	Final grade report	0.20
Question 11. In 2009–10, to what extent were the distance education courses developed by your district or by other entities?		
Q11	Extent distance education courses developed by your district or by other entities	0.02
Question 13. How important were the following reasons for having distance education courses in your district in 2009–10?		
Q13f	Providing opportunities for students who are homebound or have special needs to take courses	0.01
Q13g	Addressing school space limitations	0.02
Question 14. In 2009–10, to what extent were the following technologies used for the instructional delivery of distance education courses taken by students regularly enrolled in your district?		
Q14a	Internet courses using synchronous instruction	0.20
Q14b	Internet courses using asynchronous instruction	0.20
Question 15. In 2009–10, which one of the technologies listed in question 14 was used as a primary mode of instructional delivery for the greatest number of distance education courses taken by students regularly enrolled in your district?		
Q15	Technology used as primary mode for the greatest number of distance education courses	0.20
Question 17. In 2009–10, where did students access distance education courses that were delivered over the Internet?		
Q17a	At school	0.13
Q17b	At home	0.13
Q17c	At some other location	0.13
Question 18. Does your district plan to expand the number of distance education courses offered in the next 3 years?		
Q18	Does district plan to expand the number of distance education courses offered in the next 3 years ...	0.07

NOTE: Percents are calculated as the weighted number of imputed cases divided by the weighted number of questionnaire respondents for whom the question applied (i.e., respondents instructed to skip the question are excluded from the base). Only questionnaire items with missing data are listed in the table.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Fast Response Survey System (FRSS), “Distance Education Courses for Public Elementary and Secondary School Students: 2009–10,” FRSS 98, 2010.

“donor” district from which the imputed values were derived. Under the hot-deck approach, a donor district that matched selected characteristics of the district with missing data (the recipient district) was identified. The matching characteristics included district type (regular or charter), community type, geographic region, district enrollment size, poverty concentration, and whether a district had students enrolled in distance education courses in the 12-month 2009–10 school year. In addition, other relevant

questionnaire items were used to form appropriate imputation groupings. Once a donor was found, it was used to derive the imputed values for the district with missing data. For categorical items, the imputed value was simply the corresponding value from the donor district. For the total number of enrollments in distance education courses (a numerical item), the imputed value was calculated by taking the donor's response for that item and dividing that number by the total number of students enrolled in the donor district. This ratio was then multiplied by the total number of students enrolled in the recipient district to provide an imputed value. For the number of distance education enrollments by instructional level, the same approach was used, but the ratio was derived using the total number of distance education enrollments in place of the total number of students enrolled in the district. Imputation flags are included in the data.

Weighting Procedures and Sampling Errors

The response data were weighted to produce national estimates (see table 2). The weights were designed to reflect the variable probabilities of selection for the sampled districts and were adjusted for differential unit (questionnaire) nonresponse. FRSS survey data are based on complex sample designs that require the use of weights to compensate for variable probabilities of selection, differential response rates, and possible deficiencies in the sampling frame. The reciprocal of the probability of selection, referred to as the "base weight," will produce unbiased (or consistent) estimates of population totals and ratios if there is no nonresponse in the survey. Since a stratified sample design was employed for the survey, the base weight for the i -th district in stratum h was computed as $w_{hi}=1/f_h$ where f_h is the overall sampling rate used to select districts in stratum h .

Although the survey had a high response rate, adjustment of the base weights was necessary to compensate for the survey nonrespondents (i.e., whole questionnaire or unit nonresponse). To compensate for unit nonresponse, an adjustment factor was computed as the inverse of the base-weighted response rate within selected weighting classes. This factor was then used to inflate the base weights of the districts in the weighting class to obtain the final nonresponse-adjusted weight.

The survey findings are presented in a *First Look* report titled *Distance Education Courses for Public Elementary and Secondary School Students: 2009–10* (NCES 2012–008). The reported findings are estimates based on the sample selected and, consequently, are subject to sampling variability. The standard error is a measure of the variability of an estimate due to sampling. It indicates the variability of a sample estimate that would be obtained from all possible samples of a given design and size. Standard errors are used as a measure of the precision expected from a particular sample. If all possible samples were surveyed under similar conditions, intervals of 1.96 standard errors below to 1.96 standard errors above a particular statistic would include the true population parameter being estimated in about 95 percent of the samples. This is a 95 percent confidence interval. For example, the estimated percent of districts with any students enrolled in distance education courses is 55 percent, and the standard error is 1.4 percent. The 95 percent confidence interval for the statistic extends from $55 - (1.4 \times 1.96)$ to $55 + (1.4 \times 1.96)$, or from 52.3 to 57.7 percent.

Because the data from the FRSS survey on distance education courses were collected using a complex sampling design, the variances of the estimates from this survey (e.g., estimates of proportions) are typically different from what would be expected from data collected with a simple random sample. Not taking the complex sample design into account can lead to an underestimation or overestimation of the standard errors associated with such estimates. Estimates of standard errors were computed using a technique known as jackknife replication. As with any replication method, jackknife replication involves constructing a number of subsamples (replicates) from the full sample and computing the statistic of

interest for each replicate. The mean square error of the replicate estimates around the full sample estimate provides an estimate of the variance of the statistic. To construct the replications, 100 stratified subsamples of the full sample were created and then dropped one at a time to define 100 jackknife replicates. A computer program (WesVar) was used to calculate the estimates of standard errors using the JKN option.

Table 2. Number and percent of responding public school districts in the study sample, and estimated number and percent of public school districts the sample represents, by district characteristics: 2009–10

District characteristic	Respondent sample (unweighted)		National estimate (weighted)	
	Number	Percent	Number	Percent
All public school districts	2,149	100	15,400	100
District enrollment size				
Less than 2,500	881	41	11,500	75
2,500 to 9,999	740	34	3,000	20
10,000 or more	528	25	900	6
Community type				
City	354	16	1,900	12
Suburban	657	31	3,200	21
Town	405	19	2,700	18
Rural	733	34	7,600	49
Region				
Northeast	451	21	3,300	21
Southeast	381	18	1,700	11
Central	656	31	5,600	36
West	661	31	4,900	32
Poverty concentration				
Less than 10 percent.....	624	29	3,800	25
10 to 19 percent.....	898	42	6,600	43
20 percent or more	627	29	5,000	32

NOTE: Detail may not sum to totals because of rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Fast Response Survey System (FRSS), "Distance Education Courses for Public Elementary and Secondary School Students: 2009–10," FRSS 98, 2010.

The sample of FRSS 98 districts is relatively large compared to the population of eligible districts, so finite population correction (FPC) factors are required to estimate standard errors accurately; otherwise, the standard errors would tend to be overestimated. In addition to the FPC factors, a second set of factors referred to as JKN factors are also required to compute standard errors using the JKN option. The JKN factors pertain to the numbers of replicates that are formed for variance estimation. To facilitate loading of the factors into statistical software, the data for these factors are provided in two separate files: F98fact_FPC.dat is a text file containing the 100 FPC factors (one for each replicate), and F98fact_JKN.dat is a text file containing the corresponding 100 JKN factors. Table 3 provides the same factor information contained in the text files.⁴

⁴ A description of how the two sets of factors are used in variance estimation is given in Rust, K. (1986), Efficient Replicated Variance Estimation, *Proceedings of the Section on Survey Research Methods, American Statistical Association*, 81-87.

Table 3. Values of finite population correction (FPC) and jackknife replication (JKN) factors to be used for calculating standard errors: 2009–10

Replicate	FPC factor	JKN factor
1 to 10	0.35	0.900000
11 to 25	0.43	0.933333
26 to 60	0.76	0.971429
61 to 100	1.00	0.975000

NOTE: FPC factors are based on the average sampling rate in the variance stratum. For replicates 61 to 100, the FPC is approximately 1.00.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Fast Response Survey System (FRSS), “Distance Education Courses for Public Elementary and Secondary School Students: 2009–10,” FRSS 98, 2010.

Nonsampling Errors, Coding, and Editing

The survey estimates are also subject to nonsampling errors that can arise because of nonobservation (nonresponse or noncoverage) errors, errors of reporting, and errors made in data collection. These errors can sometimes bias the data. Nonsampling errors may include such problems as misrecording of responses; incorrect editing, coding, and data entry; differences related to the particular time the survey was conducted; or errors in data preparation. While general sampling theory can be used to determine how to estimate the sampling variability of a statistic, nonsampling errors are not easy to measure and, for measurement purposes, usually require that an experiment be conducted as part of the data collection procedures or that data external to the study be used.

To minimize the potential for nonsampling error, the questionnaire was pretested with school district respondents. During the design of the survey and the survey pretest, an effort was made to check for consistency of interpretation of questions and definitions and to eliminate ambiguous items. The questionnaire and instructions were extensively reviewed by NCES and the data requester at the Office of Educational Technology (OET), U.S. Department of Education.

Editing of the questionnaire responses was conducted to check the data for accuracy and consistency. Cases with missing or inconsistent items were recontacted by telephone. A coding source file and editing specifications were used to produce the codebook. The codebook served as the main tool for coding, editing, and processing completed questionnaires. Coders used the codebook to identify cases requiring data retrieval or clarification and prepare cases for entry into the web application. The source file served as a data dictionary and included the data file layout, a description of each data item, a list of valid response codes or range formats with codes for nonresponse and inapplicable, and defined skip patterns.

Logics, ranges, and validation checks were prepared prior to data collection and included online edit checks, manual logic checks, and automated checks using SAS. Online checks were incorporated into the web application and manual edits were conducted to process cases received by mail, fax, or telephone. Steps were taken to ensure that the method of entering data from web and hardcopy questionnaires was the same, regardless of mode. For example, to enter survey data received by mail, fax, or telephone, the data processing staff accessed the survey website as “respondents” and “completed” the survey using the responses on the hardcopy survey. Subjecting all survey responses to the same set of built-in logics, ranges, and validation checks helps to ensure that data entry does not produce systematic differences in the survey data. In addition, all hardcopy data were subject to 100 percent verification using “doublekeying.”

Definitions of Selected Analysis Variables

Many of the district characteristics, described below, may be related to each other. For example, district enrollment size and community type are related, with city districts typically being larger than rural districts. Other relationships between these analysis variables may exist.

District Enrollment Size (SIZE)—This variable indicates the total number of students enrolled in the district based on data from the 2008–09 CCD Local Education Agency Universe file. The variable was collapsed into the following three categories:

Less than 2,500 students

2,500 to 9,999 students

10,000 or more students

Community Type (URBAN)—A created variable collapsed from the 12-category urban-centric district locale code (ULOCAL) that was assigned using the 2000 Decennial Census data. Data were obtained from the 2008–09 CCD Local Education Agency Universe file. The data were collapsed into four categories:

City—Includes large, midsize, and small principal cities

Suburban—Includes large, midsize, and small urbanized territories outside principal cities

Town—Includes fringe, distant, and remote territories that are inside an urban cluster

Rural—Includes fringe, distant, and remote territories that are outside of urbanized areas and urban clusters

Region (OEREG)—This variable classifies districts into one of the four geographic regions used by the Bureau of Economic Analysis of the U.S. Department of Commerce. Data were obtained from the 2008–09 CCD Local Education Agency Universe file. The geographic regions are as follows:

Northeast—Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont

Southeast—Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia

Central—Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin

West—Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oklahoma, Oregon, Texas, Utah, Washington, and Wyoming

Poverty Concentration (POVST)—This variable indicates the percentage of children in the district ages 5–17 in families living below the poverty level, based on the Title I data provided to the U.S. Department of Education by the U.S. Census Bureau, “Small Area Income and Poverty Estimates.” For detailed information on the methodology used to create these estimates, please refer to <http://www.census.gov/did/www/saie/index.html>. The variable was collapsed into the following three categories:

Less than 10 percent
10 to 19 percent
20 percent or more

District Type (DISTYPE)—This variable indicates the type of district. Data were obtained from the 2008–09 CCD Local Education Agency Universe file and coded into the following two categories:

Regular district—Includes districts with an Education Agency Type Code (TYPE08) of code 1 (local school district that is not a component of a supervisory union); or code 2 (local school district component of a supervisory union sharing a superintendent and administrative services with other local school districts).

Charter school agency—Includes districts with an Education Agency Type Code (TYPE08) of code 7 (all schools associated with the agency are charter schools). This category also includes districts that have an Education Agency Type Code of 8 (other education agency); and have at least one charter school when matched against the corresponding 2008–09 CCD school file.