Request for Approval under the "Generic Clearance for Improving Customer Experience (OMB Circular A-11, Section 280 Implementation)" (OMB Control Number: 2900-0876)

TITLE OF INFORMATION COLLECTION: No Show Imaging Survey

PURPOSE

VHA monitors and measures no-shows as an indicator of patient access to care. Within VHA, the impact of a missed appointment on a single patient can be exasperated due to long wait times in general, and the time it takes to reschedule an appointment. Indirectly, no-shows cause delays in appointments for other patients and limit their ability to access care. Patients who fail to make their appointments miss opportunities to receive valuable and uninterrupted care from their providers. This negatively impacts the effectiveness of outpatient care deliver, and results in an increased risk of adverse health outcomes and an overall increased cost of care per patient.

In order to continue to provide quality services to Veterans, the Veteran Experience Office (VEO) partnered with the Office of Veteran's Access to Care (OVAC) to measure the satisfaction of Veterans regarding their current experience scheduling, preparing for, and attending their imaging appointments. VEO proposed to conduct a brief survey on Veterans who have recently missed an imaging appointment to better understand their reasons for becoming a no-show and to assess the effectiveness of current VA-wide no-show interventions.

DESCRIPTION OF RESPONDENTS:

The target population of the No Show Imaging survey is all Veterans who have missed an imaging appointment in the last week. The identification these no-show patients utilizes weekly data extracts from the Corporate Data Warehouse (CDW), which houses the operational records of VHA. Each no-show event eligible for a VEO survey will 1) have missed an imaging appointment and 2) have not formally canceled/rescheduled the appointment prior to the appointment (Cancelation/ No-Show Code of "N" for No-Show).

TYPE OF COLLECTION: (Check one)

[ ]	Customer Comment Card/Complaint Form	[X]	Customer Satisfaction Survey
[ ]	Usability Testing (e.g., Website or Software	[ ]	Small Discussion Group
[ ]	Focus Group	[ ]	Other:_____

CERTIFICATION:

I certify the following to be true:

1. The collection is voluntary.
2. The collection is low-burden for respondents and low-cost for the Federal Government.

3. The collection is non-controversial and does not raise issues of concern to other federal agencies.
4. Personally identifiable information (PII) is collected only to the extent necessary and is not retained.
5. Information gathered is intended to be used for general service improvement and program management purposes.
6. The collection is targeted to the solicitation of opinions from respondents who have experience with the program or may have experience with the program in the future.
7. All or a subset of information may be released as part of A-11, Section 280 requirements on performance.gov. Additionally, summaries of the data may be released to the public in communications to Congress, the media and other releases disseminated by VEO, consistent with the Information Quality Act.

Name:

- Dan Ostrow, VSignals Implementation Lead, Veterans Experience Office, VA, (414) 690-8587

To assist review, please provide answers to the following question:

Personally Identifiable Information:

1. Will this survey use individualized links, through which VA can identify particular respondents even if they do not provide their name or other personally identifiable information on the survey? [X] Yes [] No
2. Is personally identifiable information (PII) collected? [ ] Yes [X] No
3. If Yes, will any information that is collected be included in records that are subject to the Privacy Act of 1974? [ ] Yes [ ] No [**N/A**]
4. If Yes, has an up-to-date System of Records Notice (SORN) been published? [ ] Yes [ ] No [**N/A**]

Gifts or Payments:

Is an incentive (e.g., money or reimbursement of expenses, token of appreciation) provided to participants? [ ] Yes [X] No

BURDEN HOURS

Minimum Monthly Responses Needed: 1,041 (from sample plan)
Annual Reponses: 1,041 x 12 months = 12,492

Category of Respondent	**No. of Respondents per year**	**Estimated Participation Time** (X minutes =)	**Burden** (÷ 60 =)

Individuals or Households	12,492 annually	3	625 hours
Totals	12,492 annually	3	625 hours

Please answer the following questions.

1. **Are you conducting a focus group, a survey that does not employ random sampling, user testing or any data collection method that does not employ statistical methods?**

   Yes ___
   No _X_

   If Yes, please answer questions 1a-1c, 2 and 3.
   If No, please answer or attach supporting documentation that answers questions 2-8.

   a. Please provide a description of how you plan to identify your potential group of respondents and how you will select them.

   b. How will you collect the information? (Check all that apply)
   [ ] Web-based or other forms of Social Media
   [ ] Telephone

   [ ] In-person

   [ ] Mail
   [X] Other- E-mail-based surveys

   c. Will interviewers or facilitators be used? [ ] Yes [X] No

2. Please provide an estimated annual cost to the Federal government to conduct this data collection: __$13,000_____

3. Please make sure that all instruments, instructions, and scripts are submitted with the request. This includes questionnaires, interviewer manuals (if using interviewers or facilitators), all response options for questions that require respondents to select a response from a group of options, invitations given to potential respondents, instructions for completing the data collection or additional follow-up requests for the data collection.

   -Done

4. Describe (including a numerical estimate) the potential respondent universe and any sampling or other respondent selection methods to be used. Data on the number of

entities (e.g., establishments, State and local government units, households, or persons) in the universe covered by the collection and in the corresponding sample are to be provided in tabular form for the universe as a whole and for each of the strata in the proposed sample. Indicate expected response rates for the collection as a whole. If the collection had been conducted previously, include the actual response rate achieved during the last collection.

- Please see Statistical Sample Plan in the Appendix.

5. Describe the procedures for the collection of information, including:
    a. Statistical methodology for stratification and sample selection.
    b. Estimation procedure.
    c. Degree of accuracy needed for the purpose described in the justification.
    d. Unusual problems requiring specialized sampling procedures.
    e. Any use of periodic (less frequent than annual) data collection cycles to reduce burden.

    - Please see Statistical Sample Plan in the Appendix.

6. Describe methods to maximize response rates and to deal with issues of nonresponse. The accuracy and reliability of information collected must be shown to be adequate for intended uses. For collections based on sampling, a special justification must be provided for any collection that will not yield "reliable" data that can be generalized to the universe studied.

    - Please see Statistical Sample Plan in the Appendix.

7. Describe any tests of procedures or methods to be undertaken. Testing is encouraged as an effective means of refining collections of information to minimize burden and improve utility. Tests must be approved if they call for answers to identical questions from 10 or more respondents. A proposed test or set of tests may be submitted for approval separately or in combination with the main collection of information.

    - Please see Statistical Sample Plan in the Appendix.

8. Provide the name and telephone number of individuals consulted on statistical aspects of the design and the name of the agency unit, contractors, grantees, or other person(s) who will actually collect or analyze the information for the agency.

- Statistical Aspects:
    - Mark Andrews, Statistician, Veterans Experience Office, VA. (703) 483-5305

- Collection and Analysis:
    - Evan Albert, Dir. of Measurement and Data Analytics, Veterans Experience Office, VA, (202) 875-9478

- Dan Ostrow, VSignals Implementation Lead, Veterans Experience Office, VA, (414) 690-8587
- Lisa Wall, Assistant Director, National Radiology Program, VA, (214) 505-9428

Imaging No-Show Survey
Sampling Methodology Report

Prepared by

Veteran Experience Office

Version 1 July 2021

Contents

Executive Summary

In 2017, Veterans Health Administration (VHA) experienced 9.2M missed appointments. High missed appointment (or no-shows) rates have been identified as one of the most significant barriers effecting patient access to care in general and cost VHA $564M annually. Missed appointments are a particular problem due to high missed appointment rates and the subsequent non-collection of provider requested imaging for diagnosis and prevention.

VHA monitors and measures no-shows as an indicator of patient access to care. Within VHA, the impact of a missed appointment on a single patient can be exasperated due to long wait times in general, and the time it takes to reschedule an appointment. Indirectly, no-shows cause delays in appointments for other patients and limit their ability to access care. Patients who fail to make their appointments miss opportunities to receive valuable and uninterrupted care from their providers. This negatively impacts the effectiveness of outpatient care deliver, and results in an increased risk of adverse health outcomes and an overall increased cost of care per patient.

In order to continue to provide quality services to Veterans, the Veteran Experience Office (VEO) partnered with the Office of Veteran's Access to Care (OVAC) to measure the satisfaction of Veterans regarding their current experience scheduling, preparing for, and attending their imaging appointments. VEO proposed to conduct a brief survey on Veterans who have recently missed an imaging appointment to better understand their reasons for becoming a no-show and to assess the effectiveness of current VA-wide no-show interventions.

The goal of service level measurements is three-fold:

1) To collect continuous customer experience data from no-show patients in imaging clinics to monitor improvements or service lapses in how VHA manages no-shows
2) To help field staff and the national office identify areas for improvement that may reduce no-shows and improve the patient
3) To better understand the reason for no-shows and to inform VHA of the veteran's needs

The purpose of this document is to define VA's sampling methodology for selecting potential survey respondents for this study. The sampling design aims to provide monthly estimates to allow relatively robust level of precision. The survey will also allow decisions makers at different levels to make inference per agency, across veterans, and the type of appointments being missed with varying precision depending on the analysis and the amount of data being examined (e.g. monthly, quarterly, etc.).

Part I – Introduction

A. Background

The **Enterprise Measurement and Program Improvement** team (EM&PI) is part of the **Insights and Analytics** (I&A) division within the **Veterans Experience Office** (VEO). The EM&PI team is tasked with conducting transactional surveys of the Veteran population to measure their satisfaction with the Department of Veterans Affairs (VA) numerous benefit services. Thus, their mission is to empower Veterans by rapidly and discreetly collecting feedback on their interactions with such VA

entities as NCA, VHA, and VBA. VEO surveys generally entail *probability* samples which only contact minimal numbers of Veterans necessary to obtain reliable estimates. This information is subsequently used by internal stakeholders to monitor, evaluate, and improve beneficiary processes. Veterans are always able to decline participation, and have the ability to opt out of future invitations. A *quarantine* protocol is maintained to limit the number of times a Veteran may be contacted, in order to prevent survey fatigue, across all VEO surveys.

Surveys issued by EM&PI are generally brief in nature, and present a low amount of burden to Veterans. A few targeted questions will utilize a human centered design (HCD) methodology, revolving around concepts of Trust, Ease, Effectiveness and Emotion. Questions will focus on a specific aspect of a service process; spanning communication, applying for benefits, deliberation, and/or receipt of benefits. Structured questions directly address the pertinent issues regarding each surveyed line of business. The opportunity to volunteer open-ended text responses is provided within most surveys. This open text has been demonstrated to yield enormous information. Machine learning tools are used for text classification, ranking by sentiment scores, and screening for homelessness, depression, etc. Modern survey theory is used to create sample designs which are representative, statistically sound, and in accordance with OMB guidelines on federal surveys.

The Veteran Experience Office (VEO) has been commissioned by the Veteran Health Administration (VHA) to measure the satisfaction and experience of veterans that have recently missed an imaging appointment. VEO proposes to conduct a **brief survey** on Veterans who had missed an appointment in the previous week. A subset of veterans will be randomly selected to participate. Sampled patients will be contacted through an invitation email. A link will be enclosed so the survey may be completed using an online interface, with customized patient information. The survey itself will consist of a handful of questions revolving around a human-centered design, focusing on such elements as trust, emotion, effective, and ease with the care they received.

B. Basic Definitions

Coverage	The percentage of the population of interest that is included in the sampling frame.
Measurement Error	The difference between the response coded and the true value of the characteristic being studied for a respondent.
Non-Response	Failure of some respondents in the sample to provide responses in the survey.
Transaction	A *transaction* refers to the specific time a Veteran interacts with the VA that impacts the Veteran's journey and their perception of VA's effectiveness in caring for Veterans.
Response Rate	The ratio of participating persons to the number of contacted persons. This is one of the basic indicators of survey quality.
Sample	In statistics, a data sample is a set of data collected and/or selected from a statistical population by a defined procedure.
Sampling Error	Error due to taking a particular sample instead of measuring every unit in the population.
Sampling Frame	A list of units in the population from which a sample may be selected.
Reliability	The consistency or dependability of a measure. Also referred to as *standard error*.

C. Application to Veterans Affairs

This measurement may bring insights and value to all stakeholders at VA. Front-line VA leaders can resolve individual feedback from Veterans and take steps to improve the customer experience; meanwhile VA executives can receive real-time updates on systematic trends that allow them to make changes.

1) To collect continuous customer experience data to monitor the relative success of programs designed to reduce non-shows and improve veteran experience when appointment cancelations are necessary.
2) To help field staff and the national office identify need of the specific veteran population they serve
3) To better understand why veterans cancel their imaging appointments

Part II – Methodology

A. Target Population and Frame

The target population of the Imaging No-Show survey is all Veterans who have missed an imaging appointment in the last week. The identification these no-show patients utilizes weekly data extracts from the Corporate Data Warehouse (CDW), which houses the operational records of VHA. Each no-show event eligible for a VEO survey will 1) have missed an imaging appointment and 2) have not formally canceled/rescheduled the appointment prior to the appointment (Cancelation/ No-Show Code of "N" for No-Show).

B. Sample Size Determination

For a given margin of error and confidence level, the sample size is calculated as below (Lohr, 1999). For population that is *large*, the equation below is used to yield a representative sample for proportions:

$$n_0 = \frac{Z_{\alpha/2}^2 pq}{e^2}$$

where

- $\boldsymbol{Z_{\alpha/2}}$ = 1.96, which is the critical Z score value under the normal distribution when using a 95% confidence level (α = 0.05).
- **p** = the estimated proportion of an attribute that is present in the population, with q=1-p.
    - Note that pq attains its maximum when value p=0.5, and this is often used for a conservative sample size (i.e., large enough for any proportion).
- **e** = the desired level of precision; in the current case, the margin of error e = 0.03, or 3%. Also referred to as **MOE**.

For a population that is relatively *small*, the finite population correction is used to yield a representative sample for proportions:

$$n = \frac{n_0}{1 + \frac{n_0}{N}}$$

Where

- $\boldsymbol{n_0}$ = Representative sample for proportions when the population is large.
- **N** = Population size.

The margin of error surrounding the baseline proportion is calculated as:

$$Margin\ of\ error = z_{\alpha/2}\sqrt{\frac{N-n}{N-1}}\sqrt{\frac{p(1-p)}{n}}$$

Where

- $\boldsymbol{Z_{\alpha/2}}$ = 1.96, which is the critical Z score value under the normal distribution when using a 95% confidence level (α = 0.05).
- **N** = Population size.
- **n** = Representative sample.
- **p** = the estimated proportion of an attribute that is present in the population, with q=1-p.

Sample sizes will be calibrated to ensure monthly reports have a 3% MOE at a 95% Confidence Level. This represents an industry standard for reliability widely used by survey administrators (Lohr, 1999).

Table 2 depicts the estimated number of unique imaging no-show patients within a month. Preliminary analysis of this no-show patient population indicates that approximately **55%** of qualifying patients have provided an email address to the VHA—a relative high proportion relative to other surveys. This represents the frame population for the survey (see section below for information on possible bias due to frame *under-coverage*). This table show the respondents needed to meet the level of precision desired. While our VA outpatient survey achieves a response rate of around 19%, we are using a conservative estimated response rate of 14% anticipating the ability to increase this assumption we encounter a higher response rate. Typically, we round

sample draws up to 7,820 monthly/1,800 weekly. The round numbers aid in quality control and provides a cushion to account for uncertainty about assumptions.

Table 2. Target Population Figures

Survey Stratum	Population
Estimated Monthly No-Show Population	17,521
Approximate Monthly Email Population	9,696
Respondents Needed Precision at 3% MOE	1,041
Expected Response Rate	14%
Estimated Sample Needed to Achieve Target (Monthly/Weekly)	7,436/ 1,735
Estimated Sample Rate	77%

C. Stratification

Stratification is used to ensure that the sample matches the population, to the extent possible, across sub-populations. Typically, the VEO surveys will have *explicit* strata that preserve the accuracy of a specific segment (e.g. business line). Since this is, in comparison, a more homogeneous population; for this survey, we propose to rely on implicit stratification alone. Implicit stratification is probability-based sample balancing approach that can balance the sample across various variables. We often use demographic variables such as Age Group and Gender, geographic variables such as District and VAMC/CBOC. We can examine the value of using other variables available in the CDW such as appoint type.

D. Data Collection Methods

At the beginning of every measurement period, VEO data analysts will access the Corporate Data Warehouse (CDW), which contains the governmental database for all VHA interactions. The no-show target population will be extracted and recorded with each new iteration. Those veterans with a valid email address will be included in the survey frame. A new random sample, according to the stratification and quarantine protocol defined below will be used to create an invitation file. Emails are immediately delivered to all selected patients. Selected respondents will be contacted within 7 days of their no-show appointment date. They will have 14 days to complete the survey. Estimates will be accessible to data users instantly on the VSignals platform.

Table 3. Survey Mode

Mode of Data Collection	Recruitment Method	Time After Transaction	Recruitment Period	Collection Days
Online Survey	Email Recruitment	Within 7 days after No-Show Appointment	14 Days (Reminder after 7 Days)	Friday

E. Reporting

Researchers will be able to use the VSignals platform for interactive reporting and data visualization. Trust, Ease, Effectiveness, and Emotion scores can be observed for each). The scores may be viewed by Age Group, Gender, and Race/Ethnicity in various charts for different perspective. They are also depicted within time series plots to investigate trends. Finally, filter options are available to assess scores at varying time periods and within the context of other collected variable information.

Recruitment is continuous (weekly) but the results from several weeks may be combined into a *monthly* estimate for more precise estimates, which is the recommended reporting level. Weekly estimates may include minor distortions but allow analysts to review scores more quickly and within smaller time intervals. Weekly estimates are less reliable for small domains, and should only be considered for aggregated populations. Monthly estimates will have larger sample sizes, and therefore higher reliability set to a 3% MOE at the 95% Confidence level. All estimates are also weighted in real time on the platform for improved representation and less bias (non-response and coverage, see section G on Sample Weighting) but the weights can introduce distortions when looking at short time windows. Quarterly estimates are the most precise, but will take the greatest amount of time to obtain (12 weeks of collection). However, Quarterly estimates are the most suitable for the analysis of small populations (e.g. VAMC, Female Veterans 18-29, etc.).

F. Quality Control

To ensure the prevention of errors and inconsistencies in the data and the analysis, quality control procedures will be instituted in several steps of the survey process. Records will undergo a cleaning during the population file creation. The quality control steps are as follows.

1. Records will be reviewed for missing sampling and weighting variable data. When records with missing data are discovered, they will be either excluded from the population file or put into separate strata upon discussion with subject matter experts.
2. Any duplicate records will be removed from the population file to both maintain the probabilities of selection and prevent the double sampling of the same veteran.
3. Invalid emails will be removed.

The survey sample loading and administration processes will have quality control measures built into them.

1. The extracted sample will be reviewed for representativeness. A secondary review will be applied to the final respondent sample.
2. The survey load process will be rigorously tested prior to the induction of the No-show Survey to ensure that sampled customers is not inadvertently dropped or sent multiple emails.
3. The email delivery process is monitored to ensure that bounce-back records will not hold up the email delivery process.

The weighting and data management quality control checks are as follows:

1. The sum of the weighted respondents will be compared to the overall population count to confirm that the records are being properly weighted. When the sum does not match the population count, weighting classes will be collapsed to correct this issue.
2. The unequal weighting effect will be used to identify potential issues in the weighting process. Large unequal weighting effects indicate a problem with the weighting classes, such as a record receiving a large weight to compensate for nonresponse or coverage bias.

G. Sample Weighting, Coverage Bias, and Non-Response Bias

A final respondent sample should closely resemble the true population, in terms of the demographic distributions (e.g. age groups). One problem that arises in the survey collection process is ***nonresponse***, which is defined as failure of selected persons in the sample to provide responses. This occurs in various degrees to *all* surveys, but the resulting estimates can be distorted when some groups are actually more or less prone to complete the survey. In many applications, younger people are less likely to participate than older persons. Another problem is ***under-coverage***, which is the event that certain groups of interest in the population are not even included in the sampling frame. They cannot participate because they cannot be contacted: those without an email address will be excluded from sample frame. These two phenomena may cause some groups to be over- or under-represented. In such cases, when the respondent population does not match the true population, conclusions drawn from the survey data may not be reliable, and are said to be **biased**.

Survey practitioners recommend the use of sampling weighting to improve inference on the population. This will be introduced into the survey process as a tool that helps the respondent sample more closely represent the overall population. Weighting adjustments are commonly applied in surveys to correct for nonresponse bias and coverage bias. As a business rule will be implemented to require callers to provide email address, the coverage bias for this survey is expected to decrease. In many surveys, however, differential response rates may be observed across age groups. In the event that some age groups are more represented in the final respondent sample, the weighting application will yield somewhat smaller weights for this age group. Conversely, age groups that are underrepresented will receive larger weights. This phenomenon is termed *non-response bias correction* for a single variable. Strictly speaking, we can never know how non-respondents would have really answered the question, but the aforementioned adjustment calibrates the sample to resemble the full population – from the perspective of demographics. This may result in a substantial correction in the resulting weighting survey estimates when compared to direct estimates in the presence of non-negligible sample error (non-response bias).

Because the email population will have different demographics than the overall population, the initial sample will be selected in a manner from the frame so that the final respondent sample resembles the overall population. Stratification may also adjust for non-response (occurring when certain subpopulations are less prone to participate). Targets will be established for every permutation of the following stratification variables. As such, population values will be collected and recorded by VEO for every data collection period.

The stratification scheme above will result in a representative sample (w.r.t to the full population). Weighting will then be applied so that the sample is more fully matched to the population. Sample weights will be generated for Monthly, and Quarterly estimates.

It was reported earlier that the email population comprises 56% of the full no-show population. Since 85% of older Americans utilize email (Choi & Dinitto, 2013), we can presume that a large share of veterans chose not to share their email address with VHA or are simply unware of that option. It is assumed that the level of patient satisfaction is not directly related to their email status (Missing at Random). Since age and gender have been observed to be strong predictors of patient satisfaction in other VA health surveys, the stratification and weighting methodology outlined above will adequately compensate for any bias introduced by the incomplete frame of population.

Weighting will utilize cell weights in real time. To make this possible, targets will be based on the previous month's population. With each query on the VSignals platform for each respondent by dividing the target for a cell by the number of respondents in the cell. The weighting scheme will include, where possible all the variables used for explicit stratification, However, cells will be collapsed if the proportion of the population is insufficient to reliably achieve a minimum of 3 completes per month. As a result, weights may be more comprehensive for larger population segments. For instance, in the VA, women are a smaller proportion of the populations. Therefore, woman will have more collapsed cells than men.

As part of the weighting validation process, the weights of persons in age and gender groups are summed and verified that they match the universe estimates (i.e., population totals). Additionally, we calculate the *unequal weighting effect*, or UWE (see Kish, 1992; Liu et al., 2002). This statistic is an indication of the amount of variation that may be expected due to the inclusion of weighting. The unequal weighting effect estimates the percent increase in the variance of the final estimate due to the presence of weights and is calculated as:

$$UWE = 1 + cv^2_{weights} = (\frac{S}{\overline{w}})^2$$

where

- **cv** = coefficient of variation for all weights w_{ij}.
- **s =** sample standard deviation of weights.
- $\overline{\boldsymbol{w}}$ = sample mean of weights, $\overline{w} = \frac{1}{n}\sum_{ij} w_{\text{ij}}$.

H. Quarantine Rules

VEO seeks to limit contact with Veterans as much as possible, and only as needed to achieve measurement goals. These rules are enacted to prevent excessive recruitment attempts upon No-Show patients. VEO also monitors veteran participation within other surveys, to ensure veterans do not experience survey fatigue. All VEO surveys offer options for respondents to opt out, and ensure they are no longer contacted for a specific survey. VEO also monitors Veteran participation within other surveys, to ensure Veterans do not experience survey *fatigue.* Finally, all VEO surveys offer options for respondents to opt out, and ensure they are no longer contacted for a specific survey.

Table 4. Quarantine Protocol

Quarantine Rule	Description	Elapsed Time
Repeated Sampling for No-Show Survey	Number of days between receiving/completing online survey, prior to receiving email invitation for a separate No-Show experience	30 Days
Other VEO Surveys	Number of days between receiving/completing online survey and becoming eligible for another VEO survey	30 Days
Prioritization	Prioritization is based on the observed sample sizes.	N/A
Opt Outs	Persons indicating their wish to opt out of either phone or online survey will no longer be contacted.	N/A

Part III – Assumptions and Limitations

A. Coverage Bias

Since the VEO No-Show Survey is email only, there is a large population VHA patients that cannot be reached by the survey. Veterans that lack access to the internet or do not use email may have different levels of Trust and satisfaction with their service. However, the majority of Veterans that do not share their email addresses do so because they did not have an opportunity to provide the information, or they elected not to share their email address. As such, it is thought that Veterans in this latter category do not harbor any tangible differences to other Veterans who do share their information. In order to verify this, VEO plans to execute a coverage bias study to assess the amount of coverage bias due, and derive adjustment factors in the presence of non-negligible bias.

Appendix 3. References

Choi, N.G. & Dinitto, D.M. (2013). Internet Use Among Older Adults: Association with Health Needs, Psychological Capital, and Social Capital. *Journal of Medical Internet Research*, 15(5), e97

Kalton, G., & Flores-Cervantes, I. (2003). Weighting Methods. *Journal of Official Statistics*, 19(2), 81-97.

Kish, L. (1992). Weighting for unequal P. *Journal of Official Statistics*, 8(2), 183-200.

Kolenikov, S. (2014). Calibrating Survey Data Using Iterative Proportional Fitting (Raking). *The Stata Journal*, 14(1): 22–59.

Lohr, S. (1999). *Sampling: Design and Analysis* (Ed.). Boston, MA: Cengage Learning.

Liu, J., Iannacchione, V., & Byron, M. (2002). Decomposing design effects for stratified sampling. *Proceedings of the American Statistical Association's Section on Survey Research Methods*.

Wong, D.W.S. (1992) The Reliability of Using the Iterative Proportional Fitting Procedure. *The Professional Geographer*, 44 (3), 1992, pp. 340-348