Attachment 10
Statistical Design Plan

September 2013

2014 Health Center Patient Survey

Deliverable 5: Statistical Design Plan

Prepared for

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SECTION 1.
INTRODUCTION

The 2014 Health Center Patient Survey, sponsored by the Health Resources and Services Administration (HRSA), aims to collect data on patients who use health centers funded under Section 330 of the Public Health Service Act. Results from the study will guide and support the Bureau of Primary Health Care (BPHC) in its mission to improve the health of the nation's underserved communities and vulnerable populations by assuring access to comprehensive, culturally competent, quality primary health care service. The 2014 Health Center Patient Survey will collect data from the patients of health centers funded through four BPHC grant programs: the Community Health Center program (CHC), the Migrant Health Center program (MHC), the Health Care for the Homeless program (HCH), and the Public Housing Primary Care program (PHPC).

Our goal is to recruit 165 grantees and complete 6,600 interviews, among them 3,630 for the CHC funding program, 1,210 for the MHC funding program, 1,210 for the HCH funding program, and 550 for the PHPC funding program. In addition, to meeting BPHC's research interests in race/ethnicity groups, patients of American Indian/Alaska Native (AIAN), Native Hawaiian/Pacific Islanders (NHPI), and Asian race groups will be oversampled. Patients aged 65 or older will also be oversampled. The target sample sizes in three design domains, namely funding program, race/ethnicity and age group, are shown in **Exhibit 1**.

Exhibit 1. Target Sample Sizes for the 2014 Health Center Patient Survey

Funding Program	Target Sample Size	Race / Ethnicity	Target Sample Size	Age Group	Target Sample Size
CHC	3,630	**Hispanic**	2,044	**0–17**	2,200
MHC	1,210	**Non-Hispanic White**	1,558	**18–64**	3,200
HCH	1,210	**Non-Hispanic Black**	1,618	**65+**	1,200
PHPC	550	**Non-Hispanic AIAN**	409		
		Non-Hispanic Asian	647		
		Non-Hispanic NHPI	251		
		Non-Hispanic Others	73		

In this report, we define the target population of the 2014 Health Center Patient Survey in **Section 2**. An overview of sample design is presented in **Section 3**, and a detailed discussion of the proposed three-stage sample design is presented in **Sections 4** through **6**. An illustrative

example of grantee sample using 2012 BPHC's Uniform Data System (UDS) data is also presented. In **Section 7**, we discuss sample sizes and power calculation in the context of the illustrative example. **Section 8** details the procedure for calculating sample weights. Data collection schedules and costs are presented in **Section 9**. In **Section 10,** we list some strengths and limitations of the study design.

SECTION 2.
TARGET POPULATION

The target population for the 2014 Health Center Patient Survey (HCPS) comprises of persons who meet the definition of a health center patient used in the BPHC's Uniform Data System (UDS). These persons receive face-to-face services from a CHC, MHC, HCH, or PHPC grantee clinical staff member who exercises independent judgment in the provision of services.[1] Patients from grantees located within the 50 United States and the District of Columbia are included; while patients from grantees within U.S. territories and possessions are excluded.

Only persons who received services through one of these grantees at least once in the year prior to the current visit are considered eligible for the survey. This eligibility criterion will be used because many of the questions in the survey ask about services received in the past year; individuals without previous visits will not be able to answer these questions and, therefore, are not considered eligible. This eligibility criterion was also implemented in the BPHC's 2009 Primary Health Care Patient Surveys (PHCPS), the 2002 Community Health Center Survey, and the 2003 Healthcare for Homeless Survey.

[1] To meet the criterion for "independent judgment," the provider must be acting on his/her own when serving the patient and not assisting another provider.

SECTION 3.
OVERVIEW OF SAMPLE DESIGN

In the 2014 Health Center Patient Survey, the primary analytic units are patients who receive services from health sites in funded grantees. The patients are clustered within health sites and the sites are clustered within the grantees. RTI International[2] will use a stratified three-stage sample design. The grantees are the first stage of selection units, also known as the primary sampling units (PSUs). Sites within selected grantees are the second stage of selection units, and patients within selected sites comprise the third stage of selection units. We expect to achieve the design goals and target sample sizes for funding programs by oversampling grantees participating in PHPC, MHC, and/or HCH funding programs at the first stage. We expect to achieve the target sample sizes for race/ethnicity by oversampling grantees and site(s) with concentrated patients in one of the three race categories (AIAN, Asian, NHPI) at the first and second stages and by oversampling patients in these three race/ethnicity categories at the third stage as well. To achieve the target sample size for patients aged 65 or older, we will oversample the older patients at the third stage of selection.

At the first stage, grantees will be selected using the stratified probability proportional to size (PPS) sampling method (Kish, 1995). Grantees participating in PHPC, MHC, and HCH funding programs and grantees with concentrated AIAN, Asian, or NHPI patients will be oversampled. The oversampling is achieved by stratification and application of different selection probability among strata. The explicit stratification is based on the type of funding a grantee receives; the stratum of grantees receiving CHC funding only is further stratified according to the proportions of patients in one of the three oversampling race/ethnicity categories. Additionally, sorting the grantee frame by region, urbanicity, and grantee size (large, medium, or small[3]) before selecting grantee sample serves as the implicit stratification, and ensures that the grantee sample has good coverage of regions, urban and rural areas, and grantee sizes. Because of the high costs associated with recruiting a grantee and hiring a field interviewer (FI) to perform the data collection, we will select an independent site and patient sample from each funding program for grantees receiving multiple funding programs.

At the second stage, sites will be selected within participating grantees, and a maximum of three sites per funding program is allowed in each grantee. If a grantee has three or fewer sites

[2] RTI International is a trade name of Research Triangle Institute.
[3] Eligible grantees are sorted by the patient volume in each grantee, and then the top third of grantees as classified large, the middle third of grantees as medium, and the bottom third of grantees as small.

in a funding program, all eligible sites will all be selected, assuming they are in reasonable proximity for an FI. A grantee with more than three sites in a funding program will have three sites selected using PPS sampling, based on the number of patients served. Again, to ensure a success of oversampling AIAN, Asian, and NHPI patients, sites with concentrated patients in those three race/ethnicity categories will be oversampled.

At the third stage, patients will be selected as they enter the site and register with the receptionist. Patients in three oversampling race/ethnicity categories and patients aged 65 or older will be identified and oversampled; that is, they will have a higher probability of selection than patients who are not in the oversampling groups. The receptionist will refer the first eligible patients who are not in the oversampling groups to the FI when the FI indicates he/she is ready for the next interview. The receptionist will refer patients in oversampling groups to the FI more frequently. For each funding program, the same number of patient interviews will be completed from each grantee to reduce unequal weighting effects (UWE) and maintain a balanced workload across grantees. The total number of patient interviews within a grantee will be divided among multiple sites if more than one site is selected for a funding program.

In our design, we take every measure to meet the design goals and reduce the design effect (*deff* [4]) due to clustering and oversampling. In summary, we present key elements of the sample design and the associated benefits in **Exhibit 2**.

[4] The design effect (*Deff)* is a measure of the precision gained or lost by the use of the more complex design instead of a simple random sample. For a multistage cluster sample like the 2014 Health Center Patient Survey, *deff* is a function of the clustering effect and the unequal weighting effect (*UWE)* and can be defined as *deff = UWE*(1 + (m-1)*ICC),* where *m* is the number of patient interviews within a grantee, *ICC* is the intracluster correlation coefficient that measures the degree of similarity among elements within a cluster, and *UWE* measures variation in the sample weight. *Deff* can be reduced by reducing either *UWE* or the clustering effect or both.

Exhibit 2. Summary of Features and Benefits of Sample Design

Key Design Features	PROS, CONS, and Comments
First Stage: Grantee Sample Selection (165 grantees will be recruited)	
Stratification	**PROS**: Ensures a representative grantee sample and enough grantees are selected for each funding program; ensures the selected grantees have good coverage of patients in three oversampling race/ethnicity categories.
Oversample PHPC, MHC, and HCH grantees and grantees with high proportion of patients in three oversampling race/ethnicity categories	**PROS**: Achieves oversampling goals in funding type, and race/ethnicity categories. **CONS**: Disproportionate sampling increases UWE. **COMMENTS**: Select PPS grantee sample from each stratum; it can reduce UWE.
Select independent sample for each funding program if grantee received grants from multiple programs	**PROS**: Reduces data collection costs and helps reduce clustering effect.
Second Stage: Site Sample Selection (at most three sites per funding program)	
Select multiple sites if a grantee has more than one site	**PROS**: Reduces clustering effect. For the funding program with more than three sites, PPS selection of sites reduces UWE too. **CONS**: Site selection process is tedious. Managing data collection from multiple sites is more costly. **COMMENTS**: Select sites within reasonable proximity for an FI.
Oversample sites with concentrated patients in three oversampling race/ethnicity categories	**PROS**: Achieves oversampling goals **CONS**: Disproportionate sampling increases UWE.
Third Stage: Patient Sample Selection (3,630 for CHC, 1,210 for MHC, 1,210 for HCH, and 550 for PHPC)	
Within each funding program, allocate same number of interviews to each grantee	**PROS**: Creates even workload for FIs and reduces clustering effect.
Select random sample as patients enter site and are registered	**PROS**: Is suitable for mobile nature of some of the target population.
Allocate interviews evenly to sites that are selected through PPS	**PROS**: Maintains roughly equal weights within a stratum, thus reducing UWE; creates even workload for FIs.
Allocate interviews to sites proportional to patient size of sites (for grantees with two or three sites)	**PROS**: Reduces UWE.
Oversample patients in three oversampling race/ethnicity categories and patients aged 65 or older	**PROS**: Achieves oversampling goals **CONS**: Disproportionate sampling increases UWE.

SECTION 4.
GRANTEE SAMPLE SELECTION

This section discusses the first stage of sample selection: the selection of grantees. It covers sample frame construction, stratification, sample allocation, and selection of stratified PPS grantee samples. An illustrative grantee sample is also presented and calculation of grantee selection probability is discussed.

4.1 Sampling Frame Construction

BPHC UDS grantee-level data from the most recent available year will be used to construct a sampling frame for the first stage of selection. The UDS is compiled each year from annual data submissions by each Section 330-funded grantee. The UDS contains data on the number of patients served, grantee characteristics, such as the type(s) of grant funding received, state, urbanicity, and number of sites. The grantee characteristics will be used in stratification. In this report, we use data from the 2012 UDS to illustrate the statistical design plan. Once the Office of Management and Budget (OMB) approval has been received, the final sample will be drawn using the most current UDS data.

The 2012 UDS data were collected from 1,198 grantees. Of these, 49 grantees will be excluded from the sampling frame, including

- twenty-nine grantees located in U.S. territories or possessions (i.e., those in Puerto Rico, the Virgin Islands, and the Pacific Basin);
- five grantees funded through the CHC program that only operated school-based sites (see **Section 5.1** for more detail on this decision);
- four grantee with fewer than 300 patients;
- eleven grantee that received MHC funding only and that served clients through a voucher program; and
- any grantee that has exited or will soon be exiting the Section 330 Program.

The grantee sampling frame includes 1,149 eligible grantees that reported in 2012. We show the distribution of key grantee characteristics in **Exhibits 3**, **4**, and **5**. **Exhibit 3** breaks down the grantees by funding program, region, urban/rural status, and number of sites within a grantee. In the grantee sampling frame, 823 grantees had a single funding program, while 326 grantees received funding from multiple programs. A total of 1,079 grantees (93.9%) received CHC funding, either solely or in combination with other funding programs; 241 grantees (21%) received HCH funding, either solely or in combination with other funding programs; 149 grantees (13%) received MHC funding, either solely or in combination with other funding programs; and only 71 grantees (6.2%) received PHPC funding, either solely or in combination with other funding programs. Roughly 66.2% of grantees received CHC funding solely.

Exhibit 3. Grantee Characteristics in the Sampling Frame (2012 UDS)

Domain Category	Number of Grantees	Percent Distribution
Funding Program Received		
C	761	66.23%
H	57	4.96%
M	2	0.17%
P	3	0.26%
CH	122	10.62%
CM	110	9.57%
CP	28	2.44%
MH	1	0.09%
PH	7	0.61%
CMH	25	2.18%
CMP	4	0.35%
CPH	22	1.91%
CMPH	7	0.61%
Total	**1,149**	**100%**
Region[a]		
Northeast	207	18.02%
Midwest	225	19.58%
South	405	35.25%
West	312	27.15%
Total	**1,149**	**100%**
Urban/Rural Location		
Urban	615	53.52%
Rural	534	46.48%
Total	**1,149**	**100%**
Number of Sites		
1	143	12.45%
2	143	12.45%
3	151	13.14%
4–9	437	38.03%
10–14	134	11.66%
15–19	56	4.87%
≥ 20	85	7.40%
Total	**1,149**	**100%**

NOTE: C = Community Health Center program; H = Healthcare for Homeless program; M = Migrant Health Center program; P = Public Housing Primary Care program; multiple acronyms used together indicate that funding was received from multiple programs, e.g., CMH = a grantee received CHC, MHC, and HPC funding; CMP = a grantee received CHC, MHC, and PHPC funding;.

[a] "Region" refers to the census region.

Exhibit 4. Distribution of Patients Served in 2012

Patient Distribution	Number of Patients
Range of Number of Patients	
Minimum	327
25th percentile (Q1)	5,422
Median	11,533
75th percentile (Q3)	22,536
Maximum	183,327
Mean Number of Patients per Grantee	17,930
Total Number of Patients Across All Grantees	20,601,579

Exhibit 5. Race/ethnicity and Age Group Distribution of Patients Served in 2012

Domain Category	Number of Patients	Percent Distribution
Race/Ethnicity		
Hispanic	6,642,837	32.24%
Non-Hispanic White	7,607,947	36.93%
Non-Hispanic Black	4,149,038	20.14%
Non-Hispanic AIAN	207,863	1.01%
Non-Hispanic Asian	599,712	2.91%
Non-Hispanic NHPI	120,379	0.58%
Non-Hispanic Others	1,273,803	6.18%
Total	**20,601,579**	**100%**
Age Group		
0–17	6,495,038	31.53%
18–64	12,640,287	61.36%
65+	1,466,254	7.12%
Total	**20,601,579**	**100%**

The number of sites within a grantee ranged from 1 to 116, and 863 grantees had at least 3 sites, with an average of about 7.6 sites per grantee. The South had 405 grantees, while the West had 312 grantees. The Northeast and Midwest had roughly the same number of grantees each: 207 and 225, respectively. Slightly more grantees were in urban areas than were in rural areas.

Another important grantee characteristic is the number of patients served in 2012 (**Exhibit 4**). Among the 1,149 eligible grantees in the grantee sampling frame, the number of patients receiving at least one face-to-face encounter for services during 2012 varied among the grantees, ranging from 327 to 183,327 and averaging 17,930. The total number of patients was approximately 20.6 million. **Exhibit 5** displays the patient distributions of race/ethnicity and age group, clearly showing that patients in AIAN, Asian, and NHPI race/ethnicity categories, and patients aged 65 or older need to be oversampled to achieve the target sample sizes.

4.2 Stratification

As shown in **Section 4.1**, the majority of grantees receive grants from CHC funding, while relatively few grantees receive PHPC, MHC, or HCH funding. A random selection of grantees without any stratification would result in very small grantee sample sizes for PHPC, MHC, and HCH funding programs. **Exhibit 6** displays the expected number of grantees[5] yielded for each funding program from an unstratified random grantee sample based on an experimental selection of 100 independent grantee samples.

Exhibit 6. Expected Grantee and Patient Yields from Unstratified Random Sampling

Grantee Funding Type	Number of Grantees Selected	Target Number of Complete Patient Interview	Number of Patients Required per Grantee
C	155	3,630	23.4
H	34	1,210	35.6
M	22	1,210	55.0
P	10	550	55.0
Total	**221**	**6,600**	**40**

NOTE: C = Community Health Center program; H = Healthcare for Homeless program; M = Migrant Health Center program; P = Public Housing Primary Care program.

The unstratified random samples have 155 CHC grantees, 34 HCH grantees, 22 MHC grantees, and only 10 PHPC grantees. To meet the target of completed interviews for each funding program, we have to complete a large number of interviews for the PHPC and MHC funding programs, which has two implications: (1) the difficulty in recruiting many patients from PHPC and MHC grantees within a short period of data collection because of the low number of patients in PHPC or MHC grantees; and (2) the clustering effect is inflated as the number of

[5] For a selected grantee participating in multiple funding programs, we take an independent sample for each funding program. For example, if a grantee receiving both CHC and MHC funding is recruited, this grantee would be counted as a CHC grantee and also as an MHC grantee.

completed interviews per grantee increases, and consequently the estimates will have low precision and the statistical power of comparison is reduced.

Stratification is needed to achieve target sample sizes for four funding programs with relatively small cluster sizes.[6] We will group grantees into four exclusive strata according to the types of funding they receive. These four groups will serve as the first-level strata and are defined in Exhibit 7.

Exhibit 7. Definition of First-Level Stratification

First-Stage Strata	Grantee Funding Type	Number of Grantees in Sampling Frame
Stratum 1: Grantees received PHPC funding solely or in combination with other programs.	P; CP; PH; CMP; CPH; CMPH	71
Stratum 2: Grantees received MHC funding solely or in combination with other programs.	M; CM; MH; CMH	138
Stratum 3: Grantees received HCH funding solely or in combination with other programs.	H; CH	179
Stratum 4: Grantees received CHC funding solely.	C	761
Total		**1,149**

NOTE: C = Community Health Center program; H = Healthcare for Homeless program; M = Migrant Health Center program; P = Public Housing Primary Care program.

AIAN, Asian, and NHPI patients are not evenly distributed among all grantees. They tend to be clustered in a few grantees: 889 grantees had fewer than 100 AIAN patients, 1,000 grantees had fewer than 100 NHPI patients, and 650 grantees had fewer than 100 Asian patients. The 20 grantees with highest proportion of AIAN patients account for 37.1% of total AIAN patients in all 1,149 grantees; 20 grantees with highest proportion of NHPI patients account for 51.4% of total NHPI patients; and 20 grantees with highest proportion of Asian patients account for 36.2% of total Asian patients. Thus, to achieve target sample sizes in three race/ethnicity categories, grantees with concentrated patients in those three race/ethnicity categories must be obtained and selected at the first-stage selection. Grantees with more than 20% of patients in one of the three race/ethnicity categories are considered patient-concentrated grantees. Stratum 4 (CHC funding solely) has over 89% of such grantees, and very few such grantees are from Strata 1, 2, and 3. Therefore, to effectively select grantees with concentrated patients in three race/ethnicity categories, Stratum 4 is further divided into four second-level strata according to whether a

[6] Cluster size is measured as the number of completed interviews within a grantee for a funding program.

grantee has concentrated patients (over 20%) in one of the three race/ethnicity categories. The result is a total of seven final grantee strata, shown in **Exhibit 8**.

Exhibit 8. Grantee Sample Final Stratification

First-Stage and Second-Stage Strata	Grantee Funding Type	Final Stratum	Number of Grantees in Sampling Frame
Stratum 1: Grantees received PHPC funding solely or in combination with other programs.	P; CP; PH; CMP; CPH; CMPH	1	71
Stratum 2: Grantees received MHC funding solely or in combination with other programs.	M; CM; MH; CMH	2	138
Stratum 3: Grantees received HCH funding solely or in combination with other programs.	H; CH	3	179
Stratum 4: Grantees received CHC funding solely.	C		
Stratum 4.1: Grantees with more than 20% of AIAN patients	C	4	31
Stratum 4.2. Grantees with more than 20% of Asian patients	C	5	16
Stratum 4.3. Grantees with more than 20% of NHPI patients	C	6	10
Stratum 4.4: All remaining grantees in Stratum 4	C	7	704
Total			**1,149**

NOTE: C = Community Health Center program; H = Healthcare for Homeless program; M = Migrant Health Center program; P = Public Housing Primary Care program.

Although some grantees have a high proportion of patients aged 65 or older, these older patients are distributed more evenly than the patients in three race/ethnicity categories. The 20 grantees with highest proportion of patients aged 65 or older only account for 2.04% of total patients aged 65 or older. As a result, oversampling grantees with concentrated patients aged 65 or older at the first stage of selection will not be as effective as oversampling grantees with concentrated patients in the three race/ethnicity categories. Thus, we decided not to oversample grantees with concentrated patients aged 65 or older.

4.3 Grantee Sample Allocation

Before selecting a grantee sample from each final stratum, we need to determine the grantee sample allocation for each final stratum. To minimize the variation in sample weights introduced by oversampling grantees who received funding from PHPC, MHC, or HCH programs, and grantees with concentrated patients in three oversampling race/ethnicity categories, we allocate the grantee sample such that a minimum UWE is achieved. We employed

a nonlinear optimization procedure OPTMODEL in SAS[7], which minimizes the UWE with the following constraints:

- select 165 grantees;
- complete 6,600 interviews;
- complete 3,630 CHC interviews, 1,210 MHC interviews, 1,210 HCH interviews, and 550 PHPC interviews;
- compete interviews per grantee: 22 for CHC, 25 for MHC, 25 for HCH, and 15 for PHPC; and
- select at least one grantee from each grantee type.[8]

The optimum sample allocation to each grantee type is presented in **Exhibit 9**. After aggregating grantee allocations to the seven final strata, the grantee sample allocation to the seven strata along with the sampling rates in each stratum are shown in **Exhibit 10**. The sampling rates for Strata 1, 2, 4, 5, and 6 are much higher than the overall sampling rate (14.5%), indicating that we oversample grantees in these strata.

Exhibit 9. Optimum Grantee Sample Allocation

Domain Category	Number of Grantees	Grantee Sample Allocation
Funding Program Received		
C	761	76
H	57	1
M	2	1
P	3	1
CH	122	16
CM	110	25
CP	28	11
MH	1	1
PH	7	1
CMH	25	10
CMP	4	4
CPH	22	12
CMPH	7	7
Total	**1,149**	**166***

Note: The optimum grantee sample allocation results in 166 grantees instead of 165 due to rounding.
C = Community Health Center program; H = Healthcare for Homeless program; M = Migrant Health Center program; P = Public Housing Primary Care program; multiple acronyms used together indicate that funding was received from multiple programs, e.g., CMH = a grantee received CHC, MHC, and HPC funding; CMP = a grantee received CHC, MHC, and PHPC funding;.

[7] http://support.sas.com/documentation/cdl/en/ormpug/59679/HTML/default/viewer.htm#optmodel.htm
[8] Grantee type is defined according to what funding program(s) a grantee participated or received funding from.

Exhibit 10. Grantee Sample Allocation and Sampling Rates in Final Grantee Strata

First-Stage and Second-Stage Strata	Final Stratum	Number of Grantees in Sampling Frame	Grantee Sample Allocation	Sampling Rate
Stratum 1: Grantees received PHPC funding solely or in combination with other programs.	1	71	36	50.7%
Stratum 2: Grantees received MHC funding solely or in combination with other programs.	2	138	37	26.8%
Stratum 3: Grantees received HCH funding solely or in combination with other programs.	3	179	17	9.5%
Stratum 4: Grantees received CHC funding solely.				
Stratum 4.1: Grantees with more than 20% of AIAN patients	4	31	25	80.6%
Stratum 4.2. Grantees with more than 20% of Asian patients	5	16	13	81.3%
Stratum 4.3. Grantees with more than 20% of NHPI patients	6	10	8	80.0%
Stratum 4.4: All remaining grantees in Stratum 4	7	704	30	4.3%
Total		**1,149**	**166**	**14.5%**

4.4 Select Stratified PPS Sample of Grantees

As mentioned in **Section 4.1**, the grantees differ widely in the number of patients served. PPS sampling is a commonly used method of unequal probability sampling to handle the large variation in patients served among grantees. In this method, the probability of a cluster being sampled is proportional to a size measure. The size measure will be the number of patients who visited the grantee for services from the 2012 UDS file. We will use PPS sampling to select the grantee sample from each final stratum.

A PPS grantee sample will be selected using the SAS SURVEYSELECT[9] procedure with predetermined sample allocation in **Exhibit 10** for each final stratum. During the selection, in addition to the seven strata for grantee sample selection discussed above, we will sort the sampling frame by region (Northeast, Midwest, South, and West), urban/rural location, and the grantee size (large, medium, small) when applying Chromy's (1981) probability minimal replacement sequential PPS selection procedure. Sorting the sampling frame by these key grantee characteristics and then applying the PPS sequential procedure induces implicit stratification according to the order of the units in a stratum. Therefore, the selected grantee

[9] http://support.sas.com/documentation/cdl/en/statug/63033/HTML/default/viewer.htm#surveyselect_toc.htm

samples will be distributed among various regions, urban/rural locations, and various grantee sizes to ensure a representative grantee sample is selected.

4.5 An Illustrative Grantee Sample

In this section we present an illustrative example of a grantee sample based on a simulation study where 100 independent grantee samples are selected, and the results are averaged over the 100 samples.

In this example, 166 grantees were selected with the sample allocation for the final seven strata specified in **Exhibit 10.** The PPS sequential method was used to select the grantees from each of the seven strata, and this process was repeated 100 times. As stated in **Section 4.2**, an independent sample was selected for each funding program, if a selected grantee participated in multiple funding programs. This process yielded 292 grantees for four funding programs: 163 CHC grantees, 46 HCH grantees, 47 MHC grantees, and 36 PHPC grantees, as shown in **Exhibit 11**. To achieve the interview targets for each funding program, the expected number of complete interviews per grantee for each funding type was calculated, as displayed in **Exhibit 11**.[10]

Exhibit 11. Expected Yield of the Grantee Funding Type and Patients of a Stratified Disproportionate Sampling

Funding Program	Number of Grantees for Each Funding Program	Average Number of Patients per Grantee	Number of Completed Interviews for Each Funding Program
C	163	22.3	3,630
H	46	26.3	1,210
M	47	25.7	1,210
P	36	15.3	550
Total	**292**		**6,600**

NOTE: C = Community Health Center program; H = Healthcare for Homeless program; M = Migrant Health Center program; P = Public Housing Primary Care program.

Exhibit 12 displays the grantee sampling frame and expected sample distribution by region, urban/rural area, and grantee size from the illustrative example. In the distribution of regions, the West has higher proportion in the grantee sample, while the proportions of the other three regions in the grantee sample are lower compared to the grantee sampling frame. This difference is mainly due to oversampling grantees with concentrated AIAN and NHPI patients;

[10] Note that during the sampling plan implementation, the sample realization may yield a slightly different distribution of grantees for each funding type.

the majority of these grantees are in the West region (Alaska and Hawaii). The grantee sample has higher proportions in urban areas compared to the grantee sampling frame; the reason for this difference is that we oversample PHPC grantees and they are mainly in urban areas. The grantee sample has lower proportions of small and medium-size grantees compared to the grantee sampling frame. This disparity occurs because of the PPS sampling method employed in grantee sample selection, which gives grantees with large patient volume a better chance of being selected than grantees with small patient volume. A best practice is to select more large grantees so as to lower data collection costs: a large patient volume ensures that the quota per grantee (as shown in **Exhibit 11**) can be easily met within the data collection time period.

In general, our proposed grantee sample selection algorithm generates grantee samples that represent different regions, urban/rural areas and grantee size very well.

Exhibit 12. Expected Grantee and Patient Sample Distribution by Region, Urban/Rural Area and Grantee Size

Domains	Grantee Frame		Expected Grantee Sample	
	N	%	n	%
Region	**1,149**	**100.00**	**166**	**100.00**
Northeast	207	18.02	26	15.36
Midwest	225	19.58	28	16.87
South	405	35.25	39	23.53
West	312	27.15	73	44.23
Urban/Rural	**1,149**	**100.00**	**166**	**100.00**
Urban	615	53.52	103	62.16
Rural	534	46.48	63	37.84
Grantee Size	**1,149**	**100.00**	**166**	**100.00**
Large	391	34.03	115	69.52
Medium	379	32.99	28	16.81
Small	379	32.99	23	13.66

To evaluate the effectiveness of oversampling grantees with concentrated patients in the three oversampling race/ethnicity categories (AIAN, NHPI, and Asians), we calculated the coverage rates[11] of the three race/ethnicity categories from the sampled 166 grantees (see

[11] Coverage rate is the ratio of (number of patients in the selected grantees / number of patients in all 1,149 grantees).

Exhibit 13). The 166 selected grantees cover 26.4% of patient population from all 1,149 grantees. The coverage rate for AIAN patients is 47%, 46.6% for NHPI patients, and over 50% for Asian patients, while the coverage rate for other races is 25.3%. With the high coverage rates from the selected grantees, additional oversampling of sites with concentrated patients at the second selection stage, and oversampling of patients in the three race/ethnicity categories at the third selection stage, we are very confident that we can achieve the oversampling goals in the three race/ethnicity categories. The oversampling procedure at the second and third stages of selection is discussed in **Sections 5** and **6**.

Exhibit 13. Patient Coverage Rates of 166 Grantees in Race/Ethnicity

Race/Ethnicity	Patient Coverage Rate
American Indian/Alaska Native	47.0%
Asian	51.2%
Native Hawaiian/Pacific Islander	46.6%
Other Races	25.3%
Overall	**26.4%**

4.6 Grantee Selection Probability

The selection probability for the i^{th} grantee within the h^{th} stratum can be calculated as

$$G_{hi} = n_h \frac{S_{hi}}{\sum_i S_{hi}}, \quad (1)$$

where h stands for the strata (h = 1, 2, …, 7, corresponding to 7 final strata); i is the index for grantees on the frame within each stratum; n_h is the number of grantees to select in the h^{th} stratum; and S_{hi} is the size measure, which is the number of patients served by each grantee. Note that we assume an 80 percent participation rate among grantees based on the results of the 2009 PHCPS. As a result, n_h will be inflated to account for nonresponse among sampled grantees.

We are aware that applying different sampling rates for each stratum and oversampling at the second stage and the third stage will cause deviations from a self-weighting design. As a result, the variations in sample weights will be increased and variances in survey estimates will be inflated, thereby reducing precision or statistical power in data analysis. To maintain a near self-weighting design within each stratum, we will select sites within grantees using PPS

sampling in the second stage of selection and select the same number of patients per grantee in the third stage.

SECTION 5.
SITE SAMPLE SELECTION

As discussed previously, more than two thirds of grantees have three or more sites. In general, grantees with more sites tend to have more patients. At the first-stage selection, grantees are selected with the PPS method, which means that grantees with large numbers of patients have a higher probability of being selected in the sample. As a result, we expect a fair number of the grantees recruited to have more than three sites. We will spread the sample of patients across multiple sites to reduce the within-grantee clustering effect and increase the precision of the analysis. We will select, at most, three sites for each funding program within a grantee for the 2014 Health Center Patient Survey. This section discusses the second stage of selection: the selection of sites from participating grantees that have multiple sites.

5.1 Determine Eligible Sites within Participating Grantees

Once a grantee is recruited and agrees to conduct the study in its sites, our recruiters will work with the grantee's administration to identify eligible sites. The following eligibility criteria will be used, and we will consult with the BPHC Contracting Officer Representative (COR) to determine the site eligibility on a case-by-case basis whenever it is necessary.

- The site should participate in at least one of the four specific funding programs and must have been operating under the grantee for at least 1 year.
- The site is not a school-based health center.
- The site is not a specialized clinic, except clinics providing OB/GYN services.
- The site does not provide services only through the migrant and seasonal farmworker voucher screening program.
- A site serves at least 100 patients.

After eligible sites are identified, we will collect from or verify with each participating grantee the following information:

- number of eligible sites serving each patient type (i.e., migrant and seasonal farmworkers, homeless, public housing, and general patients);
- address and contact information for each eligible site;
- number of patients served in each eligible site, overall and by type of patient (CHC, MHC, HCH, and PHPC); and

- sites with concentrated patients in one of the three race/ethnicity categories (AIAN, Asian, or NHPI)

5.2 Evaluate Distances between Eligible Sites

In most cases, one FI will be hired to collect data for each participating grantee. Therefore, selected sites must be within manageable distances for the FI(s). The grantees tend to operate sites in relatively localized areas. Our sampling staff will evaluate distances between the administrative office/central site and the associated sites. For a specific funding program, the site with the largest patient volume could be used as the central site. Typically sites will be excluded if they are located more than 100 miles from the central site. However, we will, consult with the BPHC COR to determine whether special data collection arrangements should be made for remote sites.

5.3 Oversampling Sites with Concentrated Patients in Three Race/Ethnicity Categories

To achieve our target sample sizes of AIAN, Asian, and NHPI patients, we will not only oversample grantees with concentrated patients in these three race groups at the first stage of selection, but we will also identify sites with concentrated patients in at least one of the three targeted race/ethnicity categories. These sites will be selected with higher probabilities than sites without concentrated patients.

5.4 Site Selection and Selection Probability

If there are three or fewer sites for a patient type (i.e., migrant and seasonal farmworkers, homeless, public housing, and general patients) and they are within a manageable distance for one FI, all of the sites will be included in the study. If one site is far from the other sites and the other sites are close to one another, the two sites that are close to each other will be selected. However, if all three sites are far from one another, we will select the site with the largest patient volume. Similarly, when two sites for a specific funding program are far from each other, the one with the largest number of patients will be selected. Again, these special cases will be reviewed with the COR.

For grantees with more than three sites for a patient type, we will use a PPS sampling method similar to the one for grantees discussed in **Section 4.4** to select three sites from the sites within a manageable distance. The number of patients served by each site under a specific funding program will serve as the size measure in the PPS sampling. For the grantees that participate in multiple funding programs, an independent PPS selection of sites will be conducted for each funding program, if needed.

The selection probability for the j^{th} site within the i^{th} grantee for funding program f is given by

$$C_{fij} = \begin{cases} 1 \quad , \text{ if 3 or fewer sites are all selected, or} \\ \dfrac{3s_{fij}}{\sum_j s_{fij}} \quad , \text{ if 3 sites are selected through PPS sampling,} \end{cases} \tag{2}$$

where s_{fij} is the number of patients in site j within grantee i for funding program f. Based on our experience with the 2009 PHCPS, we expect nearly all selected sites within participating grantees to participate in the 2014 HCPS.

SECTION 6.
PATIENT SAMPLE SELECTION

Because some of the target populations of this study are quite mobile, a random sample of patients will be selected for interview as they enter the site and register with the receptionist for services. An FI will visit a selected site for a predetermined number of days and time slots in the sampling period to conduct interviews. This section of the report presents the methodology and specifications for selecting patients from participating sites.

6.1 Patient Interview Allocation to Grantee

To achieve the near self-weighting sample of patient interviews within each grantee stratum, the same number of patients will be interviewed from the grantees in each funding program. As shown in **Exhibit 11** in **Section 4.5** from the illustrative grantee sample example, 162 CHC grantees, 47 MHC grantees, 45 HCH grantees, and 36 PHPC grantees are to be recruited. To achieve 3,630 completed interviews for CHC, we will need to complete 22–23 patient interviews per CHC grantee. We will need 25–26 completed interviews per MHC grantee to achieve 1,210 interviews for MHC; 26–27 completed patient interviews per HCH grantee to yield a total of 1,210 interviews for HCH; and 15–16 completed interviews per PHPC grantee to yield a total of 550 interviews for PHPC.

6.2 Patient Interview Allocation to Sites within Grantee

Within each grantee, we will use different methods to allocate patient interviews to multiple sites for grantees with three or fewer sites in a funding program and grantees with more than three sites in a funding program. For grantees with three or fewer sites, the number of patient interviews within that grantee will be allocated proportionally to the patient size of the sites. That is,

$$n_{fij} = n_{fi} \frac{s_{fij}}{\sum_j s_{fij}},$$

where n_{fi} is the number of patients selected from a grantee for funding program f. For grantees with more than three sites that are selected through PPS, the number of selected patients will be divided equally among three selected sites. Doing so will help to reduce the UWE.

6.3 Patient Screening and Selection

RTI will design a screening sheet that the receptionist can use to screen and select patients when a patient enters the site and registers for service. A patient will be considered

eligible if the patient received service through one of the grantees supported by BPHC funding programs at least once in the past 12 months prior to the current visit. The receptionist will ask eligible patients questions about their race/ethnicity and age to determine whether they belong to the oversampling groups. If a patient belongs to a group that will not be oversampled, the receptionist will select the first eligible patient registered after the FI has informed the receptionist that he/she is ready for the next interview. The receptionist will read a brief script about the study to the selected patient and direct the patient to the FI for questions or participation. If a patient belongs to one of the oversampling groups, the receptionist will select the patient and send the patient to the FI if he/she is available; when the FI is working on an interview or unavailable, the receptionist will give the selected patient a yellow laminated card and instruct him/her to wait in a designated area. When the FI is available and ready, the FI will look for a person holding a yellow laminated card. **Exhibit 14** shows the oversampling and non-oversampling groups based on patients' age and race/ethnicity.

Exhibit 14. Oversampling and Nonoversampling Patient Group

Patient Group	Oversampling Group	Visited	Eligible	Referred/ Selected
65+, All Race/Ethnicity	Yes			
0–64, AIAN	Yes			
0–64, Asian	Yes			
0–64, NHPI	Yes			
0–64, Other Race/ethnicity	No			

The receptionist will be asked to keep track of the number of patients who enter the site, the number of patients who are eligible, and number of patients selected while the FI is at the site to conduct data collection for each patient group, as shown in **Exhibit 14**. The receptionist will either use tally marks to count patients as they enter or complete a table based on the sign-in sheet or appointment list before the FI leaves the site. The patient count sheets for each FI data collection visit will be sent to RTI for data entry, and counts will be used to calculate the analysis weights for the study. For sites that have more than one receptionist, all receptionists must track number of visited, eligible and selected patients even though we may only recruit patients using one receptionist.

If a site is chosen for data collection in multiple funding programs, the FI will screen participating patients to determine patient population type (i.e., homeless, migrant and seasonal

farmworkers, public housing, or low income) and will use the appropriate questionnaire to conduct the patient interview.

We will closely monitor the data collection and adjust the sampling rate if necessary to ensure that target sample sizes in three race/ethnicity categories and patient aged 65 or older are met.

6.4 Patient Selection Probability

The selection probability of patient *k* from grantee *i*, site *j* for funding program *f* is given by

$$P_{fijk} = \frac{m_{fij}}{M_{fij}} \frac{weeks}{52}, \tag{3}$$

where M_{fij} is the number of eligible patients in the site during the sampling window (number of *weeks*) and where m_{fij} is the target number of selected patients inflated for nonresponse. We may have to estimate the proportion of patients from different funding programs if the site is selected in data collection for more than one funding program. The proportion of patients from different funding programs for the grantee or other sites within the grantee can be used as an approximation. Note: the patient selection probability will be calculated separately for each patient group as shown in **Exhibit 14**.

6.5 Patient's Probability of Inclusion in the Study

The probability of a patient being included in the study is the product of G_{hi}, C_{fij}, and P_{fjik} in **Formulas (1), (2),** and **(3)**, respectively. That is,

$$\pi_{hfijk} = \frac{n_h s_{hi}}{\sum_i s_{hi}} \frac{3 s_{fij}}{\sum_j s_{fij}} \frac{m_{fij}}{M_{fij}} \frac{weeks}{52}. \tag{4}$$

The design is supposed to achieve near self-weighting within each grantee stratum if no oversampling is conducted when selecting sites at the second-stage selection, and no oversampling of patients is conducted at the third-stage selection. The oversampling at the second and third stages causes the deviation from a near self-weighting design, meaning probabilities in Formula (4) will not be equal within the same grantee stratum. As a result, the UWE will be inflated.

SECTION 7.
SAMPLE SIZES AND STATISTICAL POWER

Statistical tests use data from samples to determine whether a difference exists in a population or between two populations. An example of a statistical test is testing the null hypothesis that the number of uninsured children aged 12 or younger does not differ between the population of the 2014 Health Center Patient Survey and general population for the National Health Interview Survey (NHIS). The power of the test is the probability that the test will find a statistically significant difference between two populations given that there is a true difference between those two populations. There is always a chance that the samples will appear to support or to refute a tested hypothesis when the reality is the opposite. That risk is quantified as the statistical significance level. We use a significance level of 0.05 to calculate statistical power in this document.

To reduce data collection costs and meet the target sample sizes for four funding programs and for race/ethnicity and age groups, we propose a stratified three-stage clustering design and oversampling of certain subgroups. Large variations in sample weights due to oversampling and the intra-class correlation among patients from the same grantee due to clustering can increase sampling error, thereby reducing statistical power and precision of survey estimates. The design effect (*Deff)* can be used to measure the loss of precision and statistical power due to oversampling and clustering. *Deff* is a function of the clustering effect and the unequal weighting effect (*UWE)* and can be defined as $Deff = UWE*(1 + (m-1)*ICC)$, where m is the number of patient interviews within a grantee, *ICC* is the intracluster correlation coefficient that measures the degree of similarity among elements within a cluster, and *UWE* measures variation in the sample weight. *Deff* can be reduced by reducing either *UWE* or the clustering effect or both. The effective sample size is the target sample size divided by *Deff*.

Exhibit 15 displays the power calculation for proportion estimates between the 2014 Health Center Patient Survey and 2011 NHIS, showing that minimum differences can be detected with 80% of statistical power at the 0.05 level for various domains. In the calculation, we used a proportion (p=0.5); the statistical power is the smallest for proportion estimates when the proportion is in the middle range (0.4–0.6) because the variance is the largest. The detectable differences will be smaller if the proportion estimate is out of the middle range.

Exhibit 15. Detecting Differences in Percentage Estimates between the Patient Survey and the NHIS

Domain	Patient Survey			2011 NHIS			Detectable Difference %
	Expected Sample Size	Estimated Deff[b]	Effective Sample Size	Sample Size	Estimated Deff	Effective Sample Size	
Race/Ethnicity							
Hispanic	2,044	4.0	511	24,539	2.0	12,269	6.3
NH-White	1,558	4.0	390	53,192	2.0	26,596	7.2
NH-Black	1,618	4.0	405	14,629	2.0	7,315	7.2
NH-Asian	647	4.0	162	6,795	2.0	3,398	11.2
NH-American Indian/Alaska Native	409	4.0	102	600	2.0	300	15.7
NH-Native Hawaiian/ Pacific Islander[a]	251	4.0	63	204	2.0	102	21.8
NH-Others[b]	73	4.0	18	1,916	2.0	958	—
Insurance Status							
Medicaid only	1,937	4.0	484	13,783	2.0	6,891	6.6
Medicare only	339	4.0	85	5,212	2.0	2,606	15.1
Medicaid and Medicare	334	4.0	84	1,520	2.0	760	15.8
Other	1,360	4.0	340	64,453	2.0	32,226	7.6
Uninsured	2,526	4.0	632	16,907	2.0	8,453	5.8
Age Group							
0 to 17	2,200	4.0	550	26,802	2.0	13,401	6.1
18 to 64	3,200	4.0	800	62,556	2.0	31,278	5.0
65+	1,200	4.0	300	12,517	2.0	6,258	8.3
Total	6,600	5.0	1,320	101,875	2.0	50,937	3.9

[a] Due to the data confidentiality, NHIS did release rare race categories in the 2011 public use file, such as Native Hawaiian and Pacific Islander. These rare race categories were combined in the 'Other' category. We used the proportion of Native Hawaiian/Pacific Islander in the 2010 Census (http://www.census.gov/prod/cen2010/briefs/c2010br-02.pdf) to estimate the sample size of this race category for the 2011 NHIS.

[b] Projected sample size too small for detecting differences with acceptable power.

The power analysis estimates in ***Exhibit 15*** shows that the detectable differences are well below 8% between the 2014 Health Center Patient Survey and the 2011 NHIS for race/ethnicity, insurance status and age group domains except for Non-Hispanic Asian, Non-Hispanic American

Indian/Alaska Native, Non-Hispanic Native Hawaiian/Pacific Islander, Medicare Only, and Medicaid & Medicare due to small sample sizes.

SECTION 8.
SAMPLE WEIGHTS

Patients, the primary analytic units for the 2014 Health Center Patient Survey, are selected through a three-staged sample design, as discussed in **Sections 4–6**. Disproportionate sample selection is used at all three stages; therefore, the patient samples are not self-weighting. To make inferences about the target population or any subdomains of the target population, sample weights are needed. We will calculate base weights for each respondent reflecting each respondent's probability of inclusion in the study. To account for nonresponse, a nonresponse adjustment on the base weight will be calculated. Poststratification adjustment will also be conducted to adjust for coverage bias and reduce variance.

8.1 Grantee Sample Selection Weights

The first-stage sampling weight for each grantee will be the inverse of the probability of selection as calculated in **Formula (1)** in **Section 4.6**. Therefore, the grantee sample selection weight for grantee *i* within the h^{th} stratum is given by

$$w^{(1)}{}_{hi} = 1/G_{hi}. \tag{6}$$

8.2 Site Sample Selection Weights

For the grantees that have more than three sites for a specific funding program, a subsample of three sites was selected as discussed in **Section 5.4**. Thus, the site sample selection weight for the j^{th} site within the i^{th} grantee for funding program *f* is given by

$$w^{(2)}{}_{fij} = 1/C_{fij}, \tag{7}$$

where C_{fij} is calculated in **Formula (2)**.

8.3 Patient Sample Selection Weights

From the patient recruitment logs, the number of eligible patients, the number of patients who were selected by a receptionist and sent to an FI, and the number of patients who agreed to participate during the patient recruitment time periods will be determined. The number of patients selected at each site for a specific funding program within a participating grantee, summed across the days in which the sampling for that site took place, will be divided by the total number of patients the site served in the year prior to the survey year, to obtain the probability of selection for each patient as discussed in **Section 6.4**. Thus, the patient sample

selection weight for the k^{th} patient at the j^{th} site within the i^{th} grantee for funding program f is given by

$$w^{(3)}{}_{fijk} = 1/P_{fijk}, \tag{8}$$

where p_{fijk} is calculated in **Formula (3).**

The product of three weight components discussed above forms the design-based weights for each patient. That is,

$$w_{fijk} = w^{(1)}{}_{hi} \cdot w^{(2)}{}_{fij} \cdot w^{(3)}{}_{fijk}. \tag{9}$$

8.4 Nonresponse and Poststratification Weight Adjustments

To reduce the nonresponse bias on the estimates, the design-based weight w_{fijk} will be adjusted for nonresponse. A nonresponse adjustment will be calculated separately for each funding program. Since we have age and race information for both respondents and nonrespondents collected by receptionists, weighting classes will be formed by age group and race/ethnicity, and a ratio adjustment will be calculated within each class. The adjustment within each class is calculated as:

$$Adj_{nr} = \sum_s w_{fijk} / \sum_r w_{fijk}, \tag{10}$$

where s is for all selected patients and r is for respondents.

The poststratification is anticipated to reduce the coverage bias and variance of survey outcomes, and it will be implemented using RTI's generalized exponential model (GEM; Folsom and Singh, 2000). Coverage bias can occur when a set of individuals in a sample does not match the target population. For example, if there are more young patients in the study, then estimates based on the sample may be biased if young patients respond to survey questions differently from patients in other age groups. Poststratification adjustment adjusts weights in such a way that weights for young patients will be adjusted downward. Thus, the youth over-representing issue in the sample is corrected. GEM can use more predictors in the model than the conventional weighting class methods. The predictors will be limited by available data from the UDS, including age, race/ethnicity, gender, and poverty level. A separate poststratification will be conducted for each funding program so that the sum of final analysis weights from all respondents in a funding program will match the total number of patients served by the corresponding funding program. The poststratification adjustment factor denotes Adj_{ps}.

The final analysis weights for 2014 Health Center Patient Survey are the product of the design-based weights and two adjustment factors. That is,

$$ANALWT_{fijk} = w_{fijk} \cdot Adj_{nr} \cdot Adj_{ps}. \quad (11)$$

Exhibit 16 displays and explains the terms in the formulas from this section and from **Sections 4** through **6** and provides the resource of the information as well.

Exhibit 16. Description and Data Source of Terms in Formulas Calculating Sample Weights

Formula	Terms	Description	Data Source
$G_{hi} = n_h \frac{S_{hi}}{\sum_i S_{hi}}$	G_{hi}	Selection probability for the i^{th} grantee within h^{th} stratum	Output from PROC SURVEYSELECT in SAS
	n_h	Prespecified number of grantees selected for the study in h^{th} stratum	RTI calculates the sampling rates and allocates grantee samples into each stratum (see example in Exhibit 10)
	S_{hi}	Number of patients served in the year prior to the survey year in i^{th} grantee within h^{th} stratum	BPHC's UDS
	$\sum_i S_{hi}$	Total number of patients the grantees served in the year prior to the survey year in h^{th} stratum	BPHC's UDS
$C_{fij} = \begin{cases} 1, or \\ \frac{3s_{fij}}{\sum_j s_{fij}} \end{cases}$	C_{fij}	Selection probability for j^{th} site within i^{th} grantee for funding program f ; equals to 1 if 3 or fewer sites are selected, or is calculated if 3 sites are selected using PPS	Output from PROC SURVEYSELECT in SAS, or equals to 1
	S_{fij}	Number of patients served in the year prior to the survey year from j^{th} site within i^{th} grantee for funding program f	RTI recruiters collect this information from the grantee or site in recruiting process
	$\sum_j S_{fij}$	Total number of patients served in the year prior to the survey year from all sites within i^{th} grantee for funding program f	Sum of S_{fij} within the grantee for a specific funding program
$P_{fijk} = \frac{m_{fij}}{M_{fij}} \frac{weeks}{52}$	P_{fijk}	Selection probability of patient k from grantee i, site j for funding program f	Calculate from the formula
	m_{fij}	Number of selected patients to yield n_{fij} complete interview from grantee i, site j for funding program f	FI keeps track of the number of selected patients sent by a receptionist for each funding program
	M_{fij}	Number of patients entered in the site during the sampling window (number of weeks)	RTI collect data from receptionists' tally sheets

(continued)

Exhibit 16. Description and Data Source of Terms in Formulas Calculating Sample Weights (continued)

Formula	Terms	Description	Data Source
$w^{(1)}{}_{hi} = 1/G_{hi}$	$w^{(1)}{}_{hi}$	Design weight corresponding to grantee selection	Inverse of G_{hi}
$w^{(2)}{}_{fij} = 1/C_{fij}$	$w^{(2)}{}_{fij}$	Design weight corresponding to site selection	Inverse of C_{fij}
$w^{(3)}{}_{fijk} = 1/P_{fijk}$	$w^{(3)}{}_{fijk}$	Design weight corresponding to patient selection	Inverse of P_{fijk}
$w_{fijk} = w^{(1)}{}_{hi} \cdot w^{(2)}{}_{fij} \cdot w^{(3)}{}_{fijk}$	w_{fijk}	Design weights for each selected patient	Product of three design-based weight components corresponding to three selection stages
$Adj_{nr} = \sum_s w_{fijk} / \sum_r w_{fijk}$	Adj_{nr}	A weighting class nonresponse adjustment	Calculate the nonresponse adjustment within each weighting class separately for each funding program
	$\sum_s W_{fijk}$	Sum of the design weights of all selected patients for a specific funding program	Sum of w_{fijk} of all selected patients within a weighting class
	$\sum_r W_{fijk}$	Sum of the design weights of completed interview for a specific funding program	Sum of w_{fijk} of completed interviews within a weighting class
Adj_{ps}	Adj_{ps}	Poststratification adjustment done by each funding program; adjusts weights to BPHC's UDS total number of patients for various demographic domains	Generalized Exponential Model developed at RTI; control totals are from BPHC's UDS
$ANALWT_{fijk} = w_{fijk} \cdot Adj_{nr} \cdot Adj_{ps}$	$ANALWT_{fijk}$	Final analysis weight	Product of design weight, nonresponse, and poststratification adjustments

SECTION 9.
DATA COLLECTION

9.1 Schedule

The 2014 Health Center Patient Survey data will be collected over 4 months, from August to December 2014. Typically, a work day will be divided into morning or afternoon time slots. We will send an FI to a site on predetermined days and time slots. An FI will normally work in multiple sites from one grantee or multiple grantees. We will determine the FI's time slots for each site by considering the production goal of a site, estimated patient volume in a site, the FI's working schedule, and the site's operating schedule. The production goal, which is the number of completed interviews, varies for each site; it can be as low as 5 or 6 interviews when 3 sites are selected for a PHPC grantee (15–16 interviews for PHPC per grantee) or it can be as high as 90–92 when a site is the only one selected for data collection for all four funding programs (although that scenario rarely happens). Achieving the production goal at each site should not be difficult in a 4-month data collection window. However, for some sites, because of unexpected low patient volume or an unusual operating schedule, the production goal could potentially be missed. We will closely watch the data collection process, and if a delay occurs, we will send an FI more often to the site. We may have to reduce the production goal for a site and allocate more interviews to other sites if meeting the production goal proves to be extremely difficult.

9.2 Costs

The three primary field costs are FI labor, mileage incurred by FIs, and incentives paid to respondents. We estimate that we need 4.7 hours on average to obtain one interview for the CHC patients, 6.7 hours for interviews done in an Asian language, and 7 hours per interview for MHC, PHPC, and HCH patients. These hours include time for driving to and from a facility, waiting to be approached by eligible patients, screening potential participants, administering informed consent, administering an interview, updating field status codes and completing other administrative paper work, shipping material back to RTI, and participating in regular conference calls with his/her field supervisor. We also assume that FIs will require reimbursement for an average of 60 miles per completed interview. Finally, we have budgeted for $25 in incentives for each survey respondent.

SECTION 10.
STRENGTHS AND LIMITATIONS OF STUDY DESIGN

10.1 Strengths

The three-stage PPS sample design will produce a nationally representative sample of grantees, health sites, and patients across the United States, across urban/rural locations, and across various grantee sizes.

We will create seven grantee strata according to funding program(s) in which a grantee participated and whether a grantee has concentrated patients in one of the three race/ethnicity categories (AIAN, Asian, and NHPI). We will oversample grantees receiving PHPC, MHC, and/or HCH funding, and grantees with concentrated patients in one of three race/ethnicity categories. The stratified disproportionate sample at grantee selection stage will yield a grantee sample with more grantees participating in PHPC, MHC, and/or HCH funding programs and grantees with large number of patients in three race/ethnicity categories. These aspects of the design are key so that the target sample sizes for funding programs and race/ethnicity groups can be met. The optimum grantee sample allocation procedure reduces UWE. Independent site and patient samples will be selected for each funding program if a grantee participated in multiple funding programs. This step reduces data collection cost and increases sampling efficiency because of the large costs of recruiting a grantee.

Oversampling sites with concentrated patients in one of the three race/ethnicity categories will further guarantee a success of achieving target sample sizes in the minority race/ethnicity categories. Allocating interviews per funding program in a grantee to up to three sites when possible will help to reduce the clustering effect, thus reducing sampling error and improving precision on survey estimates.

We will oversample patients at the third selection stage for ages 65 or older and in race/ethnicity categories (AIAN, Asian, and NHPI). We will closely monitor the data collection on a weekly basis, and we will adjust the sampling rates and frequency of an FI on a site to ensure target sample sizes in each group will be met within the 4-month sampling window.

When the target sample for each funding program is met, BPHC can compare survey estimates among funding programs. The combined sample of patients from the four funding programs will be sufficient for comparative analyses with national estimates of U.S. residents from the NHIS on various survey outcomes at the national level and some subgroups, such as race/ethnicity, age group, health insurance status, etc.

10.2 Limitations

The sample size has increased from 4,500 in the 2009 study to 6,600 for the 2014 study so the precision of survey estimates should improve in the 2014 study. However, oversampling grantees, sites, and patients at all three stages can cause large variation in sample weights, thereby increasing variances associated with survey estimates and reducing statistical power in data analysis. This design efficiency loss due to oversampling could partially offset the gain of the increased sample sizes.

An additional limitation is the capture of seasonal variation in health care needs and service utilization. The time constraints for completing the study within the contract time period limit the data collection period to 4 months, not a full year; thus, the study will not be able to address any seasonal fluctuations in the types of services provided to the health center patients during different seasons of the year. The short time period for data collection may also miss groups of seasonal farmworkers who move from one part of the country to another during the year.

SECTION 11.
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