# Supporting Statement – Part BCollections of Information Employing Statistical Methods for Survey of Community-Based Health Professionals for QIN-QIO Program to Increase Medication Safety and Prevent Adverse Drug Events

## Respondent Universe and Sampling Methods

The Quality Innovation Network Quality Improvement Organization (QIN-QIO) program works with healthcare providers, pharmacists and stakeholders across care settings to reduce potential adverse drug reactions, medication errors, overdoses, allergic reactions, and other adverse drug events. This data collection includes an online survey targeting community pharmacists and providers working in a group practice setting. This survey will examine resources and activities used to promote medication safety and reduce adverse drug events (ADEs).

The cross-sectional survey will collect information from 600 healthcare professionals who are participating in the CMS QIN-QIO program to reduce adverse drug events (participating group) and 600 healthcare professionals who are not participating in the QIN-QIO program to reduce adverse drug events (non-participating group). Pharmacists and providers (physicians, physician assistants, and nurse practitioners) will be sent an invitation to complete the survey online via email.

### Panel Methodology

The sample for this study will be drawn from administrative records from the QIN-QIO participating group and supplemented by a provider panel for the non-participating group. The panel is developed by Medscape, an online repository of health information and continuing education used by over 2 million healthcare providers. This online panel maintains a large network of healthcare providers across care settings. The panel was selected because it includes information on the provider type for panel members—making it a cost-efficient method of targeting multiple provider groups for the professionals not participating in the QIN-QIO program. Similarly, the low incidence of these professionals in the general population make probabilistic approaches, such as random digit dialing telephone surveys and address-based sample mail surveys, impractical. Medscape users agree to be contacted for advertising, research, and event recruitment. This means that the sample frame available for surveys is a very large subset of the actual universe being studied (Table 1).

Table 1 shows the percentage of providers included in the panel out of the total number of jobs in the profession estimated by the Bureau of Labor Statistics in 2016. The panel coverage (52% for pharmacists, 77% for physicians and physician assistants, and 49% for nurse practitioners and registered nurses) suggests that findings obtained from such an effort would represent over half of healthcare professionals. The panel will have demographic information that has been previously collected from members (including information such as state, zip code, profession, and specialty) which will be used to develop weights for non-respondents, thereby improving the representativeness of results. Questions will also be included in the survey to facilitate non-response analysis and assess any non-response bias.

Table 1. Medscape Market Research Panel Coverage

| **Provider Type** | **Members Included in Medscape Market Research Panel (2018)** | **Total Number of Professionals (Bureau of Labor Statistics, 2016)** | **Percent Coverage in Medscape Market Research Panel** |
| --- | --- | --- | --- |
| Physicians and Physician Assistants | 633,985 | 820,000 | 77.3% |
| Pharmacists | 163,026 | 312,500 | 52.2% |
| Nurse Practitioners and Registered Nurses | 1,472,139 | 3,025,240 | 48.7% |

### Sample Stratification

The pharmacists sample will be stratified by QIN-QIO region. Stratification by QIN-QIO region is designed to produce a sample with a mix of pharmacists that is consistent with the national distribution of providers, but is not intended to produce reliable estimates at the individual QIN-QIO level.**[[1]](#footnote-2)** We will randomly select pharmacists within strata with the goal of having the number of surveys allocated in proportion to the total number of units in those strata. For this effort, we will focus on obtaining responses from pharmacists in community retail pharmacies.

The group practice sample will have three levels of stratification. Because the QIN-QIO program gives QIN-QIOs the freedom to prioritize which provider groups to target to reduce adverse drug events, the sample will first be stratified at the state level into two groups: those states where QIN-QIOs work with group practice physicians only, and those states where QIN-QIOs work with physicians and physician assistants and/or nurse practitioners. States where QIN-QIOs do not work with group practice physicians will be excluded from the sample frame. The group practice provider sample will then be stratified by QIN-QIO region, and then by provider type (physicians, physician assistants, and nurse practitioners) for the state group where QIN-QIO work with physicians, physician assistants, and nurse practitioners. Stratification by provider type/setting is designed to produce a sample with a mix of healthcare providers that are representative of the range of group practice providers that QIN-QIOs are actively engaged with to promote medication safety and prevent adverse drug events. We will randomly select group practice providers within strata with the goal of having the number of surveys allocated in proportion to the total number of units in those strata.

### Expected Response Rates

Response rates for surveys with healthcare providers varies as a function of the survey content and the type of provider contacted, making estimating an expected response rate for this study among multiple providers difficult. However, Medscape typically experiences response rates in the range of 5% to 30% for studies conducted using its panel, figures that are comparable to published results from other healthcare provider surveys.[[2]](#footnote-3) We will be employing a number of strategies to maximize response rates among this group including the use of honoraria, identifying CMS as the survey sponsor, communicating the public policy benefit of participating in the survey, and using multiple reminders and contacts.

## Procedures for the Collection of Information

### Statistical Methodology for Stratification and Sample Selection

We will conduct stratified random sampling as described in section 1b. Table 2 and Table 3 show our target quotas for the participating and non-participating groups following stratification. We will set survey complete quotas to improve the likelihood that responses are representative. The quotas set are similar for both the participating group and the non-participating group. The distribution of providers (physicians, physician assistants, and nurse practitioners) across strata is based upon Bureau of Labor Statistics (BLS) information on the total number of providers in each profession and the share of providers in each profession working in a physicians’ office setting. Our sample will be proportionally allocated based on the distribution of provider types across QIN-QIO regions nationally, although this information is based on all providers in each profession, rather than those in a physicians’ office setting, because BLS does not provide state-level data within practice setting. Table 4 shows the distribution of provider types by QIN-QIO region based on results from BLS in May 2016. Final stratification will be conducted based on most up-to-date estimates upon study approval.

Table 2: Targets for Participating and Non-Participating Groups

| **Respondent Category** | **Sample Size** |
| --- | --- |
| Healthcare providers participating in the QIN-QIO program (Participating Group) | 600 |
| Healthcare providers not participating in the QIN-QIO program (Non-participating Group) | 600 |

Table 3. Practice Type/Provider Type Targets for QIN-QIO Enrolled and Unenrolled Groups

| **Practice Type** | **Provider Type** | **QIN-QIO Participating Group** | **Non-participating Group** |
| --- | --- | --- | --- |
| Retail pharmacies | Pharmacists | 300 | 300 |
| Group practice | Physicians  | 201 | 201 |
| Group practice | Physician assistants | 42 | 42 |
| Group practice | Nurse practitioners | 57 | 57 |

Table 4. Distribution of Pharmacists by QIN-QIO Region per the Bureau of Labor Statistics (BLS) for May 2016

| **QIN-QIO Region / States** | **% Distribution Based on BLS** | **Estimated Sample N (Participating)** | **Estimated Sample N (Non-participating)** |
| --- | --- | --- | --- |
| QIN F (GA, NC) | 6.2% | 19 | 19 |
| QIN I (DC, NY, SC) | 8.5% | 25 | 25 |
| QIN G (AL, IN, KY, MS, TN) | 8.8% | 26 | 26 |
| QIN A (KS, ND, NE, SD) | 2.4% | 7 | 7 |
| QIN M (AZ, CA, FL, OH, VI) | 22.3% | 67 | 67 |
| QIN N (CT, MA, ME, NH, RI, VT) | 4.9% | 15 | 15 |
| QIN E (NM, NV, OR, UT) | 3.5% | 11 | 11 |
| QIN C (MI, MN, WI) | 6.7% | 20 | 20 |
| QIN H (AK, HI, MT, WY) | 1.2% | 4 | 4 |
| QIN L (ID, WA) | 2.4% | 7 | 7 |
| QIN J (DE, LA, NJ, PA, WV) | 9.8% | 29 | 29 |
| QIN D (CO, IA, IL) | 6.8% | 20 | 20 |
| QIN B (AR, MO, OK, PR, TX) | 12.2% | 37 | 37 |
| QIN K (MD, VA) | 4.4% | 13 | 13 |
| **TOTAL** | **100%** | **300** | **300** |

Table 5. Distribution of Group Practice Providers by QIN-QIO Region per the Bureau of Labor Statistics (BLS) for May 2016

**State Group: States where QIN-QIO work with group practice physicians only**

| **QIN-QIO Region / States** | **Group Practice Provider Type** | **% Distribution Based on BLS** | **Estimated Sample N (Participating)** | **Estimated Sample N (Non‑-participating)** |
| --- | --- | --- | --- | --- |
| QIN I (NY) | Physicians | 4.7% | 14 | 14 |
| QIN G (MS) | Physicians | 1.1% | 3 | 3 |
| QIN A (ND, SD) | Physicians | 1.1% | 3 | 3 |
| QIN N (CT, MA, ME, NH, RI, VT) | Physicians | 10.9% | 33 | 33 |
| QIN C (WI) | Physicians | 4.0% | 12 | 12 |
| QIN J (NJ, PA) | Physicians | 9.6% | 29 | 29 |
| QIN B (AR) | Physicians | 1.7% | 5 | 5 |
| QIN K (MD, VA) | Physicians | 10.0% | 30 | 30 |

**State Group: States where QIN-QIO work with group practice physicians only**

| **QIN-QIO Region / States** | **Group Practice Provider Type** | **% Distribution Based on BLS** | **Estimated Sample N (Participating)** | **Estimated Sample N (Non-participating)** |
| --- | --- | --- | --- | --- |
| QIN F (GA, NC) | Physicians | 6.6% | 20 | 20 |
|  | Physician Assistants | 5.7% | 17 | 17 |
|  | Nurse Practitioners | 6.0% | 18 | 18 |
| QIN I (DC, SC) | Physicians | 7.1% | 21 | 21 |
|  | Physician Assistants | 1.9% | 6 | 6 |
|  | Nurse Practitioners | 2.8% | 8 | 8 |
| QIN G (IN, TN) | Physicians | 3.8% | 11 | 11 |
|  | Physician Assistants | 0.9% | 3 | 3 |
|  | Nurse Practitioners | 4.2% | 13 | 13 |
| QIN A (KS, NE) | Physicians | 1.5% | 5 | 5 |
|  | Physician Assistants | 1.3% | 4 | 4 |
|  | Nurse Practitioners | 1.8% | 5 | 5 |
| QIN M (AZ) | Physicians | 2.4% | 7 | 7 |
|  | Physician Assistants | 1.8% | 6 | 6 |
|  | Nurse Practitioners | 1.8% | 5 | 5 |
| QIN H (AK, WY) | Physicians | 0.9% | 3 | 3 |
|  | Physician Assistants | 0.5% | 1 | 1 |
|  | Nurse Practitioners | 0.6% | 2 | 2 |
| QIN L (ID, WA) | Physicians | 1.7% | 5 | 5 |
|  | Physician Assistants | 1.7% | 5 | 5 |
|  | Nurse Practitioners | 2.0% | 6 | 6 |
| **TOTAL** |  | **100%** | **300** | **300** |

### Estimation Procedure

We will assess the QIN-QIO’s impact on promoting resources and activities designed to promote medication safety and prevent adverse drug events, as well as clarifying attribution of the QIN-QIO program to the observed outcomes relative to other sources of information used by providers. We will document the use of resources and activities to promote medication safety and prevent adverse drug events among healthcare providers that did not actively participate in the QIN-QIO program. Our analysis for each evaluation question will begin with descriptive statistics including percentages and means in total and across subgroups. Appropriate statistical tests will be employed including t-tests, chi-square tests and analyses of variance (ANOVA) depending on the evaluation question. To identify potential drivers of high performance among QIN-QIOs, analyses will include bi-variate analyses such as cross-tabulations, correlations or attributable effects. The survey findings will also be used in multivariate modeling such as regression modeling, impact analysis, return on investment (ROI), and analysis of changed processes or outcomes that can be attributed to the QIN-QIO versus other quality improvement programs. Our evaluation analytics will combine survey data with qualitative and secondary data when possible, including information derived from CMS claims data.

### Degree of accuracy needed for the purpose described in the justification

Table 6 shows the planned margins of error for the two health professional groups and for the subsample of participating and non-participating members. The groupings represent the common recipients of adverse drug event-related technical assistance from the QIN-QIOs, and the study design prioritizes estimation accuracy within these groups.

Table 6: Sample Size and Margin of Error

| **Sample Size** | **Group** | **Margin of Error** | **Recruited** | **Margin of Error** | **Non-Recruited**  | **Margin of Error** |
| --- | --- | --- | --- | --- | --- | --- |
| 600 | Community Pharmacists | 4.00% | 300 | 5.66% | 300 | 5.66% |
| 600 | Group Practice Providers | 4.00% | 300 | 5.66% | 300 | 5.66% |

This sample size also provides sufficient power for testing between groups within the sample. The following figure is a power chart that shows sample sizes and the corresponding effect size detected with power of 90%, Type I probability of 5% and accounting for the finite population. Both the community pharmacist group and the group practice provider group, each with sample size of 600, achieve an effect size of under 0.15 In other words, the sample size will allow for the detection of medium to smaller size differences between groups.

Figure 1. Sample Size and Effect Size



### Unusual problems requiring specialized sampling procedures

We do not foresee any unusual problems that require specialized sampling procedures.

### Any use of periodic (less frequent than annual) data collection cycles to reduce burden

The adverse drug events survey will be conducted once.

## Methods to Maximize Response Rates and Deal with Issues of Non-Response

### Methods to Maximize Response Rates

To maximize response rates of the surveys we will employ multiple contacts. Please see Appendix B and C for a sample of the emails that will be sent to healthcare providers inviting them to take the survey. In addition, we will work with CMS to establish advance communication about the study, its purpose, the public policy objectives of the effort, and anticipated timing for the data collection effort. Communications will establish CMS as the sponsor of the study to improve provider confidence in the work.

*Multiple contacts:* In this data collection, we plan to follow some of the principles of the Dillman Total Design survey method[[3]](#footnote-4) which emphasizes multiple contacts with members of the sample as being one of the most successful techniques to increase response rates. This technique is now considered standard methodology for any survey.

When possible, we will work with QIN-QIOs to provide its members with information and notices about the data collection effort, purpose, and a time frame of when to expect a contact. Also, CMS’s contractor for this survey effort, the Independent Evaluation Center (IEC) for the Quality Improvement Program in the 11th Scope of Work, has conducted numerous online surveys using panel sample on a variety of topics that will be leveraged to maximize response rates. The initial survey invitation will provide more information on the study to increase respondent confidence in the validity and the importance of the survey resulting in higher response rates.[[4]](#footnote-5) Multiple email follow-ups will be employed following the initial invitation to take the survey. The email invitations will be CMS-sponsored, prominently displaying their logo to increase confidence in the content and importance of the study. Providers will also be provided with an honorarium for their time spent on the survey in keeping with standard practice for the Medscape panel.

### Methods to Deal with Issues of Non-Response

There are two types of non-response – unit non-response and item non-response. Unit non-response, the failure of a sampled entity to respond, is handled in two ways:

1. *Intensive contact and re-contact plan to receive a response from the sampled entity.* We will make follow up attempts with each sample entity. If the designated respondent is unavailable after several attempts, we identify a qualified alternative respondent.
2. *A weighting plan to compensate for nonresponse.* The sampling plan calls for a proportionate allocation of the sample. In theory, the sample would be self-weighting. Due to unit non-response, the sample distribution may not be proportionate. Initial weighting will be employed to bring the strata back into proportion. There may be key qualities of the sample entities that are related to their propensity to respond. The IEC team will review response rates across information available in the sampling frame to identify qualities and characteristics that differentiate between the propensities to respond. Measures that may be available or used include urban/non-urban, provider age, and size of the facility where the individual is practicing. If any of these measures indicate a differentiation in the yield rates, they will be included in the weighting plan where we will use methods such as raking ratio adjustment to balance the sample according to these variables and hold the relative proportion across the QIOs.

Item non-response is the event of not providing a response to question either by No Answer, Refusal or by responding “Don’t Know.” In this study, we consider item nonresponse to be substantial if the missing rate is 30% or more for any given survey item or the missing item rate is greater than 70% for any single questionnaire. Item nonresponse will be handled in two different ways:

1. *Re-contact of sample entity*. In the case of item nonresponse for a specific question, we will re-contact the sample entity to ask for clarification and completion of the question.
2. *Imputation*. We propose to use imputation sparingly and only for interval scaled questions. We will impute the missing value using a general linear model capturing the relationship between providers like age, provider type, setting, practice size, urban/non-urban splits, etc. to create a prediction model. The predicted value for the missing cases could be included in the analysis.

### Generalizing to the Universe Studied

The Medscape panel represents a sizable proportion of healthcare providers. We will use pre-collected panel information and data collected from surveys to develop weights that will make the data more representative of the universe of healthcare providers. The information collected should yield data that is reliable to CMS in informing future decisions on the QIN-QIO program.

## Tests of Procedures or Methods to be Undertaken

As part of developing the survey instruments, the project team has conducted internal beta-testing to assess the hour burden per respondent and to ensure that the questions and responses are readily understandable and skip patterns are logical.

Additionally, we have conducted cognitive interviews of the surveys with the healthcare providers being targeted for this study. Eight cognitive interviews have been conducted in-person with the recruited respondents (four pharmacists and 4 providers, including those who were participating with QIOs and those who weren’t participating). Participants who did not work with the QIO were recruited through Medscape. Interview participants were asked to complete the survey online. This was followed by an in-depth cognitive interview. The cognitive interviews will solicit feedback from providers about possible improvements to the survey and the survey administration process. This pre-testing has enabled the team to assess and correct ambiguities in the survey questions and instructions. We have made several changes to survey content based on this input.

## Individuals Consulted on Statistical Aspects and Individuals Collecting and/or Analyzing the Data

Table 7 provides the names and affiliation for those consulted on the statistical aspects of the design and who will collect or analyze the information.

Table 7: Individuals Consulted on Statistical Aspects and Performing Data Collection & Analysis

| **Name** | **Affiliation** |
| --- | --- |
| Michael Samuhel, PhD | Booz Allen Hamilton |
| Ping Yu, PhD | Booz Allen Hamilton |
| Jiaqi Li, PhD | Booz Allen Hamilton |
| Vonna Drayton, DrPH | Booz Allen Hamilton |
| Anna Ettinger, PhD, MSW, MPH | Booz Allen Hamilton |
| Elyse Levine, PhD | Booz Allen Hamilton |
| Tse Hua, Shih, PhD | Booz Allen Hamilton |
| Jia Zhao, PhD | Booz Allen Hamilton |
| Zachary Lewis, MA | Ipsos |
| Omar Pedraza, MPH | Ipsos |
| Helen Fisun, MPH | Ipsos |
| Alan Roshwalb, PhD | Ipsos |

Table 8 shows the name of CMS staff who advised on survey design.

Table 8: CMS Staff Who Advised on Survey Design

| **Name** | **Affiliation** |
| --- | --- |
| Nancy Sonnenfeld, PhD | Center for Clinical Standards and Quality |
| Lawrence LaVoie, PhD | Center for Clinical Standards and Quality |
| Anita Thomas, PhD | Center for Clinical Standards and Quality |

1. There are 14 QIN-QIO regions made up of one or more states (plus Washington, DC, Puerto Rico, and the U.S. Virgin Islands) covered by a QIN-QIO. Subsequent references to “geographic distribution” address these QIN-QIO regions. [↑](#footnote-ref-2)
2. Discussions of provider response rates in online surveys can be found in articles such as Cunningham, Ceara Tess, et al. "Exploring physician specialist response rates to web-based surveys." BMC Medical Research Methodology 15.1 (2015): 32. and Blackstock, Oni J., et al. "A cross-sectional online survey of HIV pre-exposure prophylaxis adoption among primary care physicians." Journal of General Internal Medicine 32.1 (2017): 62-70. [↑](#footnote-ref-3)
3. Dillman DA (2000). Mail and internet surveys: The tailored design method (Vol. 2). New York: Wiley. [↑](#footnote-ref-4)
4. Pit SW, Vo T, Pyakurel S. (2014). The effectiveness of recruitment strategies on general practitioner’s survey response rates–a systematic review. *BMC medical research methodology, 14*(1), 1. [↑](#footnote-ref-5)