# Chapter 3
# Sampling

Conducting monitoring often requires collection of data from a sub-set of the population in which you are interested. Taking that sub-set is known as sampling. This chapter explains how to carry out sampling effectively.

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WRAP helps individuals, businesses and local authorities to reduce waste and recycle more, making better use of resources and helping to tackle climate change.

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# Contents

# Sampling

## 3.1 Introduction

This chapter explains the basics of sampling including why we sample, how to decide your sample size and how to make sure the sample is representative. It also helps you to be clear about your target area, and how you can select and profile your target population.

**Whether you're conducting waste analysis, a questionnaire survey, or participation monitoring, it is essential that the sample is representative.**

Sampling is not a particularly complex task but your ability to make valid statements about your results depends on a good understanding of sampling. In particular, you will want to be able to state what the results obtained from your sample say about the wider population from which the sample was drawn. The intention of this chapter is to help you to do this.

Section 3.2 below looks at definitions and outlines the sampling process. Section 3.3 looks at the target population, as well as profiling, and leads into sample selection in Section 3.4. Section 3.5 provides information about sample size and Section 3.6 considers sampling frames. Recommended approaches to sampling are described in Section 3.7, with more detailed information including sources of error and weighting in Sections 3.8 to 3.11.

## 3.2 What is sampling and why do we need it?

If you cannot monitor everyone in your target area, or everyone who uses a particular facility because the numbers are too great, you will need to take a **sample**. A sample is used because it is generally cheaper, quicker and more feasible than monitoring the whole population/users of a scheme or facility.

The **target population** is the population that you are interested in. It may be all the households in your local authority or partnership area, or it may be all the households in a 'hard to reach' population, or it may be 'low to medium recyclers', or it may be all the households living within a particular waste collection round. In this document we refer to it as the 'target population' to be clear that this can be different from the 'general population' of your area. The target population may not necessarily be people or households (it could, for example, be all the household waste recycling centres in a county), but it usually is.

**"Sampling ... enables you to make reliable generalisations about the whole target population ... [The representative sample] must mirror the target's profile."**

The **target area** is the geographical area in which your target population is located.

**Sampling** is the process of identifying a sub-set of your target population that enables you to make reliable generalisations about the whole target population. In order to be reliable, the sample must be **representative**. It must mirror the profile of the target population. It is also important to be aware that the size of the sample will affect how confident you can be that the results you obtain are reflective of the target population. Table 3.1 summarises the steps in the sampling process.

**Table 3.1** Summary of steps in the sampling process

| Steps in sampling process | Recommendation |
|---|---|
| 1. Define (profile) your target population – decide which factors are important. | If households, use socio-demographics such as ACORN or MOSAIC.<br>See Section 3.3. |
| 2. Decide how to obtain a sample that is reflective of this profile (your sampling strategy). | See the table in Section 3.4. |
| 3. Decide how precise you want the results to be – the required sample size will depend on this. | For participation monitoring and questionnaire surveys, 3% precision is sufficient – so you will need a sample of at least 1100. See Section 3.5. |
| 4. Design your monitoring in a way which reduces bias. | Good monitoring design and training can reduce bias. See Section 3.7. |
| 5. Do your monitoring and collect the data. | See the chapters on waste analysis, surveys or participation monitoring for guidance on the monitoring methods. |
| 6. Weight your data to match your target population if necessary. | Weighting is not ideal but may be necessary. See Section 3.9. |

## 3.3 The target population

First you need to identify your target population and then describe it.

If you are investigating a household waste recycling centre (HWRC), then your target population might be all those people in the catchment area of that HWRC. Alternatively your target population might be households in a low performing area made up of several collection rounds.

It is important to have a good knowledge of the target population from which the sample is to be taken. You should decide which characteristics of the target population are likely to have most influence on the topic you are investigating. If, for example, you are investigating HWRC usage you may decide that car ownership is likely to play a role. Your sample should include car owners and non-car owners in the same proportion as they exist in the target population. If you are investigating food waste, you might decide that household size is a key factor. You need know the household size profile of your target population to ensure that the sample you have chosen (and the results obtained) is representative by household size. Demographic profiling can be used to ensure that the sample is representative of the target population, as described below.

**Profiling** is the process of describing the target population from which your sample will be drawn. How you decide to profile your target population will depend on which factors you have decided are important to your study.

Ideally a demographic profiling tool such as ACORN, MOSAIC or GIS-based census data should be used for profiling, but these can be cash or resource intensive. However, these profiling tools may already be available within your authority.

These types of profiles provide useful insights about your population, giving detailed socio-demographic information for categories such as age, gender, social grade, ethnicity, employment status, income levels, housing type and tenure. This provides a good basis for defining some key characteristics of your target population, which you can then take into account when selecting your sample.

In the absence of a demographic profiling tool, sample selection by means of housing type or council tax banding may provide a viable compromise. Ideally, you would look to combine these measures with other factors such as ethnicity, tenure or social grade, but this may not always be practical.

## 3.4 How do I select my sample?

There is a range of techniques that can be used for selecting a sample of your target population. These are described in Section 3.7.

Any sample that you choose to select must fulfil two criteria:

1. The sample must be made up of households or people with an overall profile (social/demographic) that matches your target population. This is what we call a **representative** sample. The results from observing or speaking to a sample of your target population can be generalised to that population, provided the sample is representative.
2. The sample must be of a sufficient size that you can be confident the results you obtain for the sample will enable them to be generalised to the target population (see Section 3.5).

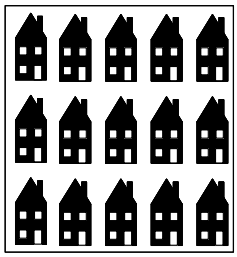
If the sample chosen is not representative of your target population with respect to a key factor of relevance to the topic you are monitoring, you run the risk of biasing the results. For example, if your sample has a higher proportion of retired households than is found in the target population, the results will be biased as the retired population may hold different views to those of the other members of the target population. Figure 3.1 illustrates what is meant by a representative sample.

**TOP TIP**

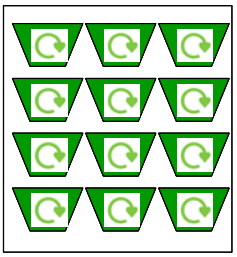
**Profiling**
For most types of monitoring, if you give your street list to the providers of the social classification data, they will be able to profile this for you. Otherwise you can do it yourself using web-based resources such as 'Up My Street'. If you are using a contractor to undertake monitoring work, you must be very clear about whether or not you require profiling as part of the work they are contracted to do for you.

**Figure 3.1** Representative samples

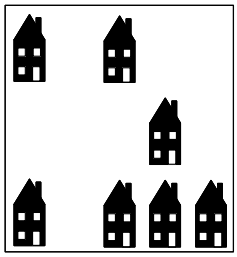
**Population is uniform**



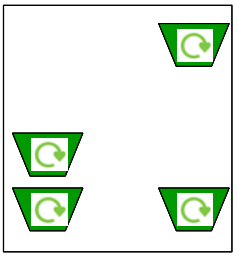
Population
All households in the local authority



Population
All kerbside boxes in the local authority

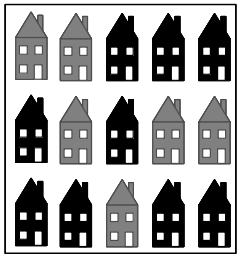


Sample of households in the local authority

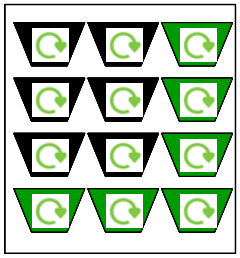


Sample of kerbside boxes

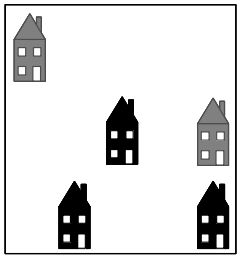
**Population is mixed**



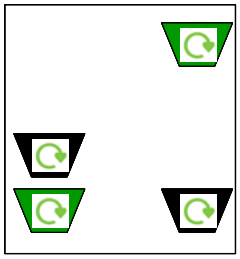
Population
All households in the local authority
40% grey; 60% black



Population
All kerbside boxes in the local authority
50% green; 50% black



*Representative* sample of households
40% grey; 60% black



*Representative* sample
50% green; 50% black

## 3.5 What size should my sample be?

In Section 3.4 above we discussed the importance of constructing a sample that is representative of your target population. We now explain how to manage the degree of error in your results, known as sampling error.

Because you haven't monitored the entire target population, there will always be a degree of error associated with your results (this is known as 'sampling error'). This sampling error, or the difference between the result you would have obtained had you monitored everyone and your sample result, reduces as the sample size increases, but not in a linear way (see Table 3.2). For example, to reduce the error by half you would have to quadruple the size of the sample. In practical terms this means that you have to find a sensible balance between the sampling error you are happy to accept and the costs of increasing the sample size.

**Precision** or confidence interval refers to how close your sample result might be to the true population result (i.e. the result you would have got had you monitored everyone in your target population). The confidence interval is determined by the sample size. The confidence interval is often presented as '+/- x%' or 'x% - y%' around the sample result. To increase the precision (narrow the confidence interval), you would have to increase the sample size. For waste-related monitoring, +/- 3% is usually adequate.

Confidence intervals are calculated and reported using a known probability level. It is normally acceptable to be 95% confident in your results. This means that you can be confident that if you carried out the monitoring 20 times, on 19 occasions the confidence interval you have calculated from your sample result will contain the result that you would have got had you monitored everyone.

Using confidence intervals means that you can say things like: "The results from my sample of 1100 people showed that 50% claimed to recycle. I am 95% confident that the actual percentage of people in my authority claiming to recycle falls between 47% and 53%." There is still a 1 in 20 chance that the real result is outside this range, but that is an acceptably low probability.

For questionnaire surveys and participation rate monitoring, WRAP recommends that you should aim for 1100 completed questionnaires or households monitored. This figure needs to allow for rejected questionnaires, and so you will need to collect more data in order to achieve this. If you monitor less than 1100, there is a noticeable increase in sampling error (as shown in Table 3.2). On the other hand, as the sample size climbs above 1100 there is a diminishing return in the reduction in error, and a big increase in cost. This is why WRAP recommends a sample size of 1100 if any generalisations to the wider population are to be made from the results.

Table 3.2 shows the sample sizes you will need to be 95% confident of your results for set levels of precision.

**CASE STUDY**

**Staffordshire Moorlands: sampling for participation monitoring**

A six-week pre-campaign participation survey was undertaken in the town of Cheadle. A total of 1432 households were monitored to allow for a minimum 1100 final sample.

The survey area was selected as it provided the closest representation of the demographics of the district: 41% detached, 38% semi detached, 17% terraced, 4% flats.

For more information, see the full case study in Annex 1.

**Table 3.2** Sample sizes and associated levels of precision

| Level of precision required | Minimum sample size (rounded up) | If the result for your sample is 50%, you can say that the result for the target population is between: |
|---|---|---|
| +/- 1% | 8800 | 49% and 51% |
| +/- 2% | 2300 | 48% and 52% |
| +/- 3% | 1100 | 47% and 53% |
| +/- 4% | 600 | 46% and 54% |
| +/- 5% | 400 | 45% and 55% |
| +/- 6% | 300 | 44% and 56% |
| +/- 7% | 200 | 43% and 57% |
| +/- 8% | 150 | 42% and 58% |
| +/- 9% | 120 | 41% and 59% |
| +-/ 10% | 100 | 40% and 60% |

Table 3.2 shows that the larger the sample you use the more reliable your results are. This means that your level of precision (or confidence interval) will be narrower.

**WRAP recommends a sample of 1100 for each target population for questionnaire surveys and participation monitoring.**

A sample of around 1100 gives a margin of error of +/- 3% almost regardless of the size of the population (this makes a difference only on small populations). So if area A has a population of 100,000 and area B has a population of 200,000, then sample B does not need to be twice the size of sample A. It is the size of the sample that matters.

As long as the sampling is carried out correctly, excellent results can be derived from relatively small sample sizes compared with the target population.

Sample sizes smaller than 1100 are viable but you need to be aware that the results become less precise as the sample size gets smaller. If you are considering a sample size less than 1100, you should think carefully and consider what level of precision is acceptable to you. For developing a waste strategy, having a range of 10 percentage points in your results may be fine but, if you are redesigning your service or scheme and making large investments, you may want to be more certain by increasing the precision.

**Examples**

**"As long as sampling is carried out correctly, excellent results can be derived from relatively small sample sizes."**

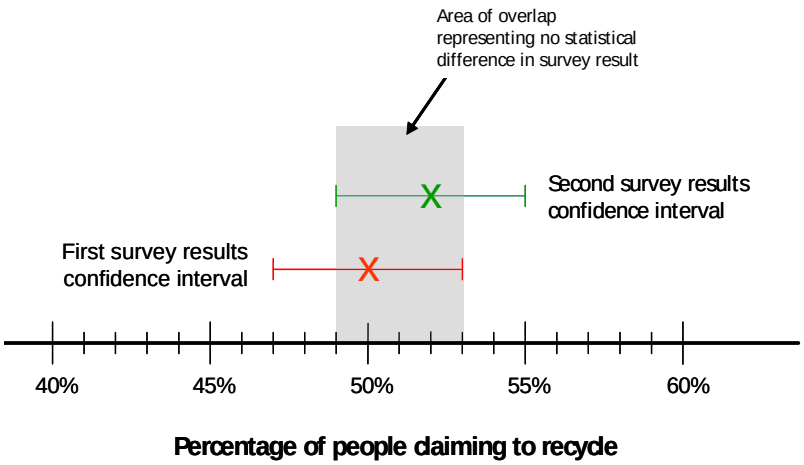
"My local authority wants to introduce new containers for both kerbside and residual waste. The success of the scheme is very dependent on whether people accept the new containers. I want to be as sure as I can be that the survey I plan to do gives me precise answers. The difference between whether 50% say they like them and 55% is crucial – I want to know within 2% either way. This means I need to survey a minimum of 2300 people."

"My local authority is developing a new waste strategy and one of the key issues is whether we spend money on improving our civic amenity site. We are pretty sure that we want to do this anyway, so what people

say is useful but not crucial to our decision. So long as I know within 5% either way, I'm happy. This means I need to survey only 400 people."

The confidence interval is not always reported in results as it tends to complicate the message, but you shouldn't forget that it is there. It is particularly relevant if you are trying to show differences between areas or over time (e.g. pre- and post-campaign monitoring). If you didn't know about sampling error or confidence intervals, you might be tempted to assume that there was a real increase in an area if the number of people claiming to recycle changed from 50% to 52%. But in fact you know that if 1100 people were surveyed each time, then the range for the actual recycling rate would be 47% to 53% for the first survey, and 49% to 55% for the second survey (see Figure 3.2); so in fact the rate may not have increased between the two surveys.

**Figure 3.2** Example of comparative results with confidence intervals




**DEFINITION**

**Sampling error**
Because you haven't monitored the entire target population, there will always be a degree of error associated with your results (this is known as 'sampling error').

Sampling error is the difference between your sample result and the result you would have obtained had you surveyed everyone.

## 3.6 Sampling frames

For surveys where people can choose whether to participate or not, you will have to try to contact more people than your required final sample size. For instance, you may have to knock on 4000 doors to achieve 1100 face-to-face interviews. The expected response rate for your survey will indicate how many people you might need to contact. The response rate depends on the type of survey and how it is presented. Likely response rates for surveys are given in the relevant sections of Chapter 4.

The larger number of people that your final sample (e.g. 4000) will come from is known as the **sampling frame**. This should be representative of your target area and should be selected using your chosen sampling approach (see Section 3.7 below).

The equation below shows how to calculate the size of your sampling frame for a survey of 1100 households and a predicted contact rate of 30%.

$$\text{Sampling frame} = \frac{\text{Required sample size}}{\text{Predicted contact rate}} = \frac{1100}{0.3} = 3667 \text{ households}$$

## 3.7 Recommended approaches to sampling

This section outlines some strategies for selecting representative samples. Care should be taken to ensure the most appropriate technique is used. Table 3.3

gives recommended sampling approaches for different monitoring methods. The different sampling methods are then discussed in turn below.

**Table 3.3** Recommended sampling approaches for different monitoring methods

| Type of monitoring | Recommended sampling approach |
|---|---|
| Participation monitoring | Round-based sampling |
| Waste analysis | Cluster sampling<br>Stratified random sampling |
| Face-to-face survey at the doorstep | Cluster sampling |
| Face-to-face survey on-street | Quota sampling |
| Citizens' panel survey | Stratified random sampling* |
| Postal survey | Simple or stratified random sampling |
| Telephone survey | Stratified random sampling<br>Quota sampling |
| Web-based survey | Stratified random sampling<br>(if data allows) |

* The citizens' panel may have been recruited to be representative of the residents in the authority area but this should be checked. If your target area differs from your authority area, then the results from the survey will be representative of the panel and not your target area.

### *3.7.1 Round-based sampling*

For participation monitoring, the only realistic option is to base your sample on a selection of collection rounds that are representative of your target area. This is because operational realities make it impractical to attempt to monitor random households or even clusters of households. An additional advantage of using round-based monitoring is that it is very easy to combine participation data with round tonnages to draw out more information. See Chapter 6 for more explanation.

### *3.7.2 Cluster sampling*

Where questionnaire surveys require household visits, any form of random sampling will be very expensive. To overcome this problem, groups of households or small areas known as clusters may be selected. A balance has to be struck between cost and making the clusters as small as possible. The smaller they are the more expensive they are to survey. Conversely, the smaller they are the nearer the sample is to being random – and therefore more representative.

After deciding on the design of the sample, for example representativeness by ACORN, geographical clusters are randomly selected that will produce the correct profile in the sample. This method is often essential for face-to-face interviewing because it reduces travel time for staff. However, those respondents living close to each other may have broadly similar views, patterns of behaviour or other influencing characteristics, so a larger sample may be needed to get the full range of responses and views. Assessing the socio-demographics of the areas chosen will help you decide this.

For larger areas, such as a whole country, randomly selected clusters would be very spread out, making the survey expensive. In this case a multi-level approach known as multi-stage cluster sampling can be used, where the target area is broken down into convenient units such as counties or regions. A number of these units will then be selected to represent the target area and clusters randomly selected within only the selected units.

Cluster sampling is best suited to:

- face-to-face surveys where the clusters of residents may be on estates, or ethnic groups in small geographical clusters; and
- waste analysis where streets are selected by demographic profile (each street is a cluster). If households are selected at random on those streets this will be stratified random sampling (see Section 3.7.4).

### *3.7.3 Quota sampling*

This method is frequently used in market research to obtain a representative sample. It involves interviewers finding respondents with certain characteristics, usually related to demographic or socio-economic variables (e.g. age, sex or socio-economic group). The quota will match the characteristics of the population being investigated. For example, you may want a quota that matches the sample's age profile with the age profile of those living within your local authority area.

**"... investment in monitoring is likely to be paid back many times over if it means that schemes are made more effective"**

One of the drawbacks with this approach is that it encourages interviewers to 'seek out' particular types of people. This means that interviewer bias may be a problem (see Section 3.8), as interviewers may unknowingly approach certain types of people more than others. If you have set a gender quota, for example, you may end up with an untypical proportion of young mothers and retired men, while still keeping to the gender quota. On the other hand, building too many factors into quota sampling may make it extremely difficult to find people to interview that fit particular combinations of characteristics, and may make the survey process unwieldy for the interviewer. The practicalities of quota sampling are outlined in Chapter 4.

Quota sampling is best suited to:

- face-to-face surveys in public places where each interviewer has a quota to meet and can visually identify the characteristics of respondents that fit the quota; and
- telephone surveys where the characteristics of the respondent are unknown before the call is made.

### *3.7.4 Stratified random sampling*

This method divides the population up into a number of groups (or 'strata') based on specific characteristics of the population relevant to the subject of the investigation. This ensures that small groups of people with particular characteristics don't get missed out by chance. Possible characteristics for the strata might be age, housing type, household size and ethnicity, but would depend on the topic of interest. Random sampling then takes place within each of the strata.

Generally, the number of people selected from each stratum should be proportional to the number of people with that characteristic in the population.

For example, in stratified random sampling based on housing type, if 20% of the population lives in flats, 20% of the achieved sample should also live in flats.

Sometimes you may want to over-sample a particular group in a population. This is normally the case when the group is small and you definitely want to be able to say something about it.

Stratified random sampling is best suited to:

- postal and telephone surveys where you know in advance the characteristics of the population, you have a list that shows those characteristics for each member of the population, and can select a random sample of households which have the required characteristics.

### *3.7.5 Simple random sampling*

The above shows that there is a variety of approaches to selecting your sample. The most seemingly straightforward method of sampling is known as **simple random sampling**, in which units of the target population are selected entirely at random and each has an equal chance of being selected. However, a problem in simple random sampling is that certain small groups of people with particular characteristics can be missed.

In practice this method is difficult to carry out other than for postal or telephone surveys. This is because the households would be geographically dispersed across your target area; for example you might have to monitor only 1 in 12 households. In practice it is far more cost-effective to work with clusters of households, which might be recycling rounds for participation monitoring, or streets (or groups of streets) for questionnaire surveys and waste analysis.

Simple random sampling is best suited to:

- postal surveys where you don't need to over-sample a particular group.

## 3.8 Important types of design error to be aware of

You should also bear in mind that there are errors other than sampling error that have an effect on the reliability of your results. These errors can often be more significant than sampling error. They are not normally measurable so are not reflected in the calculation of the confidence interval. They need to be controlled through good project planning, quality control and staff training.

### *3.8.1 Time and location*

When selecting your sample, also bear in mind the effect that time of day and location will have on the results (this is relevant to questionnaire surveys, both door-to-door and on site, but not relevant to participation monitoring or waste analysis). You may unwittingly select a predominance of retired or home-working people by conducting your survey during working hours. If conducting a survey in a public place, bear in mind that the location may only be used by a section of the population or may be frequented by visitors (e.g. shoppers from outside the area), which can complicate selection.

### 3.8.2 Response bias

The people who actually respond to a survey may not be representative of your target population profile, as certain types of people might be more inclined to participate. This can affect representativeness, and so it is necessary to check that your final sample is representative of your target population and make adjustments to your survey if it is not.

### 3.8.3 Respondent error and respondent fatigue

Survey respondents may not recall accurately or may over-report positive responses, particularly where they know that they should be exhibiting a desired behaviour, such as recycling. This can be overcome by including checking questions that can verify respondents' answers. It is very difficult to measure the degree of respondent error.

It is also quite commonly the case that questionnaires can become over-loaded with questions and boring for respondents. Once response fatigue (boredom) sets in, respondents tend to give patterned, incomplete or ill-considered responses. Control of questionnaire length, good interviewing technique and imaginative questionnaire design can help to overcome respondent fatigue.

### 3.8.4 Data collection error

Poorly worded questions (ambiguous wording), poor interviewing techniques and flaws in the way questionnaire surveys are carried out can also contribute to data collection errors. These are not normally measurable so the effect goes unrecorded. Where possible, you should pilot the survey in advance with a small group of people to test the questions and make modifications before going 'live'.

For participation monitoring, data collection errors are more likely to be recording errors by the monitor. Having standardised recording methods and using well-trained monitors should minimise errors. Also, using the same monitors for each stage of monitoring will mean that the rate of error is likely to be consistent.

For waste analysis and capture rate monitoring, errors could come about from poorly calibrated equipment, mixing different sources of material, poorly trained staff and recording errors by staff. Good quality control should ensure that these types of errors are minimised.

### 3.8.5 Data processing error

Errors in the coding of open-ended questions in questionnaire surveys and data entry mistakes are the most common sources of data processing errors. A 10% quality check of data entry should always be carried out (see Chapter 4).

For waste analysis where small data entry errors can make a large difference in the results (such as the difference between 12.34kg and 123.4kg), **all** data entry should be quality checked.

### 3.8.6 Other non-sampling error

Other errors may occur when listings of the population are incomplete. For telephone interviews, some people may not have a listed telephone number or may not have a landline, and so it is not possible to include these people in the

survey. This will cause problems with the results if the views of these people are different from the rest of the survey participants.

## 3.9 What should I do if I don't end up with a representative sample?

If, when you come to look at the results, the sample has characteristics that aren't proportional to the characteristics of the population, you may need to make adjustments to the results through a process known as 'weighting'. This would apply, for example, if you set out to achieve a sample in which 30% were flat-dwellers but ended up with only 25% because they were difficult to find. In this case weighting can be used to adjust the results from the data analysis so that the overall results can be generalised to the target population profile. Follow the example below to see how this can be applied.

**Example of weighting**
Your survey produces a result that 28% of people claim to recycle regularly. But when broken down by gender it transpires that there is a difference, with 20% of men claiming to be recycling regularly compared with 40% of women. Your survey has obtained a sample of 1100 people in which 60% are male, but the authority as a whole has only 50% males. This means that the men are having a disproportionate effect on the results.

The first stage is to calculate the weighting factor:

Divide the male percentage in the target area by the achieved percentage, i.e. 50/60 = 83%.

Divide the female percentage in target area by the achieved percentage, i.e. 50/40 = 125%.

| | % in sample | % in target area | Weighting % |
|---|---|---|---|
| Male | 60 | 50 | 83 |
| Female | 40 | 50 | 125 |
| Total | 100 | 100 | |

Next multiply the number of recyclers in each category by its weighting (e.g. 132 x 83.3% = 110). This gives you the weighted number of recyclers for each category. Add these together, and then divide by the total number in the sample. This is the weighted percentage recycling overall.

| | Number in sample | Recyclers (%) | Number of recyclers | Weighted no. of recyclers | Weighted % recycling |
|---|---|---|---|---|---|
| Male | 660 | 20 | 132 | 110 | |
| Female | 440 | 40 | 176 | 220 | |
| **Total** | **1100** | | | **330** | **30%** |

The weighted result shows that 30% of people recycle and not 28% as previously calculated. This is because the men were having a disproportionate effect on the actual result by understating the level of claimed recycling in the unweighted results.

## 3.10 Can I use a control?

A control area is an area that is used for comparative purposes to assess the degree of change as a result of an intervention. An example control area would be part of the authority in which no awareness campaigns had run or no scheme improvements had been made. Controls are most often used in scientific experiments where, for example, one group of people is given a drug while the other is given a placebo.

The difficulty in trying to use control areas in the context of waste management is finding an area that is sufficiently similar but in which no changes are being made. If there are even quite small socio-demographic differences between the areas, you can never be sure whether they are the cause of the differences observed rather than the scheme improvement or the communications campaign. For this reason WRAP does not recommend using controls for routine monitoring.

## 3.11 I want to monitor one area but it isn't representative – is this a problem?

There may be occasions when it is useful to monitor an area that isn't representative of the authority as a whole. Common examples are when poor-performing areas are monitored before and after an intervention (e.g. a new scheme or a communications campaign) to assess the scale of improvement. This is a valid approach, but you must remember that you **cannot** use those figures to talk about the authority as a whole because the population you have monitored – the target population – is not the same as the whole authority population. You also need to remember that it is the profile of the target population you will want your sample to be representative of, not the authority population.

For partnerships, some of the partners may want to monitor other target populations for their own purposes. This is fine but they must also combine the results with other households to generate a sample representative of the partnership. If they don't, the results can't be used to generate a partnership average. When WRAP funds a partnership, it expects representative results at the partnership level as well as for each partner.

## 3.12 Summary of chapter

This chapter has:

- stressed the importance of having a good understanding of sampling (Section 3.1);
- described sampling and why it is needed (Section 3.2);
- explained the importance of profiling the 'target population' when sampling (Section 3.3);
- described the process for selecting a sample and some recommended approaches (Section 3.4);
- discussed sample size (Section 3.5);
- explained what is meant by the sampling frame and how to calculate it (Section 3.6);
- indicated the recommended approaches to sampling for different types of monitoring (Section 3.7);
- outlined some of the sampling errors to be aware of when undertaking monitoring (Section 3.8);
- described the process of weighting data (Section 3.9);
- discussed the use of 'controls' when monitoring (Section 3.10); and

- considered implications of monitoring specific areas rather than areas representative of the whole local authority area (Section 3.11).

## 3.13 Where do you want to go next?

Chapter 1 provides an **introduction** and helps you decide which chapters you need to look at.

Chapter 2 explains how to set **monitoring aims, objectives and KPIs.** It then describes how to use the results of monitoring to **improve a service /scheme or to measure the effects of a communications campaign**.

Chapter 4 deals with monitoring **awareness, claimed behaviour and satisfaction.**

Chapter 5 deals with monitoring service or scheme **usage and participation.**

Chapter 6 looks at the use of **tonnage data**.

Chapter 7 explains how to measure **capture rates.**

Chapter 8 considers monitoring of **contamination levels.**

Chapter 9 looks at approaches to measuring **waste reduction.**

Chapter 10 deals with monitoring **communications campaigns.**

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