

B. Collection of Information Employing Statistical Methods

B.1 Respondent Universe

Target Population and Sampling Frame

The target population for the NPRA Survey is nonprofit organizations that perform or fund research and development activities. An organization is nonprofit if categorized by the Internal Revenue Service (IRS) as 501(c)(3) public charity, 501(c)(3) private foundation, or other exempt organization [e.g., 501(c)(4), 501(c)(5), 501(c)(6)]. As recorded on the IRS Exempt Organizations Business Master File (December 2016), there are 1.6 million tax-exempt organizations in the United States. Of those, nearly 1.2 million filed an information return with the IRS in the past 24 months. Certain nonprofit organizations are not required to file an information return (e.g., churches), but those that are required must file Form 990, 990-N, 990-EZ, or 990-PF, according to their organization type and financial size (see Table B.1.1).

Table B.1.1: Criteria for Filing IRS Exempt Organization Forms

Type of Exempt Organization	Required to file
Public Charity and Other Exempt Organizations:	
Gross receipts normally \leq \$50,000	990-N
Gross receipts $<$ \$200,000, and Total assets $<$ \$500,000	990-EZ
Gross receipts \geq \$200,000, or Total assets \geq \$500,000	990
Private Foundations	990-PF

Small organizations, those with gross receipts under \$50,000 are allowed to file Form 990-N (“e-postcard”), which does not require the organization to report financial data. Nearly half of the filing organizations filed Form 990-N. These organizations were excluded from the frame due to their relatively small size and lack of financial data. The remaining organizations filed Forms 990, 990-EZ, or 990-PF, which require financial reporting.

The financial information on Forms 990, 990-EZ, and 990-PF is captured on the National Center for Charitable Statistics’ (NCCS) Core Financial Files. NCSSES will use the circa 2013 versions of the core files to construct the sampling frame for the NPRA Survey. The 2013 Core Financial Files are the latest available at the time of the sample selection for the NPRA Survey. These files are labeled “circa” 2013 because the data may be from different fiscal years. The due date for 990s is rolling based on the 15th day of the fifth month after the end of the organization’s taxable year. When the 2013 core file was constructed, most organizations had filed for their 2013 fiscal year; however, a few organizations had filed only for FY 2012 or had already filed for FY 2014. Further, if an organization did not file a return, but is presumed to be still active, NCCS uses the form from the latest filing. As shown in Table B.1.2, three separate core files are available.

Table B.1.2: NCCS Core Financial Files and Number of Records

Core File	Number of Records
501(c)(3) public charities that file Form 990 or 990-EZ	382,401
Other exempt organizations that file Form 990 or 990-EZ	140,219
501(c)(3) private foundations (Form 990-PF)	95,992
Total	618,612

The core files include a total of 618,612 organizations with unique employee identification numbers (EIN) that NCSSES will use as the sampling frame. Of those, 95,992 represent private foundations of all sizes that complete Form 990-PF. The other 522,620 represent public charities and other exempt organizations that filed Form 990 or 990-EZ. Typically, these organizations have gross receipts over \$50,000, because those with gross receipts under \$50,000 are allowed to file Form 990-N and are not recorded on the core files.

Frame Coverage

Using the core financial files as a sampling frame excludes most public charities and other exempt organizations with gross receipts under \$50,000 (note some file Form 990 or Form 990-EZ).¹ While organizations with gross receipts under \$50,000 represent 70% of the public charities and other exempt organizations, they represent approximately 0.1% of the total gross receipts generated by public charities and other exempt organizations.² Exclusion of these small organizations is a limitation because they will not be covered by the sampling frame (i.e., undercoverage). Alternatively, the IRS Exempt Organization Business Master File (EO/BMF) includes all exempt organizations regardless of financial size. However, the financial variables on the EO/BMF are limited to gross receipts, revenue, and total assets. The additional financial information available on the core files will be used in developing a propensity score model to improve the sample stratification (see Attachment E. NCCS Core File Description for a list of the variables on the core files). Although exclusion of these small organizations is a limitation in coverage, NCSSES believes the likelihood that these organizations are performing and/or funding R&D is small and the impact on the estimate of the total research expenditures will be negligible.

Another source of undercoverage is from new organizations that have not filed a Form 990, 990-EZ or 990-PF. However, these coverage errors are likely to be small due to an increase of only 1.1% of organizations between the 2014 and 2015 EO/BMF files.³

Frame Exclusions

The core files include some organizations that are not in the scope of this study, such as organizations outside the United States, educational institutions, churches, and government

¹ Based on the filing requirements code, 126,377 organizations on the core file are not required to file a Form 990, 990-EZ, or 990-PF.

² Based on gross receipts on the 2013 Exempt Organization Business Master File. For zero-filers, most of which are allowed to file Form 990-N and for which NCSSES has no record of income, NCSSES assumed the maximum threshold (\$50,000) to calculate the gross receipts percent. The percentage was 0.8% with this maximum threshold assumption.

³ The number of organizations filing Form 990, 990-EZ, or 990-PF within 24 months was 601,415 in September 2015 and 593,715 in September 2014.

organizations. These organizations are excluded from the sampling frame based on the criteria presented in table B.1.3.

Table B.1.3: Summary of Organizations Excluded From the Frame

	Nonprofit Organizations
Total Organizations on NCCS Core Files	618,612
Exclusions	
1) IRS subsection code: Exclude organizations with subsection code not equal to 3, 4, 5, or 6⁴	57,282
2) Foundation code: Exclude organizations with foundation code 10=Church or 14=Government	6,613
3) State: Exclude organizations outside the U. S.	1,321
4) North American Industry Classification System (NAICS): Exclude organizations with NAICS code 92=Public Administration	14
5) “Out of Scope” based on NCCS Coding⁵	32
6) Educational exclusions	49,568
7) Inactive organizations (based on pilot)	51

Response Rate

Response rates will be calculated using the American Association for Public Opinion Research standard definitions.⁶ The NPRA Pilot Survey achieved a screening response rate of 43.4% based on AAPOR’s RR1. The cooperation rate for answering the amount spent on research was 88.0% for performers and 85.6% for funders. See section B.3 for a discussion of the methods NCSSES plans to use to maximize response rates for the survey.

B.2 Statistical Methodology

Identifying Likely Performers and Likely Funders of R&D

Organizations performing and/or funding R&D will be rare and difficult to target, one of the greatest challenges for this survey. NCSSES will use two strategies to increase the sampling efficiency of locating performers and funders: (1) frame truncation, and (2) stratification. Both the frame truncation and stratification use the core financial information and classification codes to identify organizations that are more likely to perform or fund research.

⁴ Most exclusions were based on the following 501(c) subsection codes: 02 - Title holding corporations for a tax-exempt organization; 07- Social and recreational clubs; 08- Fraternal beneficiary societies and associations; 09 - Voluntary employees' beneficiary associations; 10 - Domestic fraternal societies; 12 - Benevolent life insurance associations, mutual ditch or irrigation companies, etc.; 13 - Cemetery companies, providing burial and incidental activities for members; 14 - State-chartered credit unions, etc.; and 19 - Post or organization of war veterans. The full list of the 501(c) subsection codes is available on the data dictionary for the NCCS Core Financial files, available at <http://nccsweb.urban.org/PubApps/showDD.php#Core%20Data>.

⁵ NCCS assigns a “G” identifying organizations that are considered government entities and “N” identifying organizations that have a physical IRS contact address, but nearly all program operations are conducted/focused outside the U.S. A total of 33 cases had a code of N or G. One organization coded as G was retained as a hospital: Christiana Care Health Services. The remaining 32 were eliminated.

⁶ The American Association for Public Opinion Research (AAPOR), *2015 Standard Definitions: Final dispositions of case codes and outcome rates for survey*, 8th edition, AAPOR (2015).

To identify the core financial variables related to performing and/or funding research and evaluate the impact of frame truncation, NCSES identified a set of “likely performers” and a set of “likely funders” on the frame. The likely performers and likely funders are a subset of organizations identified from auxiliary sources that strongly indicate that they are performing or funding research. The list was then updated based on responses from the NPRA Pilot Survey. Organizations that stated that they performed or funded were included; organizations that stated that they did not perform or fund were excluded.

This process resulted in 1,747 likely performers and 1,240 likely funders. The auxiliary sources and the process for matching to the frame are described in Attachment F. Likely Performer and Funder Sources. These counts reduced to 1,680 and 1,216, respectively, after the frame exclusions.

Organizations not identified as a likely performer or a likely funder will be referred to as “unknown.” The unknown organizations will be a mix of those performing or funding research (but not flagged via the auxiliary sources), as well as those not conducting any R&D. Nearly all of the organizations flagged as a likely performer and/or funder are expected to be conducting R&D. By comparing the organizations identified as likely performers or funders with organizations of unknown status, NCSES will identify characteristics associated with R&D and use this information to stratify the organizations into likelihood-based strata.

Table B.2.1 presents the likely performer and likely funder organizations by form type. There were 168 organizations classified as both a likely performer and a likely funder. Most (151) filed Form 990 while two filed 990-EZ, and 15 filed 990-PF. A large majority of the likely performers filed Form 990. The likely funders filed either Form 990 (35%) or Form 990-PF (64%).

Table B.2.1: Likely Performers and Likely Funders by Form Type

	Nonprofit Organizations	Likely Performer	Both	Likely Funder	Likely Performer or Funder
Form 990	233,484	1,409	151	370	1,930
Form 990-EZ	176,948	71	2	7	80
Form 990-PF	93,299	32	15	671	718
Total	503,731	1,512	168	1,048	2,728
Likely Performers		1,680			
Likely Funders			1,216		

Financial Truncation

To increase the efficiency of reaching organizations that perform or fund research, NCSES will impose a financial threshold. Table B.2.2 presents the mean revenue, assets, and expenses for the likely performers and the likely funders, as well as those not identified as either.

Table B.2.2: Mean Revenue, Assets, and Expenses

		Mean
Likely Performer (n=1,680)	Total Revenue	\$107,092,455
	Total Assets	\$174,924,720
	Total Expenses	\$99,380,581
Likely Funder (n=1,216)	Total Revenue	\$53,520,896
	Total Assets	\$297,838,957
	Total Expenses	\$34,912,864
Not likely Performer or Funder (n=501,033)	Total Revenue	\$2,934,023
	Total Assets	\$5,282,247
	Total Expenses	\$2,643,318

For the NPRA Pilot Survey, NCSES examined cut-offs based on revenue, assets, and expenses. For each variable, NCSES evaluated the percentage of organizations remaining in the frame and the percentage of likely performers or funders remaining in the sample. The goal was to retain organizations that are likely to be performing or funding research, while eliminating organizations that are unlikely to be performing or funding research. The evaluation resulted in the following financial requirements:

Form 990 or 990-EZ - Includes organizations with at least \$500,000 in expenses. At this financial threshold, the frame includes 85% of the likely performers/funders and 24% of all organizations. The 99,943 organizations that meet these criteria represent 97% of total revenue, 98% of total expenses, and 95% of total assets.

Form 990-PF - Includes organizations with at least \$2,750,000 in total assets. At this financial threshold, the frame includes 88% of the likely funders and 19% of all organizations. The 17,827 organizations that meet this threshold represent 90% of total revenue, 83% of total expenses, and 94% of total assets.

Final Stratification

After financial truncation, the frame includes 99,943 Form 990 and Form 990-EZ organizations and 17,827 Form 990-PF organizations. Table B.2.3 includes the number of organizations meeting the financial threshold by form type.

Table B.2.3: Number of Organizations Meeting the Financial Truncation Threshold

	All Organizations	Likely Performers/ Funders
Form 990	99,869	1,705
Form 990-EZ	74	1
Form 990-PF	17,827	718

To increase the sampling efficiency, NCSSES will stratify the organizations based on frame variables associated with R&D. The stratifying variables will be codes available on the frame, such as National Taxonomy of Exempt Entities (NTEE) codes (e.g., hospitals, research institutes), as well as a propensity score measuring the likelihood that the organization is performing or funding research.

The propensity score is developed from logistic regression models, with likely performer or funder as the outcome, and codes and financial characteristics from the core files as the predictor variables. The propensity scores are used to classify organizations into density strata, where organizations with high propensity scores will be classified into the high-density stratum, and the organizations with low propensity scores will be classified into the low-density stratum. Because NCSSES expects the percentage of performers or funders in the high-density stratum to be higher than the low-density stratum, NCSSES will oversample the high-density stratum to increase the likelihood of sampling a performer or funder.

Table B.2.4 presents the final stratification.

Table B.2.4: Final Stratification

Stratum	Size Stratification						Total
	1	2	3	4	5	6	
1 Likely Performer and Funder	49	33	23	20	19	20	164
2 Likely Performer (not Funder)	588	267	140	94	76	75	1,240
3 Likely funder (not Performer)	492	201	96	57	44	42	932
4 Hospitals	1,367	634	421	342	291	255	3,310
5 Research Organizations⁷	742	726	290	146	65	46	2,015
6 Form 990 organizations							
a. High density (top decile of propensity scores)	3556	1655	670	362	201	146	6590
b. Medium density (deciles 8, 9)	10,468	4,187	1,848	866	399	227	17,995
c. Low density (deciles 1–7)	37,349	19,171	6,961	3,283	1,191	409	68,364
7 Form 990-PF organizations							
a. High density (top decile of propensity scores)	582	368	235	125	79	55	1,444
b. Medium density (deciles 7–9)	2,160	1,652	741	358	126	64	5,101
c. Low density (deciles 1–6)	4,929	3,228	1,480	570	231	103	10,541

⁷ Research organizations are defined as 1) NTEE major group = H-Health - Disease Specific (research) or U-Science and Technology; 2) Common Code = 05-Research Institutes and/or Public Policy Analysis; and 3) Non-Private Foundation Reason Code = 05-Medical Research.

Sample Allocation

To determine the sample allocation for the study, NCSES used the estimated percentage of performers and funders from the NPRA Pilot Survey. NCSES used the estimated percentages for two aspects of the allocation. First, NCSES estimated the stratum population sizes for performers and funders. Second, NCSES estimated the relative cost per performer/funder survey in each stratum. All costs are scaled to the expected performer/funder surveys in the Research Organization stratum. Organizations identified as likely performers or funders (Strata 1–3) will be selected with certainty. The organizations that reported performing and/or funding research are included in Strata 1–3. The estimated population sizes and cost ratios are presented in Table B.2.5.

Table B.2.5: Stratification and Sample Allocation Assumptions

Stratum		Total on Frame (N)	Assumed Perf %	Assumed Eligible Perform	Assumed Fund %	Assumed Eligible Fund	Relative Cost
1	Likely Funders and Performers	164	64%	105	75%	123	-
2	Likely Performers (not Funders)	1,240	61%	752	39%	488	-
3	Likely Funders (not Performers)	932	8%	76	50%	466	-
4	Hospitals	3,310	9%	284	6%	189	4.79
5	Research Organizations	2,015	38%	764	31%	615	1.00
6a	Form 990 Organizations	6,590	19%	1,267	12%	811	2.17
6b	Form 990 Organizations	17,995	6%	1,038	4%	692	7.12
6c	Form 990 Organizations	68,364	5%	3,097	2%	1327	10.57
7a	Form 990-PF Organizations	1,444	5%	77	12%	166	4.07
7b	Form 990-PF Organizations	5,101	3%	135	12%	587	4.83
7c	Form 990-PF Organizations	10,541	4%	373	9%	933	5.52
		117,696		7,968		6,397	

All likely performers and likely funders (Strata 1-3) will be selected with certainty. The remaining strata are allocated sample based on the relative cost per performer/funder survey and the estimated performer population size, and variance of total expenses for each size stratum

The overall sample size was determined to obtain a CV of 1.5% of mean expenses for performing organizations. Based on the stratification, sample allocation, and assumptions described above, this requires a sample size of 730 performing organizations. Based on 60% screening response rate, the expected incidences from the NPRA Pilot Survey and valid responses to the performance expenditure amount for 95% of organizations, the required sample size is sample size 6,219 organizations. The resulting design included some strata with a single unit selected. NCSES increased all stratum sizes to a minimum of 15. This resulted in an overall sample size of 6,437.

Sample Selection

The sample will be a systematic (1-in-k) sample of organizations within each stratum. Organizations will be selected with equal probability within strata. The organizations will be implicitly stratified by size before selecting the systematic sample to ensure the sample is proportionally distributed by size. The organizations in each stratum will be sorted by total expenditures.

Estimation

Weighting

Estimates from the NPRA Survey will be weighted to be representative of nonprofit organizations in scope for the survey. These weights will apply to all estimates derived from the survey data, such as total expenditures on R&D. The weighting process will begin with the computation of sampling (base) weights for all selected organizations. The sampling weight is calculated as the number of organizations in the frame (N_h) divided by the number of organizations selected (m_h) in stratum h , or the reciprocal of the probability of selection, $W1 = N_h/m_h$. The base weight corrects for differential sampling rates for the strata.

NCSES will then adjust for nonresponse within each stratum. The stratum nonresponse adjustment will be a ratio adjustment where the respondents (r) will be weighted to account for the non-respondents (nr). The base weight is used to calculate the adjustment factor,

$$f1 = (\sum_{r+nr} W1) / (\sum_r W1).$$

The base weight is adjusted by the nonresponse factor, $W2 = W1 * f1$.

NCSES will do a second nonresponse adjustment to increase the sample representativeness relative to the data on the frame (i.e., classification codes and financial variables). This will be based on a propensity score adjustment. For this adjustment, first, NCSES will build a logistic regression model with survey response as the outcome (1=respond, 0=no response). The outcome will be modeled based on the frame data. Respondents and non-respondents will be grouped into quintiles on the basis of their response propensity score. Within each quintile, the respondents (r) will be weighted to account for the non-respondents (nr), $f2 = (\sum_{r+nr} W2) / (\sum_r W2)$.

The nonresponse adjusted weight is $W3 = W2 * f2$. The nonresponse adjustment will be conducted for Form 990 and Form 990-PF separately.

Finally, the weights will be calibrated to match the total number of nonprofit organizations on the frame. NCSES will use generalized regression calibration (GREG) to match the frame based on total assets, total expenses and total organizations in each stratum.

Variance Estimation

NCSES will use successive difference replication (SDR) (Fay & Train, 1995) a replication variance method based on a variance estimator for systematic samples presented by Wolter (1985).

B.3 Methods to Maximize Response Rates and to Deal with Issues of Nonresponse

The methodology for the NPRA Survey incorporates features that promote increased response rates, including the addition of a screener phase to the survey, modifications to the number and style of communications, and real-time monitoring of survey comments and errors. Utilizing these strategies should help us engage nonprofit organizations and quickly intervene with respondents who have questions or issues to improve responses and response rates.

Addition of a Screener Phase

Based on our experience with the NPRA Pilot Survey, NCSES found that many of the nonprofit organizations selected to complete the survey do not perform or fund research. Therefore, NCSES will conduct a screener so that organizations that do not perform or fund research activities can quickly respond and then be removed from the survey. As a result, the survey fielding period will be divided into two phases, Phase I—Screener and Phase II—Survey. Before the beginning of Phase I, the sample will be divided into two groups: (1) nonprofits strongly believed to currently perform and/or fund R&D (Knowns) and (2) nonprofits for which NCSES has no information concerning their R&D activities (Unknowns).

Nonprofits in the Unknown group will begin with the Phase I screener which will identify R&D performers and funders. Nonprofits in the Known group will be excluded from Phase I because they have already been identified as likely performers or funders of research in the past, based on information from the NPRA Pilot Survey or the NCSES Survey of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions.

Communications

Our methodology uses multiple modes of contact (e-mail, mail, telephone); tailoring and varying the message of contact attempts; short and to-the-point communications; clear and detailed instructions for responding to the survey; and easy survey access for multiple respondents within the organization. These features are all associated with increased response rates (Dillman, Smyth, & Christian, 2008).

NCSES will use several key components of the communications to demonstrate the authenticity of the survey. First, the Prenotification Letters will be signed by the NCSES Director, John Gawalt. Other mailed communications and several e-mails will be signed by the NCSES Project Officer, Ronda Britt. Second, while NCSES already hosts a web page on its site that provides some information about the survey (<https://www.nsf.gov/statistics/srvynpra/>), for the full implementation, information will be added, including the fielding periods, survey contractor's name, PDF copies of the survey instruments that can be downloaded, as well as the name and telephone number of the NCSES Project Officer.

Real-Time Monitoring of Survey Comments and Issues

In addition to providing more communication with the organizations and demonstrating more evidence of the authenticity of the survey, NCSSES will monitor responses in real time using our data collection monitoring system. NCSSES can identify organizations that have errors in their survey (which would prevent them from submitting), and proactively contact the organization to offer assistance or answer questions about the item(s) at issue. This real-time monitoring should help us increase survey completion and alleviate delays or nonresponse due to questions organizations may have.

Nonresponse Analysis

We will conduct a nonresponse analysis and it will inform the weighting adjustments to correct for a sample that is disproportionate from the population.

The nonresponse analysis will include four components:

- 1) **Response rates:** During survey fielding, response rates for key subgroups will be calculated and monitored throughout each phase of the data collection. Subgroups will be defined based on the frame variables, including by NTEE code and organization size. Differential response rates across key subgroups will guide data collection activities toward increasing response where it is low. NPRA Pilot Survey response rates for hospitals have led to a modified data collection protocol to increase response from these organizations.
- 2) **Early/Late Responders:** The NPRA survey is a multi-mode data collection protocol designed to maximize response rates. In addition to monitoring response rates by phase, NCSSES will monitor the research expenditures by phase. NCSSES will compare the research expenditures between early responders and those responding later in the survey (i.e. those more difficult to reach and/or reluctant responders) to determine any systematic differences in response.
- 3) **Administrative Data:** The NPRA frame contains hundreds of data items from administrative data collected by the IRS (Forms 990 and 990-PF.) These data include key correlates to research expenditures, including total expenditures, total assets, as well as classification codes such as NTEE and NAICS codes. Using the frame data, NCSSES will conduct a logistic regression with survey response as the outcome (1=respond, 0=no response). The resulting response propensity scores provide a measure of representativeness based on the frame data, which will be quantified in the form of an R-indicator as described by Schouten et al (2009).
- 4) **Debriefing Interviews:** Forty Debriefing Interviews will be conducted. Twenty will be conducted with organizations that have completed the questionnaire approximately two weeks after submission and will focus on the survey content and process. The other 20 interviews will be conducted with organizations that chose not to respond at the end of data collection to examine why they decided not to respond. Specific issues that will be covered

are general attitudes toward the survey; whether the organization received the contacts, and, if not, which modes did they not receive; whether the contacts were sent to the right person; and the frequency of attempts. Information from the Debriefing Interviews will be used to refine the data collection strategy for the next cycle of the survey.

B.4 Tests of Procedures and Methods

No methodological tests are planned for the survey. NCSES conducted the NPRA pilot survey in 2016 to test the feasibility of the questions, sampling procedures, and data collection procedures. The methodology and results of this pilot survey are described in the evaluation report which is available upon request from the NCSES Project Officer.

B.5 Individuals Consulted on Technical and Statistical Aspects of Design

The NPRA Survey will be conducted by NSF's National Center for Science and Engineering Statistics. ICF is the contractor in charge of data collection. The name, title, affiliation, and telephone numbers for those consulting on the project are below.

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Attachments

- A. FY 2016 NSF Survey of Nonprofit Research Activities
 - i. A-1: FY 2016 NSF Survey of Nonprofit Research Activities
 - ii. A-2: FY 2016 NSF Survey of Nonprofit Hospital Research Activities
- B. Comment Letter from Andrew Reamer
- C. Debriefing Interview Protocols
 - a. Debriefing Protocol for Respondents
 - b. Debriefing Protocol for Non-respondents
- D. Debriefing Interview Correspondence
- E. NCCS Core File Description
- F. Likely Performer and Funder Sources
- G. Propensity Models for Performer and Funder Stratification
- H. Communications with Nonprofit Organizations of Unknown Eligibility
- I. Communications with Nonprofit Organizations of Known Eligibility