3

Surveys for Improving Vaccinations

3.1 Introduction

Learning Objectives

By the end of this section of the SPIVA Toolkit, you should be able to:

- Describe the purpose of community-based surveys;
- Outline "The 7 Steps of Highly Effective Surveys";
- Discuss at least two sampling approaches;
- Describe the relationship between sample size and measurement precision;
- Distinguish three type of measurement data; and
- Describe at least two biases from each: design of questions, questionnaires, and administration.

A survey is a systematic method for gathering information from a population or from a subset of that population (called a sample) for the purpose of developing quantitative descriptions of that population [3]. This quantitative description is called a statistic. For example, among clients vaccinated in our clinic, useful statistics might include the mean age of female clients and the proportion of children with monolingual, Spanish-speaking parents. These are examples of descriptive statistics. In contrast, analytic statistics assess the relationship between two or more variables. In this toolkit, we focus on descriptive statistics.

Community surveys are used for collecting descriptive data about opinions and attitudes. The feedback and survey findings are often used by those conducting the survey. In this toolkit, we focus primarily on community surveys, where the goal is understanding trends and attitudes and using this information to improve vaccination campaigns and public health preparedness. We will use a case study approach to present the information.

On April 14, 2010, Broome County Health Department News Release invited community residents to take the online "H1N1 Response - Citizen Satisfaction Survey" (see Exhibit 3.1). The Web-based survey collected information on age, sex, ethnicity, occupation, income level, vaccination history, perceptions of and satisfaction with the public health H1N1 response, and much more. This timely, comprehensive, and relevant survey illustrates the value, opportunities, challenges, and limitations of conducting a community-based survey.

In addition to collecting data on H1N1 vaccine uptake, vaccine type, vaccination site accessibility, vaccine cost, and satisfaction with services, Broome County Health Department surveyors also included questions to assess satisfaction with, perceptions of, and confidence in public health services:

Q: Please indicate whether you Agree or Disagree with the following general statements regarding Broome County's response to the H1N1 Pandemic:

	Agree	Disagree	Don't Know
a) Organized a sufficient number of H1N1 vaccination clinics	○	○	○
b) Kept the public informed through the media (press conferences, interviews, etc.)	○	○	○
c) Hosted a sufficient number of public information (town hall) sessions	○	○	○
d) Educated the public about how to protect themselves and others from illness	○	○	○
e) Worked with local schools and school districts	○	○	○
f) Facilitated local H1N1 response efforts	○	○	○

The following questions were asked about local, state, and national public health agencies:

Q: After observing the response to the 2009 Influenza Pandemic my perception of the following organizations' ability to respond to an emergency is:

- ○ Weakened
- ○ Remained the Same
- ○ Strengthened

Exhibit 3.1 Broome County Health Department, Binghamton, New York, conducts online "H1N1 Response - Community Satisfaction Survey"

The Broome County Health Department (BCHD) News Release on April, 14, 2010, included the following: "The Broome County Health Department would like feedback from the community on the local response to the H1N1 flu pandemic. A short community survey has been created and posted on the Broome County Health Department webpage. The public is encouraged to visit http://www.gobroomecounty.com/hd/flu to provide feedback on the Health Department's efforts to protect the community from illness during the H1N1 pandemic. Information provided will be evaluated and used to improve local emergency response plans and mass dispensing activities."

The BCHP survey covered the following content areas:

- Gender
- Sex
- Children under 18
- Medical insurance
- Income level
- Education level
- Ethnicity
- Health care occupation
- Broome County community risk communication
- H1N1 vaccine uptake
- H1N1 vaccine type
- Seasonal vaccine uptake
- Frequency of annual influenza vaccine uptake
- Vaccine clinic location
- Broome County vaccine clinic services
- H1N1 vaccine cost
- Information sources
- Use of BCHD H1N1 pandemic Web site
- Perception of BCHD and other agencies' response
- Confidence in BCHD and other agencies' response
- Value of drop-in clinic and
- Interest in serving on a BCHD H1N1 focus group

The online survey used by BCHD can be found in Appendix C

Q: After observing the response to the 2009 Influenza Pandemic how confident are you in the following organization's ability to respond to an emergency?

- ○ Very Confident
- ○ Confident
- ○ Indifferent
- ○ Not Confident
- ○ Not at All Confident

From these questions above we can appreciate the valuable information that can be collected from community members about the public health H1N1 response, risk communication, vaccination program, and other services. We will use the Broome County Health Department survey as a starting point to review survey design concepts. Here are some additional survey design questions to consider:

- What were the primary goals of the survey? If the goals included reporting summary statistics, then the next question applies.
- Were the self-selected respondents to the online survey representative of Broome County residents? Some factors that might influence who responded to the survey include:
  - Access to survey invitation;
  - Computer Internet access;
  - English language literacy; and
  - Level of education.
- The survey findings applied to which target population(s) in Broome County?
- Do they have enough respondents from ethnic minorities that may represent a small fraction of the population, yet for which they might want an accurate picture to address possible health disparities?
- Were the questions designed and ordered to increase data accuracy and respondent completion?
- Who is the primary audience for the survey results?
- How will the survey findings be used?

We believe that the Broome County Health Department approach (key informant interviews, focus groups, and surveys) is the type of model practice we are promoting with the SPIVA Toolkit. To improve our public health surveys we review a 7-step approach that can be used by non-epidemiologists.

3.2 The 7 Steps of Highly Effective Surveys

In an effective survey the data collected accurately measures key characteristics of interest from the target population. To achieve this we need the following:

- *Representative* and *sufficient* sample of subjects, and
- *Accurate* and *precise* measurements from each subject.

In short, we strive to minimize *systematic error* (bias) and *random error* (chance) in both sampling (subject selection) and measurement (questionnaire administration).

To promote the design and conduct of effective vaccination surveys we are adapting a systematic, practical approach called "The 7 Steps of Highly Effective Surveys":[1]

1. Define the survey goals;
2. Select a study design;
3. Design a sampling plan;
4. Design the questionnaire;
5. Pretest the survey;
6. Conduct the survey; and
7. Communicate findings.

The 7 Steps of Highly Effective Surveys

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3.2.1 Step 1: Define the survey goals

To be effective, survey studies must have clear, understood, and agreed-upon goals. Before embarking on a survey, we should answer the following questions:

- What questions do we need/want answered?
- Why are these questions important? (significance)
- Will we report survey summary statistics? (sampling design and sample size)
- From whom do we propose to collect the information (sample population)
- To whom will the survey findings apply? (target population)
- Were the right stakeholders included in the survey design?
- Who is the primary audience for the survey findings?
- How will the survey findings be used?

3.2.2 Step 2: Select a study design

A survey is a systematic method for gathering information from a population (or from a sample) for the purpose of developing quantitative descriptions of that population. Epidemiology[2] is a foundational science of public health. Epidemiologists commonly use survey

[1] From Tomás Aragón & Arthur Reingold, *Essential Field Epidemiology*, UC Berkeley Center for Infectious Diseases & Emergency Readiness

[2] The study of the *distribution* and *determinants* of health-related states or events in specified populations, and the application of this study to the control of health problems [4].

methods to sample and collect primary data from subjects for epidemiologic studies. It may be useful to us to view a survey as part of an epidemiologic study. Epidemiologic studies can be descriptive, analytic, or both. A descriptive study measures the magnitude, extent, and variety of a problem or issue. An analytic study assesses the relationship between two or more variables. The hallmark of an analytic study is the use of comparison groups to test hypotheses.

In public health we conduct three types of epidemiology studies that can be used for descriptive or analytic purposes:

- Cross-sectional study;
- Cohort study; and
- Case-control.

In a *cross-sectional study* we collect data from the study subjects only once "at a point in time." For example, before vaccinated clients exit our influenza mass vaccination clinic, we approach them to conduct a satisfaction survey. In non-research settings, cross-sectional studies are more common because of lower costs, ease of administration (no follow up), or simpler design. For the SPIVA Toolkit we focus on cross-sectional surveys.[3]

In a *cohort study* we collect data from the study subjects more than once: (a) at baseline (possibly as part of a cross-sectional study); and (b) at a later time to assess a change in status compared to baseline. For example, among our clinic enrollees, we might compare the proportion of vaccinated clients that developed influenza-like illness (ILI) compared to the proportion unvaccinated clients that developed ILI. Cohort studies are designed to answer analytic questions. These data can be used to calculate field vaccine effectiveness. We would use a survey to collect ILI symptoms for case classification.

In a *case-control study* we compare "cases" to "controls" (noncases) to assess differences in exposure to putative causal factors. For example, in a school-based outbreak of chickenpox, we might compare the proportion of cases that were vaccinated against chickenpox to the proportion of controls that were vaccinated. Case-control studies are designed to answer analytic questions. These data can be used to calculate field vaccine effectiveness. We would use a survey to collect influenza vaccination history.

In summary, a survey is one method used by investigators to collect primary data from subjects to answer the key questions of a study. Survey data can be used to classify outcome status (case vs. noncase), and to measure other variables (e.g., demographics, behaviors, attitudes, exposures). It is useful for us to recognize that surveys—a data collection method—can be viewed through the lenses

[3] A cross-sectional survey is just a cross-sectional study that uses a survey for primary data collection.

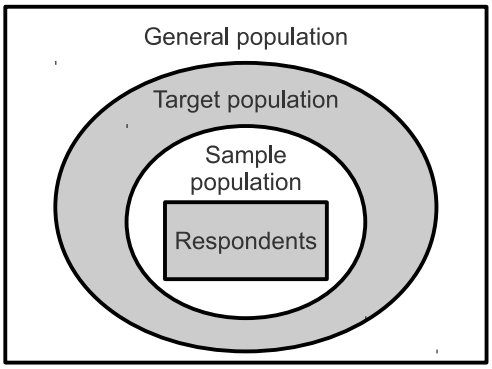

Fig. 3.1. Relationship of target population, sample population, and respondents. The frame population (not shown) is a listing of target population that will be used for selecting the sample population.

of an epidemiology study. Then we can appreciate that surveys can be used to collect data for different types of epidemiology studies (cross-sectional, cohort, and case-control).

3.2.3 Step 3: Design a sampling plan

If one of our survey goals includes using or reporting survey statistics then we need to design a sampling plan that will ensure that the survey findings accurately represents the characteristics and experiences of the population of interest. To ensure representativeness we use *probability sampling* methods. A sampling plan will consist of two parts:

1. Sampling design and sample size (design component);
2. Selection and recruitment protocol (implementation component).

The sampling design is the description of our methods to ensure that we have enough survey respondents that are representative of the population of interest. The selection and recruitment protocol are the operational instructions for implementing the sampling design.

We start by reviewing survey sampling terminology. The subjects that complete our questionnaires are called *respondents*. The respondents are the subset of the sample population that completed our survey. The *sample population* (also called the "sample") is a representative subset of the target population that was selected to complete the survey. Therefore, assuming no significant selection errors, the survey findings (from respondents) will apply to the target population. In other words, the *target population* is the inferential "target" of our survey findings. Figure 3.1 summarizes these relationships.

When we embark on a survey, the *target population* is the population of interest to which the survey findings will apply. The target population should be specified by person, place, and time. For example, male adults aged 18 years or older that lived in San Francisco in 2010. The *sample* (sample population) is the representative subset of the target population that we intend to enroll into our survey study. The *respondents* are the subset of the sample that participate on our survey. The non-respondents are those that do not participate in our survey.

Our first task in designing a sampling plan is to clearly specify the survey target population. For an influenza vaccination survey we will generally deal with the following target populations:

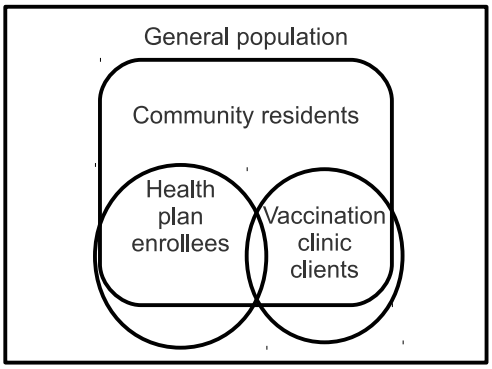

Fig. 3.2. Relationship of potential target populations for a vaccination survey

- Health plan enrollees (administrative membership);
- Vaccination clinic clients (location-based); and
- Community members (geographic or cultural connection).

These possible target populations overlap in membership and surveying them presents special challenges (see Figure 3.2). Once we have selected our target population, we need a list that enumerates this population.

Operationally, this list of the target population is called a *sampling frame* (or frame population). For example, for the health plan, the membership roster will serve as the sampling frame. *Undercoverage* occurs when current health plan members are not in the sampling frame. This can occur if the membership roster is outdated. Conversely, persons that have left the health plan but are still on the roster are actually *ineligible*. In acquiring or constructing a sampling frame, we want to minimize both undercoverage and ineligibility. While ineligible persons can always be removed from the survey study, undercoverage cannot easily be corrected after the study.

The sampling frame becomes our operational representation of the target population. In general, we do not have the staff and resources to survey everyone in the sampling frame, therefore, we must sample a representative subset (sample population). We have the following sampling approaches:

1. Simple random sampling;
2. Systematic sampling;
3. Cluster sampling; and
4. Stratified sampling.

Simple random sampling

We use *simple random sampling* (SRS) when we can (a) list everyone in the target population; and (a) randomly select a sample from that list. Figure 5 is a graphical depiction of simple random sampling.

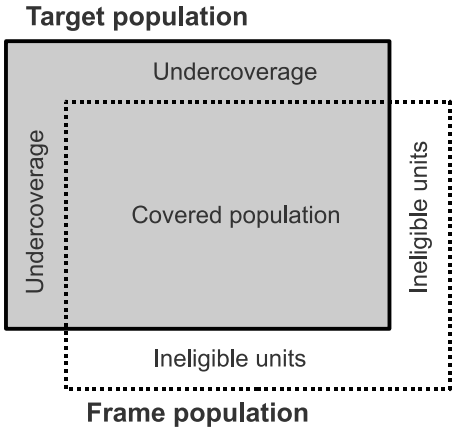

Fig. 3.3. Relationship of target population and sampling frame (frame population): undercoverage and ineligible units.

Example 3.1. Simple random sampling: Consider a pre-influenza season cross-sectional survey of our health plan enrollees (target population of 100,000) to learn who does and does not intend to receive the seasonal influenza vaccine and why. The survey findings will guide our influenza vaccination outreach and promotion. We select a 20% simple random sample (sample population of 20,000) from our enrollee list. We send the survey to this sample of 20,000 enrollees, but only 40% respond (8000 respondents). Assuming no significant sampling errors, the survey findings from our 8000 respondents will apply to our target population of 100,000 (health plan enrollees).

Systematic sampling

We use *systematic sampling* when (a) the target population is becoming eligible in real time; (b) we have access to the target population as they become eligible; and (c) we must administer the survey immediately because we only have temporary access to them. Yes, we will eventually have a complete list for simple random sampling, but by the time we have a sample it will be too late, too expensive, or infeasible to survey them at a later time. Systematic sampling can be used in venues where non-member clients are dropping in to receive one-time services and follow-up is unlikely (e.g., pandemic influenza mass vaccination clinics).

Example 3.2. Systematic sampling: Consider a pandemic influenza mass vaccination clinic cross-sectional survey to assess client satisfaction. We estimate that we will vaccinate at least 16,000 clients (estimated target population). We would like to have 1000 respondents, but will invite 2000 clients (sample population) assuming 50% refusal. Therefore, we will invite every 8th vaccinated client before

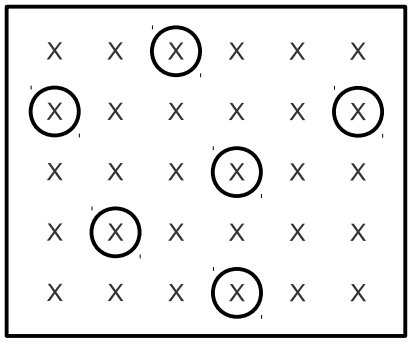

Fig. 3.4. Simple random sampling (SRS) from a sampling frame with a 20% sample. The sample population is of size 6.

they exit the clinic. To minimize bias, at the beginning of every hour we will randomly select a number between 1 and 8, and our first selection each hour will be based on that number.

Cluster sampling

We use *cluster sampling* when (a) we cannot list the target population; or if we could list them, it would be too expensive to survey a random sample (e.g., face-to-face interviews in a large geographic area); and (a) we can list identifiable "clusters" that can be sampled (e.g., clinics, schools, neighborhoods, census tracts). Because these constraints occur often, cluster sampling is common. Figure 3.5 is a graphical depiction of cluster sampling.

We have a few caveats with cluster sampling. First, because clusters sizes can differ dramatically, we want to ensure the larger clusters have a higher chance of being sampled. To do this we need to know approximate cluster sizes. Second, because people within clusters tend to be more alike, these correlated data will need to be taken into account when calculating summary statistics.[4] And third, once clusters have been selected, we can list the cluster members and then take a simple random sample within clusters.

Because cluster sampling can be complex, we recommend a statistical or epidemiological consultation. If a consultation is not available, takes good notes at each step (e.g., cluster sizes) and the statistical corrections can be made later.

Example 3.3. Cluster sampling: Consider a post-pandemic influenza winter wave, community-based, cross-sectional survey to assess influenza vaccination among children attending elementary schools (K5) in our county. We want to learn why parents did not vaccinate

[4] Within cluster correlation affects the variance of our summary statistics, but not the point estimates. Without corrections the confidence intervals will be narrower than they should be.

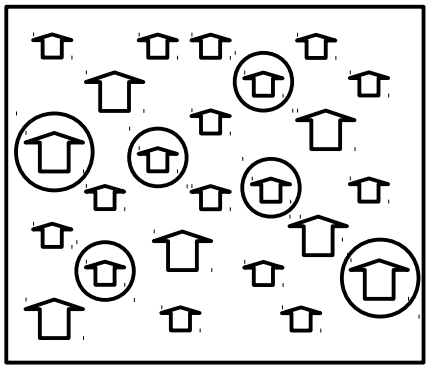

Fig. 3.5. Cluster sampling of elementary schools in a county

their children, including beliefs about the vaccine, sources of information, and barriers to vaccination. The schools cannot provide us with a student list, but we do have the list of 200 elementary schools in our county, including the numbers of students in each school. We have 21,660 students (target populations) enrolled in 68 schools (average cluster size is 320 students). We propose a multi-stage sampling plan: (a) randomly choose 30 elementary schools (clusters); (c) within each cluster, use simple random sampling to select 20 students per grade (K–5), giving us a sample population of 3600 students. We estimate that 50% of student families will respond to the survey, leaving us with about 1800 respondents (30 students per grade). Although we do not have a statistical consultant, we will document our sampling carefully so that a collaborator with statistical knowledge can make the statistical corrections later.

Stratified sampling

We use stratified sampling when (a) a sub-population of interest is small but we need reliable statistics (simple random sampling will select too few to give reliable data); and (b) we are able to list and classify the target population so that we can oversample this sub-population. This list can be of individuals or of clusters. For individuals, we will conduct stratified random sampling; i.e., simple random sampling of individuals within strata. For clusters, we will conduct stratified cluster sampling; i.e., simple random sampling of clusters within strata. This will become clear with examples.

The necessity for stratified sampling occurs commonly with ethnic minorities that often comprise a small percentage of the total population. If we were to rely on simple random sampling we would not sample a sufficient number of that sub-population, and our summary statistics of that group would be unreliable. To close ethnic health disparities, reliable data is important, so we use stratified sampling to oversample from these groups.

Fig. 3.6. Stratified random sampling: For the "ethnicity" field, we select a 20% random sample from the whites, latinos, and Asians strata; however, from the African Americans stratum we select a 50% random sample ("oversample").

Stratified sampling can be applied to any level (e.g., African American) of a categorical field (e.g., race/ethnicity). Because this issue occurs commonly, stratified sampling is common. Here is an example involving enrollees of our health plan.

Example 3.4. Stratified random sampling (of individuals): Consider a pre-influenza season cross-sectional survey of our health plan enrollees (target population of 100,000) to learn who does and does not intend to receive the seasonal influenza vaccine and why. The survey findings will guide our influenza vaccination outreach and promotion. Because of the health disparities among ethnic groups in our county, we want to make sure we get reliable data for each group, however, African American make up only 7% of our enrollees. Therefore, we decide to use stratified sampling to oversample African Americans enrollees. Here's how we do it:

1. We take our total 100,000 enrollees (target population) and divide them into four mutually exclusive ethnic groups: white (31,000), African American (7000), Latino (31,000), and Asian (31,000).
2. For for each ethnic group except African Americans, we select a 15% simple random sample (4650 per group).
3. For the African American group we select a 66.5% simple random sample (4655 per group). This oversample ensures that we have about the same number in each group.
4. The sum of these subgroup samples makes up our sample population (18,605) that we invite to complete the survey.
5. We send the survey to this sample of 18,605 enrollees, but only 40% respond (7442 respondents). Assuming no significant sampling errors, the survey findings from our 7462 respondents will apply to our target population of 100,000 (health plan enrollees).
6. Because we have oversampled African Americans, we need to adjust our combined, overall summary statistics to take into account

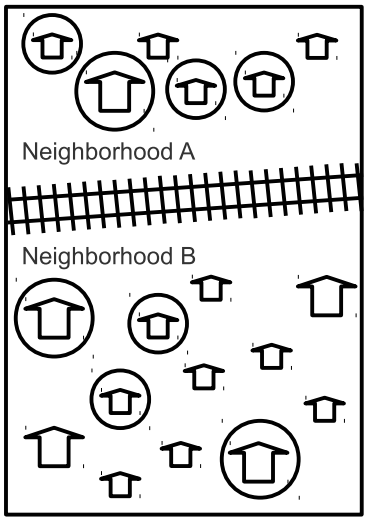

Fig. 3.7. Stratified cluster sampling of elementary schools in a community. Neighborhoods A and B are separated by railroad tracks. Neighborhood A is home to predominantly low-income ethnic minority residents. Neighborhood B is much larger and affluent. To address the ethnic disparity in pediatric vaccine uptake we oversample the schools in Neighborhood A (66%) compared to Neighborhood B (33%).

African Americans are "over-represented" in the data.[5] We keep detailed documentation of our methods so that a collaborator with statistical knowledge can make the statistical corrections later.

Now, here is an example involving clusters in a community.

Example 3.5. Stratified cluster sampling (of clusters): Consider a post-pandemic influenza winter wave, community-based, cross-sectional survey to assess influenza vaccination among children attending elementary schools (K5) in our community. We want to learn why parents did not vaccinate their children, including beliefs about the vaccine, sources of information, and barriers to vaccination. Our community is divided by railroad tracks. On one side, Neighborhood A is home to predominantly low-income ethnic minorities; in contrast, Neighborhood B is much larger and affluent. If we did standard cluster sampling, we would get too few Neighborhood A schools in our sample (and unreliable data). Therefore, we decide to sample 33% of schools from Neighborhood B and 66% from Neighborhood A (oversample). In effect, we stratified by neighborhood and then cluster sampled within strata. Although we do not have a statistical consultant, we will document our sampling carefully so that a collaborator

[5] If the findings are broken down (stratified) by ethnic group, then a statistical adjustment is not necessary; it is only necessary if we present combined, overall statistics.

with statistical knowledge can make the statistical corrections later for the combined summary statistics.

In summary, designing a sampling plan may seem complex, but most of the steps are straightforward and can be done with a calculator or spreadsheet. While it is preferable to have a consultant, this may not be feasible. It's better to forge ahead and keep good notes of the methods so that statistical adjustments or corrections can be implemented later. The sampling approaches we covered and the reasons we need them are very common. In fact, cluster, simple random, and stratified sampling are often used together under the term "multi-stage" sampling. Do not be discouraged or intimidated by the jargon!

Sample size determination

In order to improve the precision of our measurements we must have a sufficient number of respondents (sample size). The number of respondents is equal to the sample population we invite minus those that do not enroll in our survey. Therefore, in order to get enough respondents we must invite a larger sample population. Here are the necessary steps for achieving a sufficient sample size:

1. How many respondents do we need? (sample size estimate)
2. What sample population size do we attempt to recruit in order to get enough respondents?

We handle these questions in order.

Sample size estimation for a single proportion

For our purposes, we will be most interested in measuring what proportion (fraction) of a population has a characteristic of interest. For example, what proportion of a population got vaccinated? To get the sample size for a proportion we follow these steps:

1. What is the expected proportion? (e.g., 0.20)
2. What is the desired confidence level? (usually 95%)
3. What is the desired width (precision) of the confidence interval? (e.g., 0.10; i.e., 0.05 below and 0.05 above expected proportion)
4. Look up the sample size in a sample size table (see Table 3.1).

For example, for an expected proportion of 0.20 and a 95% confidence interval of width 0.10, the sample size is 246 subjects.

If the expected proportion is greater than 0.50, just use the complement. For example, if the expected proportion is 0.80, then just use $1 - 0.80$ or 0.20.

Table 3.1. Sample Size for a Descriptive Study using Proportions

Expected Proportion	Confidence Level (%)	Total width of confidence interval						
		0.10	0.15	0.20	0.25	0.30	0.35	0.40
0.10	90	98	44	-	-	-	-	-
	95	138	61	-	-	-	-	-
	99	239	106	-	-	-	-	-
0.15	90	139	62	35	22	-	-	-
	95	196	87	49	31	-	-	-
	99	339	151	85	54	-	-	-
0.20	90	174	77	44	28	19	14	-
	95	246	109	61	39	27	20	-
	99	426	189	107	68	47	35	-
0.25	90	204	91	51	33	23	17	13
	95	288	128	72	46	32	24	18
	99	499	222	125	80	55	41	31
0.30	90	229	102	57	37	25	19	14
	95	323	143	81	52	36	26	20
	99	559	249	140	89	62	46	35
0.40	90	261	116	65	42	29	21	16
	95	369	164	92	59	41	30	23
	99	639	284	160	102	71	52	40
0.50	90	272	121	68	44	30	22	17
	95	384	171	96	61	43	31	24
	99	666	296	166	107	74	54	42

Source: [5]

Sample population size estimation

The sample is the population we will recruit for the survey. The size of the sample must take into account the proportion that will not participate (non-respondents).

$$\text{Sample} = \text{Respondents} + \text{Non-respondents}$$

The number of necessary respondents was based on the sample size.

$$\text{Sample} = \text{Sample Size} + \text{Non-respondents}$$

Therefore, once we have estimated the sample size (SS), we must inflate the number to account for non-respondents (NR). To calculate the sample population (SP) we use this simple equation:

$$SP = \frac{SS}{1 - NR}$$

From our previous example (expected proportion of 0.20, 95% C.I., confidence interval width of 0.10, and sample size of 246), suppose we estimate that we will have 25% non-responders, then here is the calculation:

$$SP = \frac{246}{1 - 0.25}$$

That is, our sample population will need to be 328 in order to get a sufficient number of respondents (sample size of 246).

Recruitment protocol

The recruitment protocol contains the operational instructions for recruiting the sample population. The details of this protocol will depend on several factors including:

- How will the survey be administered? If interviewer-administered, will it be face-to-face, or over the phone? If self-administered, will it be paper-based, web-based, or other (e.g., text message-based)?
- How and how often will the sample population be contacted and invited to participate? For example, if the invitation to participate will be done by phone, how many calls will be made during day vs. evening hours, weekdays vs. weekends, etc?
- Will incentives be offered to potential respondents? If yes, how will that be handled?

Finally, the recruitment protocol will be used to train the recruiting staff, which often times are also the interviewers.

3.2.4 Step 4: Design the questionnaire

A survey is one method to collect data for a study. Developing and administering a survey instrument involves three steps:

- Design the questions;
- Design the questionnaire; and
- Design the questionnaire administration.

There are two types of questions: open-ended questions and closed-ended questions. Focus groups and key informant interviews almost exclusively use open-ended questions. In contrast, survey questionnaires will use primarily closed-ended questions.[6] In this section we focus on closed-ended questions.

Design the questions

To design survey questions we need to review and understand the following:

- Types of measurements;
- Types of survey questions;
- Question formats;
- Response scales; and
- Modes.

[6] In outbreak investigations, open-ended questions are used early in an investigation to generate research hypotheses. However, we used closed-ended questions to collect data to test hypotheses.

Types of measurements

To design survey questions we must first answer these questions:

- What are we trying to measure? (construct)
- How will we measure it? (measurement)
- How will we minimize biases?

What we are trying to measure (knowledge, attitude, belief, behavior, etc.) is called a construct. Operationally, we collect survey data to build a measurement of that construct. In surveys, we have three types of measurement data:

- Quantitative;
- Qualitative; and
- Psychometric (attitudes, beliefs, intentions, etc.).

These measurements and examples are summarized in Tables 3.2 and 3.3.

Quantitative measures are either continuous numbers (e.g., height, weight) or discrete numbers (e.g., 1, 2, 3, . . .). Qualitative measures are either unordered categories (e.g., male, female) or ordered categories (e.g., rarely, sometimes, often). Psychometric scales measure levels of personal beliefs, attitudes, opinions, agreement, etc. The Likert Scale is an ordered and symmetric psychometric scale about a neutral choice. For example, this Likert Scale measures level of agreement with a personal statement:

Q: How strongly do you disagree or agree with each statement? (circle one):

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a) I do not get the flu vaccine because I rarely get sick.	1	2	3	4	5
b) I do not get the flu vaccine because it can give you the flu.	1	2	3	4	5

In analysis, these psychometric questionnaire items can be treated as discrete numbers (1 to 5) or as ordinal categorical levels.

The Broome County Health Department "H1N1 Response—Citizen Satisfaction Survey" used many of these measurement types. Here are examples adapted from the Broome County Health Department Survey.

Quantitative measurements: Age is continuous, but it is usually collected as a discrete integer.

Q: Please enter your age [ ]

Qualitative measurements: Here are examples of nominal categorical measurements:

Q: Please select gender (choose one):

○ Male
○ Female

Q: What type of insurance do you have, if any? (choose one)

○ None
○ Private
○ Medicaid
○ Medicare

Here is an example of ordinal categorical measurement:

Table 3.2. Types of quantitative and qualitative measurements used in surveys

Measure	Examples	
	Variable	Possible values
Quantitative		
Continuous	Time Height Weight	minutes inches pounds
Discrete numbers		
Integers (. . . , -1, 0, 1, . . .)	Weight change (± lbs)	Pounds loss or gained
Counting numbers (0, 1, 2, . . .)	Age	Age in years
Qualitative		
Categorical, nominal	Case status	○ Yes ○ No
	Gender	○ Male ○ Female
	Ethnicity	○ African American ○ Asian ○ Latino ○ White
Categorical, ordinal	Annual household income	○ $< \$50,000$ ○ \$50,000–\$100,000 ○ $> \$100,000$

Table 3.3. Types of psychometric measurements used in surveys

Measure	Examples	
	Variable	Possible values
Agreement with statement (Likert item)	Statement #1 (e.g., "Influenza vaccines are not effective in preventing flu.")	1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree
Level of belief, feeling, etc.	Level of confidence (e.g., "After observing the response to the 2009 Influenza Pandemic how confident are you in your local health department's ability to respond to an emergency?")	1 = Not at all Confident 2 = Not Confident 3 = Indifferent 4 = Confident 5 = Very Confident
Change in belief, feeling, etc.	Change in perception (e.g., "After observing the response to the 2009 Influenza Pandemic my perception of my local health department's ability to respond to an emergency is . . . ")	1 = Very Weakened 2 = Weakened 3 = Remained the Same 4 = Strengthened 5 = Very Strengthened
Opinion	Rate the quality of . . .	1 = Very Poor 2 = Poor 3 = Okay 4 = Good 5 = Very Good

Q: Please indicate the range of your total household income (choose one).

- ○ $0 to $25,000
- ○ $25,001 to $45,000
- ○ $45,001 to $65,000
- ○ $65,001 to $85,000
- ○ $85,001 to $105,000
- ○ $> \$105,000$

There are two ways to collect 2-level responses. We can use a list with "check all that apply" or individually with a "yes" vs. "no" choice. For example, this question:

Q: Have you ever taken any of these influenza antiviral medications? (check all that apply)

- □ Oseltamivir
- □ Zanamivir
- □ Amantadine

is equivalent to these questions:

Q: Have you ever taken Oseltamivir?

○ Yes
○ No

Q: Have you ever taken Zanamivir?

○ Yes
○ No

Q: Have you ever taken Amantadine?

○ Yes
○ No

Psychometric measurements: Essentially, we have knowledge about facts, attitudes, intentions to act, and behaviors. The first three cannot be observed—we must query the respondent to measure these types of constructs. Attitudes and intentions are the domain of psychometric measurements. We generally will ask about one of the following:

- Belief
- Concern
- Agreement
- Awareness
- Intentions
- Confidence
- Desirability
- Satisfaction
- Acceptability
- Perception of quality

When we question a respondent, we can use an open-ended question format:

Q: What are your beliefs about vaccines causing autism?

An alternative approach is to use a closed question format with a rating scale such as the Likert questionnaire item where respondents specify their level of agreement to a statement about this belief:

Q: How strongly do you disagree or agree with this statement: Vaccines cause autism (choose one):

○ Strongly disagree
○ Disagree
○ Neither agree nor disagree
○ Agree
○ Strongly agree

Here is an example of Likert items applied to influenza vaccination services. Each Likert items can be analyzed as either ordinal categorical data or as discete numerical data (1, 2, 3, 4, 5).

Q: How strongly do you disagree or agree with each statement regarding your local health department response to the H1N1 Pandemic? (choose one: 1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree)

___ Organized a sufficient number of H1N1 vaccination clinics.
___ Kept the public informed through the media (press conferences, interviews, etc.).
___ Hosted a sufficient number of public information (town hall) sessions.
___ Educated the public about how to protect themselves and others from illness.
___ Worked with local schools and school districts.
___ Facilitated local H1N1 response efforts.

Each one of these Likert items will get a score of 1 to 5. We can create a Likert Scale by combining the results of these Likert items. This Likert Scale can range from 5 to 30.

Types of survey questions

In contrast to types of measurements, we now review types of survey questions:

- Factual;
- Socio-demographic;
- Behavioral;
- Attitudinal; and
- Intention;

Factual questions ask about things for which there is a correct answer. In theory, such information could be obtained by independent means of observation. Factual questions can be about a variety of things, such as figure-based facts (date, age, weight), events (pregnancy, marriage), and behaviors (getting vaccinated). A factual question may use quantitative or qualitative measurement types, but not psychometric.

Socio-demographic questions ask about respondent characteristics such as age, marital status, income, employment status, education, and ethnicity. A socio-demographic question may use quantitative or qualitative measurement types, but not psychometric.

Behavioral questions are used to ask respondents to report on activities they do, or have done. For example: Did you receive the "swine flu" (H1N1) vaccine last season? A behavioral question may use quantitative or qualitative measurement types, but not psychometric.

Attitudinal questions ask about respondents' opinions, judgments, emotions, and perceptions. These cannot be measured by other means; we are dependent on respondents' answers. Attitudinal questions are about psychometric constructs.

Intention questions ask respondents to indicate their intention regarding some behavior. They share features with attitudinal questions. Intention questions are about psychometric constructs; when action occurs it becomes a behavior.

Question formats

Closed question format is a survey question that provides a limited set of predefined answer categories from which respondents choose.

> Q: Has a health care provider recommended that you receive a seasonal flu vaccine this year? (select one answer only)
>
> ○ Yes
> ○ No

Open question format is a survey question requires respondents to answer questions in their own words.

> Q: What are your beliefs about vaccines causing autism?

Response scales

For a closed question, a response scale is a predefined set of possible answers. Respondents are asked to select a response from a list. Common response scale formats are rating, ranking, or frequency scale formats.

Rating response format is a response format which requires the respondent to select from an ordered list. The Likert item is a common example of a rating response format.

Ranking response format is a response format where respondents express their preferences by rank ordering a list of items.

> Q: Listed below are possible venues to receive your flu vaccine. Based on convenience to you, please enter the number 1, 2, 3, or 4 alongside each possible venue to indicate your rank ordering. 1 stands for the most convenience, 4 for the least convenience.
>
> ___ Health department mass vaccination site
> ___ Community clinic
> ___ Local pharmacy
> ___ Personal physician

Frequency scale response format is a scaled response format where respondents indicate how often they engage in a behavior. Here is one example:

Q: When I cough or sneeze I cover my mouth and nose (choose one):

- ○ Never
- ○ Occasionally
- ○ Sometimes
- ○ Often
- ○ Always

Design the questionnaire

Now that we have the questions, we must select a questionnaire mode, determine the ordering of the questions, and compose and test the questionnaire.

Select questionnaire mode

Traditionally, surveys have been of three types: mail, telephone, or face-to-face. The mailed paper survey is a self-administered questionnaire (SAQ), and the telephone and face-to-face surveys are interviewer-administered questionnaire (IAQ). Therefore, to design the questionnaire we need to answer the following questions:

- Will it be a self-administered questionnaire?
  - Questionnaire sent to respondent (e.g., mail, email)
  - Respondent sent to questionnaire (e.g., online survey)
- Will it be an interviewer-administered questionnaire?
  - Telephone (audio) interview
  - Face-to-face interview
- Will we use technological assistance?
  - Computer-assisted personal interviewing (CAPI)
  - Audio computer-assisted self-interviewing (ACASI)
  - Computer-assisted telephone interviewing (CATI)
  - Online Web surveys

We ensure that our selection is appropriate for our survey goals, target audience, and budget.

Order questions (including skip patterns)

Questions should be ordered to improve clarity, completion, and validity (minimize bias). We should use skip patterns so respondents can skip questions that are not relevant to them. However, we must ensure that the question order retains a logical flow.

Design the questionnaire administration

Up to now, we have designed the questions and questionnaire. Next, we design the operational details of how the questionnaire will be administered. Consider an interviewer-administered questionnaire:

- How will the interviewers interact with respondents?
- What are the guidelines for interviewer probing?
- What will be the degree of privacy?
- Will the interviewer use show cards?[7]
- Will the interviewer use visual aids to enhance recall?

Biases in questionnaires

Biases in using questionnaires can come from the design and implementation of the survey:

- Questions;
- Questionnaire; and
- Questionnaire administration.

Biases in survey questionnaires threaten the validity of survey findings, therefore we take great care to minimize these biases. Biases can creep into the design and implementation of the survey:

- Questions;
- Questionnaire; and
- Questionnaire administration.

In this section we focus on how to minimize bias when designing questions, questionnaires, and administration. Summarized in Tables 3.4–3.6 are the biases that can result from the design of these survey components [6, 7]. We cover selected examples here (see Exhibit 3.2 for more resources).

Biases from question design

The design of questions can be a source of bias. Summarized in Table 3.4 is a comprehensive list of biases. Selected examples are covered here.

Problems with wording: The *double-barrelled* question unintentionally contains two (or more) questions in one question. Here is an example:

> Q: Will anyone in your family receive the H1N1 or the seasonal flu vaccination?
>
> ○ Yes
> ○ No

A "yes" response has three meanings: it could mean intending to receive seasonal vaccine only, H1N1 only, or both vaccines. This question could be split into two questions, or changed to provide all possible mutually exclusive options:

[7] Listing of response alternatives

Exhibit 3.2 A Catalog of Biases in Questionnaires

by Bernard C.K. Choi, Ph.D. and Anita W.P. Pak, Ph.D.:

"Bias in questionnaires is an important issue in public health research. To collect the most accurate data from respondents, investigators must understand and be able to prevent or at least minimize bias in the design of their questionnaires. This paper identifies and categorizes 48 types of bias in questionnaires based on a review of the literature and offers an example of each type. The types are categorized according to three main sources of bias: the way a question is designed, the way the questionnaire as a whole is designed, and how the questionnaire is administered. This paper is intended to help investigators in public health understand the mechanism and dynamics of problems in questionnaire design and to provide a checklist for identifying potential bias in a questionnaire before it is administered." This open access article is freely available from http://www.cdc.gov/pcd/issues/2005/jan/04_0050.htm

Q: Will anyone in your family receive the H1N1 or the seasonal flu vaccination?

- ○ Both vaccines
- ○ Neither vaccine
- ○ Seasonal only
- ○ H1N1 only
- ○ Not Sure

Sometimes a question contains *technical jargon* that is unnecessary. For example,

Q: Within 5 days of receiving the flu vaccine did you develop any of the following (check all that apply):

- ☐ pyrexia
- ☐ myalgias
- ☐ arthralgias
- ☐ erythema at the injection site
- ☐ edema at the infection site

should be changed to:

Q: Within 5 days of receiving the flu vaccine did you develop any of the following (check all that apply):

- ☐ fever
- ☐ muscle aches
- ☐ joint aches
- ☐ redness at the injection site
- ☐ swelling at the infection site

Table 3.4. Sources of Questionnaire Bias—Question Design

Source	Bias
Problems with wording	ambiguous question
	complex question
	double-barrelled question (two questions in one)
	short question
	technical jargon
	uncommon word
	vague word
Missing or inadequate data for intended purpose	belief vs behavior[a]
	starting time
	data degradation
	insensitive measure
Faulty scale	forced choice (insufficient category)
	missing interval
	overlapping interval
	scale format
Leading questions	framing
	leading question
	mind-set
Intrusiveness	reporting (self-report response)
	sensitive question
Inconsistency	case definition
	change of scale
	change of wording
	diagnostic vogue

Source: [6]

Missing or inadequate data for intended purpose: The *belief vs behavior* bias can arise when think we are measuring one but we are actually measuring the other. This can happen when we are measuring psychometric constructs (beliefs, intent, agreement, etc.) and we mistakenly interpret that were are measuring behavior.

The *starting time* bias can occur when our question uses a time frame that we define imprecisely. For example, for a survey that is conducted during influenza season (which spans months), a question that starts with "In the past two months ..." will actually be measuring different time periods. This can be significant because the risk of influenza infection changes over time. If relevant, provide specific calendar time periods. Use a calendar as a visual and reference cue.

The *data degradation* bias occurs when we collect data based on broad categories when more precise can be collected with the same effort. For example, instead of collecting age as a categorical variable (e.g., Age 15 to 24), if we have the date of birth we can easily calculate age. Precisely collected data can always be categorized as needed; however, the reverse is not possible—we cannot retrieve the precise data from categorical data.

The exception to the preference of collecting more precise data is when we are collecting sensitive information that is better collected

in broad categories. For example, measurements of financial income are collected as categorical data.

The *insensitive measure* bias occurs when too few categories are provided as possible responses when more categories provides better discriminatory power. Consider the following question:

Q: How important is it to be vaccinated against the flu?

Option A: (Unimportant) 1—2—3 (Important)

Option B: (Unimportant) 1—2—3—4—5 (Important)

Option B provides more discriminatory power and is a more sensitive measure.

Faulty scale: The *forced choice* bias occurs when a reasonably comprehensive list of options are not provided for selection so that the respondent is "forced" to choose from a limited list. In this question from a RAND influenza vaccination survey [8], investigators include a "Don't know" option to avoid the "forced choice" bias.

> Q: Each year, the federal government recommends seasonal flu vaccine for high priority groups. Are you a member of a high priority group recommended for seasonal flu vaccine? (select one answer only)
>
> ○ Yes
> ○ No
> ○ Don't know

The *neutral scale format* includes a neutral option that can be selected. Some investigators prefer to "force" respondents to "take sides": this is accomplished by removing the neutral option. This is an intentional application of "forced choice." In this question from the RAND influenza vaccination survey [8], investigators included a neutral choice:

> Please indicate how much you agree or disagree with the following statement:
>
> Q: Being vaccinated against seasonal flu is safe. (select one answer only)
>
> ○ Strongly agree
> ○ Agree
> ○ Neutral
> ○ Disagree
> ○ Strongly disagree

Removing the "Neutral" option would have forced the respondent to select "agree" or "disagree" even though they may truly be neutral. There is no consensus on which approach is better, although this author (TJA) prefers avoiding a "forced choice" question.

Leading questions: A *framing* bias occurs when how the question is framed influences the respondent's answer. Consider these equivalent statements:

A Influenza vaccine has a 10% failure rate (1 out of 10 vaccinated persons still become sick with the flu).

B Influenza vaccine has a 90% success rate (9 out of 10 vaccinated persons do not become sick with the flu).

Even though these questions are numerically equivalent, respondents may have a preference for questions that contain "success" or an aversion for questions than contain "failure."

A *leading question* bias leads or guides a respondent to an answer.

A Did you protect your loved ones (children) by vaccinating them against the flu?

B Were your children vaccinated against the flu?

Question A clearly "leads" a respondent to a "Yes" answer. Question B is more neutral and appropriate.

Intrusiveness: A *self report* bias arises when respondents selectively suppress information for questions they may perceive an intrusive. This can be reduced by *loading* the question. For example, in the RAND influenza vaccination survey [8], investigators loaded the question about why respondents do not intend to get vaccinated against influenza.

> There are many reasons why people don't get a seasonal flu vaccine. What is the main reason you do not intend to get a seasonal flu vaccine this season? (select one answer only)
>
> ○ Don't know enough about seasonal flu
> ○ Don't need it
> ○ Others need it more than I do
> ○ Might get sick or experience side effects
> ○ Dislike needles
> ○ Don't know where to get the vaccine
> ○ There was no vaccine available when I tried to get it
> ○ I got/will get an H1N1/Swine flu vaccine instead
> ○ Flu vaccines cost too much
> ○ It takes too much time to get the vaccine
> ○ Don't believe in flu vaccines
> ○ Other, please specify

Loading the question informed respondents that others share the same reasons for not getting vaccinated. Also, notice that these responses could have been elicited in focus groups of stakeholders. Focus groups can provide possible responses that are representative of and relevant to stakeholders.

Sensitive questions are questions that ask about areas that are generally considered to be sensitive such as age, income, sexual orientation, marital status, etc. If asked early in the questionnaire, these questions may cause the respondent unease and affect the responses to the remaining questions, or cause the respondent to quit early before the primary questions are answered. The general approach is to put sensitive questions at the end of the questionnaire. If one must come early, consider loading the question.

Inconsistency: If our survey will assess influenza or influenza-like illness, then we should use an existing case definition. However, *case definitions* change over time, even during an investigation. The CDC case definition for influenza-like illness is fever ($T > 100°F$) AND cough and/or sore throat (in the absence of a known cause other than influenza). To have flexibility in changing the case definition, and to reduce possible inconsistencies, ask about each component separately.

Q: Did the patient have a fever? ($T > 100°F$)

- ○ Yes
- ○ No

Q: Did the patient have a cough?

- ○ Yes
- ○ No

Q: Did the patient have a sore throat?

- ○ Yes
- ○ No

Q: Did the patient a diagnosis *other than influenza* to explain the respiratory illness?

- ○ Yes
- ○ No

The *diagnostic vogue* bias arises when a diagnostic label for an illness changes over time, differs by geographic region, or differs by culture. When the novel influenza A (H1N1) virus was discovered to be the cause of a new influenza pandemic, its diagnostic label changed several times: "swine" flu, swine-origin influenza A (H1N1) virus, novel influenza A (H1N1) virus, etc. A diagnostic name that may be up-to-date and technically accurate may not be widely accepted by the general public.

Biases from questionnaire design

The design of questionnaires can be a source of bias. Summarized in Table 3.5 is a list of biases. Selected examples are covered here.

Table 3.5. Sources of Questionnaire Bias—Questionnaire Design

Source	Bias
Ordering of questions	unblind interviewer; affect recall
Formatting problem	horizontal response format juxtaposed scale (questionnaire format) left alignment and right alignment
Questionnaire too long	no-saying and yes-saying open question (open-ended question) response fatigue
Flawed questionnaire structure	skipping question

Source: Adapted from [6]

Ordering of questions: How questions are ordered can bias the interviewer or the interviewee. For example, in outbreak investigation surveys, questions about possible causal exposures come before any questions about illness. The illness questions are used to determine case status and we want the interviewer to be "blind" to the case status of the interviewee. Likewise, we do not want the interviewee to be dwelling on their case status when they answer the exposure questions. In other words, preceding questions can set up a context or state of mind that can, consciously or unconsciously, bias the interviewer or interviewee.

Formatting problem: As a general rule, for a single question with a selection list, avoid the *horizontal response format*, instead use vertical response formatting like this RAND influenza vaccination Likert item [8]:

> Please indicate how much you agree or disagree with the following statements:
> Q: Being vaccinated against seasonal flu is worth the time and expense (select one answer only).
>
> ○ Strongly agree
> ○ Agree
> ○ Neutral
> ○ Disagree
> ○ Strongly disagree

In self-administered questionnaires, the check boxes should be aligned to the left of the response (as above). However, in an interviewer-administered questionnaire, the check boxes should be aligned to the right:

IAQ: Have you ever been diagnosed with any of the following health problems? (select all answers that apply)

a. Diabetes ☐
b. Heart disease ☐
c. Chronic lung disease (e.g., emphysema) ☐
d. Asthma ☐
e. Immune system problems (e.g., chemotherapy, HIV) ☐
f. Kidney disease ☐
g. Sickle cell disease or hemophilia ☐
h. None of the above ☐

Questionnaire too long: Response fatigue among respondents can occur when a questionnaire is, or perceived to be, too long or too burdensome. Personal interviews can last 50 to 90 minutes; telephone interviews, 30 to 60 minutes; and self-administered questionnaires, 10 to 20 minutes. If a questionnaire is too long, respondents lose interest or stop concentrating. They may start to give invalid responses (all yes's or all no's) or they may refuse to answer any remaining questions.

Biases from questionnaire administration

Sources of bias from the administration of questionnaire are listed in Table 3.6. In general, we think about the types of biases that can occur, consciously or unconsciously, because of interviewers' or respondents' pre-existing biases, or how they perceive or react to each other, the setting, the questions, or the responses. For interviewers, they must be trained to set aside their personal biases and to conduct all interviews without bias. For respondents, we must consider how the administration can be designed to minimize responder bias. Focus groups can be a good source of ideas or to test different approaches.

3.2.5 Step 5: Pretest the survey

Usually we think of pretesting as applying only to the questionnaire. However, there are several "moving parts" to a survey study of which the questionnaire is one component. The Comparative Survey Design and Implementation (CSDI) Guidelines Initiative based at University of Michigan has published an online, freely available *Guidelines for Best Practice in Cross-Cultural Surveys* [9]. Summarized in Table 3.7 are the methods for pretesting survey components. Essentially, we need to pretest field procedures and cognitive processes.

If the survey will use recruiters and interviewers, then these staff need to be trained and evaluated. Pretesting can be an additional opportunity to evaluate the effectiveness of staff training.

Table 3.6. Sources of Questionnaire Bias—Administration of Questionnaire

Source	Bias
Interviewer not objective	interviewer
	nonblinding
Respondent's subconscious reaction	end aversion (central tendency)
	positive satisfaction (positive skew)
Respondent's conscious reaction	faking bad (hello-goodbye effect)
	faking good (social desirability)
	unacceptable disease or exposure unacceptability
	underlying cause (rumination)
Respondent's learning	learning
	hypothesis guessing
Respondent's inaccurate recall	primacy and recency
	proxy respondent (surrogate data)
	recall
	telescope
Cultural differences	cultural

Source: [6]

3.2.6 Step 6: Conduct the survey

We are now ready to conduct our survey. This involves the following steps:

- recruit and enroll subjects;
- collect data;
- process and enter data;
- analyze data; and
- interpret results

The recruitment and enrollment of subjects is a critical step because we want to minimize non-respondent bias. We want all recruiters or interviewers to use the same procedures in recruitment and enrollment. Standardization is the general rule in conducting a good survey. We want data collection to be consistent across interviewers and for all subjects.

If data has been collected on paper forms, then these need to be checked for completion, logical errors, and entered into a computer system for analysis. CDC's DOS-based Epi Info 6 gained popularity because of it's simplicity and effectiveness in linking questionnaire design, data collection, data entry, and data analysis. Although the CDC stopped supporting Epi Info 6, public health programmers in Denmark have developed a similar program called EpiData Entry and EpiData Analysis.[8]

In the analysis and interpretation of data, we must remained focused on our original study goals and objectives. We can be tempted

[8] Available from www.epidata.dk.

Table 3.7. Methods for Pretesting Survey Components

Pretesting Method	Description
Field Methods	
Field pilot study	A miniature version of the main data collection
Interviewer debriefings	Small group discussion with interviewers to talk about their experiences
Respondent debriefings	Respondents' comments on specific questions or the survey as a whole (usually collected during a field pilot study)
Behavior coding	Systematic coding of the interviewer-respondent interaction in order to identify problems that arise during the question-answer process [3]
Focus groups	Small group of people brought together to discuss specific topics in a relatively unstructured manner, led by a moderator who ensures the flow of the conversation is in the intended direction
Cognitive Methods	
Vignettes	Brief scenarios describing hypothetical situations to which respondents are asked to react in order to explore contextual influences on respondent's response formation processes
Concurrent think-aloud	Respondents' report of the thoughts they are having while answering a survey question
Retrospective think-aloud	Interview with respondents after they have completed a survey about how they came up with answers to specific questions
Expert review	Review of draft materials by experienced methodologists, analysts, or translators
Miscellaneous Methods	
Question Appraisal System	A systematic appraisal of survey questions that allows the user to identify potential problems in the wording or structure of the questions that may lead to difficulties in question administration, miscommunication, or other failings.
Usability Testing	Testing of the functionalities of CAPI, CATI, sample management systems or printed materials such as respondent and interviewer booklet, show cards, etc.

Source: [9]

to pursue new and interesting questions at the expense of the original goals. This will delay disseminating or publishing our findings and may reduce the effectiveness of our study findings.

3.2.7 Step 7: Communicate findings

Once the survey data analysis is completed and the results have been interpreted and discussed internally, it is useful to present the findings to a live audience to get immediate feedback and questions. This feedback can be incorporated into written forms of communication.

Exhibit 3.3 Organization of a scientific publication

- Introduction
  - What is the problem and why is it important?
  - What is known and unknown about this problem? (previous findings and research)
  - What are the problems with the previous research?
  - How did we fix these problems and what is the purpose of this study?
- Methods
  - Study and survey design (cross-sectional, cohort, case-control)
  - Subject selection
    - Sampling design (target, sample, respondents)
    - Recruitment and retention plans
  - Measurements
    - Constructs
    - Key questions
  - Statistical issues (e.g., sample size)
- Results: Concise description of key findings that correspond to order of tables and figures
- Discussion
  - Key findings: What did the study find?
  - Interpretation: What do the results mean and how strongly do you believe the results?
  - Prior agreements/disagreements: How do the results compare with prior knowledge?
  - Strengths: What were the strengths of the study?
  - Limitations: What were the limitations of the study?
  - Implications: What are the scientific/clinical implications of the study?
  - Next steps: What are the next steps?
  - Conclusions

In choosing the medium to communicate finding we ask these questions:

- Who is the audience?
- What are the goals for this audience?
- What are the overall survey goals?

The audience will come from the list of stakeholders that have already been identified. What goals do we have with a particular audience. Is it part of a disease control campaign? How does this

audience like to receive information? Do we need to include or involve community opinion leaders (e.g., religious leaders)? What stake do the stakeholders have in the results, and do you need to manage expectations?

To communicate findings, we usually use one of the following media:

- News release
- Newsletter or Bulletin
- Web page
- Interim or final report
- Manuscript for peer-reviewed article

Regardless of medium, results should be accurate, focused, timely, relevant, and concise. We avoid technical jargon and use plain language that is easy to understand.

One common error is to attempt to include too many results in one publication. This can delay your publication and also confuse your message by having too many findings. We believe it is more effective to break up your findings and to prepare several publications.

While only a minority of survey study findings will go on to be submitted for peer-review publication, we find it useful to review how findings would be organized and presented to a scientific audience. Exhibit 3.3 summarizes key questions and sections for a scientific publication. Even if we are not publishing an article, we can use this outline to improve our communication effectiveness.

3.3 Managing Personnel and Resources

Most local health departments have few resources to spare in terms of time, money, and personnel. Many rely on a range of volunteers and private entities to administer their seasonal flu campaigns. It is understandable why health departments are wary of attempting to conduct additional activities such as surveys and assessments.

Health department staff should keep in mind that there are a range of organizations that support the everyday public health infrastructure and provide surge capacity during emergencies. Relationships with those entities should be developed to combine public health workforce and community members' efforts to increase overall public health preparedness. Appendix D is a generic Job Action Sheet for a clinic survey worker.

This toolkit highlights five types of external partner organizations that can assist in conducting surveys or assessments, as well as support the functional implementation of vaccination programs.

1. Community Emergency Response Teams (CERT)

2. Medical Reserve Corps (MRC)
3. Student Volunteers (public health, nursing, or medical school)
4. Community-Based Organizations (faith-based organizations, neighborhood groups, advocacy groups, cultural organizations)
5. Community outreach workers / *promotores*

Community Emergency Response Teams (CERT)

Originally developed in 1985 by the Los Angeles City Fire Department, the concept of training civilian volunteers to help respond to disasters has taken hold in 28 states. Developing and training CERT teams has been supported nationally by the Federal Emergency Management Agency (FEMA) and the Emergency Management Institute (EMI) since 1993. Most CERT teams operate in conjunction with their state and/or local emergency management agencies and can provide a range of trained and eager volunteers to help support public health functions. More information about how to contact a CERT team in your area, as well as resources to help start a team can be found at `http://www.citizencorps.gov/cert/`. (See Exhibit 3.4)

Medical Reserve Corps (MRC)

The MRC was established in 2002 with the mission "to improve the health and safety of communities across the country by organizing and utilizing public health, medical and other volunteers." MRC is made up of medical and public health professionals and is composed of community-based organizations that function to coordinate these volunteers. The program is run nationally through the Office of the Surgeon General. More information about how to contact an MRC in your area, as well as resources to help start a unit can be found at the following Web site: `http://www.medicalreservecorps.gov/` (See Exhibit 3.5)

Student Volunteers

Many cities and towns across the United States are home to medical schools, nursing schools, and schools of public health. These educational institutions can provide a steady stream of well-trained volunteers with a variety of specialties ranging from clinical to behavioral health to epidemiology expertise.

Community-Based Organizations (CBO)

There exists a plethora of community and faith-based organizations in most communities. Some may be chapters of a national organization (such as the Red Cross) and others may be unique to their specific community. Engaging these groups in public health initiatives

Exhibit 3.4 Public Health Community Emergency Response Training Modules

The Center for Infectious Diseases & Emergency Readiness at the UC Berkeley School of Public Health has developed a series of in-depth CERT training modules that can be found here: http://cert.idready.org/ (Username: cidercert, Password: Community). The Public Health Community Emergency Response Training (PH-CERT) Curriculum is designed for emergency response teams such as CERTs, MRCs and ARC volunteers who may be a critical resource in a variety of responses to public health related events. These groups may employ community mitigation strategies such as basic home care for infectious individuals, use of personal protective equipment, and appropriate actions to deal with infectious disease and environmental threats before, during, and after emergencies and disasters that have public health implication. The PH-CERT Curriculum is a critical tool that bridges the gap between currently available trainings. It can be used as a just-in-time training tool or as standard training for community level volunteers with some preparedness and response training.

Also, the NACCHO Advanced Practice Center toolkit "CERT - Pandemic H1N1 Influenza—Train-the-Trainer" developed by the Santa Clara Public Health Department can be found at the following Web site: http://www.naccho.org/toolbox/tool.cfm?id=1779

can often increase community participation and buy-in, particularly if public health practitioners make an effort to reach underserved or at-risk populations through these types of organizations. By engaging trusted community leaders in the planning process one can expect to improve participation in a range of public health interventions.

Community Outreach Workers / Promotores

Community outreach workers (*promotores*, in Spanish) are increasingly being incorporated into LHD educational and outreach teams. Their particular job functions and topical expertise vary depending on the LHD program to which they are assigned. However, their professional experience with specific pockets of communities and neighborhoods, their personal experiences and familiarity with lifestyles and cultural aspects of ethnic communities, and their practical orientation to accessing and engaging community residents make positive and time-saving contributions to community assessments and surveys. There are statewide and local networks of outreach workers. By contacting local community-based organizations and involving LHD

Exhibit 3.5 Medical Reserve Corps: Applied Practice Example

In August 2009, the Rhode Island State Health Department requested RI MRC involvement in the planning of their fall vaccination campaign. The RI MRC was tasked with developing and implementing an H1N1 training and competency course for their volunteers; recruiting and managing the volunteer staff and logistics for each clinic; providing medical control at each clinic with the use of a site supervisor (a licensed medical professional); and operating within the state health department's Emergency Operations Center (EOC) during each clinic. As a result of this effort... 275 RI MRC volunteers vaccinated 122,000 students for an approximate 73% uptake rate... The school vaccination clinics proved to be a strong indicator of the successful partnership between the RI MRC unit, DMAT, and the Rhode Island State Health Department. With pre-established roles, responsibilities, and structure—the clinics ran smoothly and successfully.

Chester, Becky. Rhode Island Medical Reserve Corps Unit Vaccinates 122,000 Students. NACCHO Preparedness Brief. January 2010. Available Online: http://www.naccho.org/topics/emergency/AHPIP/preparednessbrief.cfm

MRC's efforts were an integral part of Rhode Island achieving the highest overall H1N1 vaccination rate, 38.8%, in the country. In addition, Rhode Island led the country in vaccinating children and high-risk individuals. Nearly 85% (84.7%) of children were vaccinated compared to the national average of 36.8%. Almost 58% (57.5%) of people in high-risk groups were vaccinated compared to the national average of 33.2%. (Rhode Island Department of Health, 2010)

Rhode Island Department of Health. Governor, Dept of Health Celebrate Rhode Island's Top-Ranking H1N1 Vaccination Effort. Press Release, April 14, 2010. Available Online: http://www.ri.gov/press/view/11214

staff assigned to outreach work that can facilitate the participation of outreach workers/*promotores* in a LHD-sponsored community assessment, one is likely to tap into this community-oriented resource.

Exhibit 3.6 Student Volunteers: Applied Practice Example

The North Carolina Center for Public Health Preparedness, housed within the University of North Carolina Gillings School of Global Public Health has developed an excellent example of how public health graduate students can be utilized for a variety of functions through their "Team Epi-Aid" program. Through this program students have provided assistance to local and state public health entities in the areas of epidemiology, disease outbreak investigations, surveillance, rapid needs assessments following emergencies, and community health assessments and surveys. More information about Team Epi-Aid can be found here: http://nccphp.sph.unc.edu/teamepiaid/index.htm