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CONSTRUCTING HYPOTHESES

- step one -

FORMULATING A RESEARCH PROBLEM

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**CONFUSED?
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CHALLENGE?**

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WITH YOUR
ASSIGNMENT?**

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ESSENTIAL TERMS

You should be able to define these by the end of the chapter

- alternative hypotheses
- hypothesis
- null hypothesis
- research hypothesis

BONUS TERMS

You will learn more about these by the end of the chapter

- hunch
- hypothesis of point
- prevalence
- operationalisable
- Type I error
- Type II error
- Unidimensional
- valid

LEARNING OBJECTIVES

At the end of this chapter, you will be able to:

- Define what a hypothesis is
- Understand the functions of a hypothesis in your research
- Describe how hypotheses are tested
- Formulate a hypothesis
- Discuss different types of hypotheses and their applications
- Identify how errors in the testing of a hypothesis can occur
- Understand the use of hypotheses in qualitative research

Almost every great step [in the history of science] has been made by the 'anticipation of nature', that is, by the invention of hypotheses which, though verifiable, often had very little foundation to start with. (T.H. Huxley, cited in Cohen & Nagel 1966: 197)

THE DEFINITION OF A HYPOTHESIS

Hypothesis: A hypothesis is a hunch, assumption, suspicion, assertion or idea about a phenomenon, relationship or situation, the reality or truth of which you do not know, and you set up your study to find this truth. A researcher refers to these assumptions, assertions, statements or hunches as hypotheses and they become the basis of an enquiry. In most studies the hypothesis will be based either upon previous studies or on your own or someone else's observations.

The second important consideration in the formulation of a research problem in quantitative research is the construction of a hypothesis. Hypotheses bring clarity, specificity and focus to a research problem, but are not essential for a study. You can conduct a valid investigation without constructing a single formal hypothesis. On the other hand, within the context of a research study, you can construct as many hypotheses as you consider to be appropriate. Some believe that one must formulate a hypothesis to undertake an investigation; however, the author does not hold this opinion. Hypotheses primarily arise from a set of 'hunches' that are tested through a study, and one can conduct a perfectly valid study without having these hunches or speculations. However, in epidemiological studies, to narrow the field of investigation, it is important to formulate hypotheses. The importance of hypotheses lies in their ability to bring direction, specificity and focus to a research study. They tell a researcher what specific information to collect, and thereby provide greater focus.

Let us imagine you are at the races and you place a bet. You bet on a hunch that a particular horse will win. Only after the race will you know if your hunch was right. To take another example, suppose you have a hunch that there are more smokers than non-smokers in your class. To test your hunch, you ask either all or just some of the class if they are smokers. You can then conclude whether your hunch was right or wrong.

Now let us take a slightly different example. Suppose you work in the area of public health. Your clinical impression is that a higher rate of a particular condition prevails among people coming from a specific population subgroup. You want to find out first whether or not your hunch is right, and second what are the probable causes of this condition. There could be many causes. To explore every conceivable possibility would require an enormous amount of time and resources. Hence, to narrow the choice, based on your knowledge of the field, you could identify what you assume to be the most probable cause. You could then design a study to collect the information needed to verify your hunch. If on verification you were able to conclude that there is a prevalence of the assumed condition in the population subgroup and that the assumed cause really is the reason, your assumptions would be proved right.

In these examples, you started with a superficial hunch or assumption. In one case (horse racing) you waited for the event to take place, and in the other two instances you designed a study to assess the validity of your assumption, and only after careful investigation did you arrive at a conclusion about the validity of your assumptions.

Hypotheses are based upon similar logic. As a researcher you *do not know* about a phenomenon, a situation, the prevalence of a condition in a population or the outcome of a programme, but you do have a hunch to form the basis of certain assumptions or guesses. You test these by collecting the information that will enable you to conclude whether or not your hunch was right. The verification process can have one of three outcomes.

STEP ONE FORMULATING A RESEARCH PROBLEM

Your hunch may prove to be right, partially right or wrong. Without this process of verification, you cannot conclude anything about the validity of your assumption.

Hence, a hypothesis is a hunch, assumption, suspicion, assertion or an idea about a phenomenon, relationship or situation, the reality or truth of which you do not know. A researcher refers to these assumptions, assertions, statements or hunches as hypotheses, and they become the basis of an enquiry. In most studies the hypothesis will be based upon either previous studies or your own or someone else's observations.

There are many definitions of a hypothesis. According to Kerlinger (1986: 17), 'A hypothesis is a conjectural statement of the relationship between two or more variables'. *Webster's Third New International Dictionary* (1976) defines a hypothesis as:

a proposition, condition, or principle which is assumed, perhaps without belief, in order to draw out its logical consequences and by this method to test its accord with facts which are known or may be determined.

Black and Champion (1976: 126) define a hypothesis as 'a tentative statement about something, the validity of which is usually unknown'. In another definition, Bailey (1978: 35) defines a hypothesis as:

a proposition that is stated in a testable form and that predicts a particular relationship between two (or more) variables. In other words, if we think that a relationship exists, we first state it as a hypothesis and then test the hypothesis in the field.

According to Grinnell (1988: 200):

A hypothesis is written in such a way that it can be proven or disproven by valid and reliable data - it is in order to obtain these data that we perform our study.

From the above definitions it is apparent that a hypothesis has certain characteristics:

- 1 It is a tentative proposition.
- 2 Its validity is unknown.
- 3 In most cases, it specifies a relationship between two or more variables.

THE FUNCTIONS OF A HYPOTHESIS

While some researchers believe that to conduct a study requires a hypothesis, having a hypothesis is not essential, as already mentioned. However, a hypothesis is important in terms of bringing clarity to the research problem. Specifically, a hypothesis serves the following functions:

CHECKPOINT
Hypotheses
and research
questions

- The formulation of a hypothesis forces you to precisely specify what you want to find out about, thus bringing specificity and clarity to your study.
- The specificity and clarity needed to construct a hypothesis ensure you only collect the information you need, thereby providing focus to the study. This also enhances the validity of your study as it ensures you are measuring what you set out to measure.
- As it provides a focus, the construction of a hypothesis enhances objectivity in a study.
- The testing of a hypothesis enables you to specifically conclude what is true or what is false, thus enabling you to contribute towards theory formulation.

THE TESTING OF A HYPOTHESIS

To test a hypothesis you need to go through a process that comprises three phases: (1) constructing the hypothesis; (2) gathering appropriate evidence; and (3) analysing evidence to draw conclusions as to the validity of the hypothesis. Figure 6.1 shows this process diagrammatically. It is only after analysing the evidence that you can conclude whether your hunch or hypothesis was true or false. Conventionally, when drawing your conclusion about a hypothesis, you specifically make a statement about the correctness or otherwise of a hypothesis in the form of 'the hypothesis is **true**' or 'the hypothesis is false'. It is therefore imperative that you formulate your hypotheses clearly, precisely and in a form that is testable. In arriving at a conclusion about the validity of your hypothesis, the way you collect your evidence is of central importance and it is therefore essential that your study design, sample, data collection method(s), data analysis and conclusions, and communication of the conclusions be valid, appropriate and free from any bias. Testing and drawing conclusions about the validity of a hypothesis become meaningless if the study design, sampling, methods of data collection, etc. used in testing the hypothesis are inappropriate. You need to be certain about the appropriateness of the whole research process when testing a hypothesis.

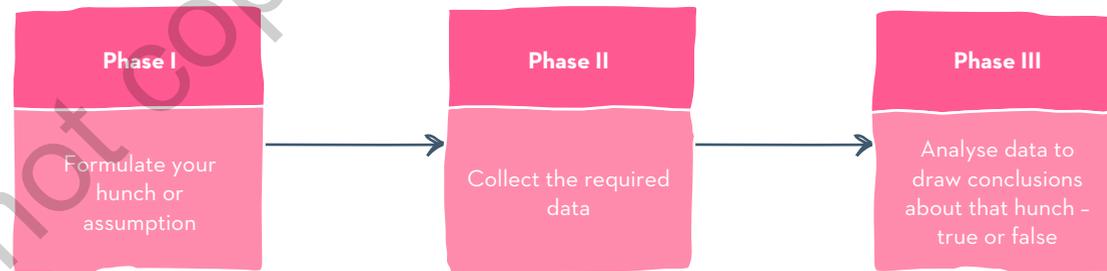


Figure 6.1 The process of testing a hypothesis

STEP ONE FORMULATING A RESEARCH PROBLEM

THE CHARACTERISTICS OF A HYPOTHESIS

There are a number of considerations to keep in mind when constructing a hypothesis, as they are important for valid verification. The wording of a hypothesis therefore must have certain attributes that make it easier for you to ascertain its validity.

First, a hypothesis should be *simple, specific* and *conceptually clear*. There is no place for ambiguity in the construction of a hypothesis, as ambiguity will make the verification of your hypothesis almost impossible. It should be 'unidimensional' – that is, it should test only one relationship or hunch at a time. To be able to develop a good hypothesis you must be familiar with the subject area (the literature review is of immense help). The more insight you have into a problem, the easier it is to construct a hypothesis. For example:

The average age of the male students in this class is higher than that of the female students.

The above hypothesis is clear, specific and easy to test. It tells you what you are attempting to compare (average age of this class), which population groups are being compared (female and male students), and what you want to explore (whether male students have higher average age).

Let us take another example:

Suicide rates vary inversely with social cohesion. (Black & Champion 1976: 126)

This hypothesis is clear and specific, but a lot more difficult to test. There are three aspects of this hypothesis: 'suicide rates'; 'vary inversely', which stipulates the direction of the relationship; and 'social cohesion'. To find out the suicide rates and to establish whether the relationship is inverse or otherwise are comparatively easy, but to ascertain social cohesion is a lot more difficult. What determines social cohesion? How can it be measured? This problem makes it more difficult to test this hypothesis.

Second, a hypothesis should be *capable of verification*. Methods and techniques must be available for data collection and analysis. There is no point in formulating a hypothesis if it cannot be subjected to verification because there are no techniques to verify it. However, this does not necessarily mean that you should not formulate a hypothesis for which there are no methods of verification. You might, in the process of doing your research, develop new techniques to verify it.

Third, a hypothesis should be *related to the existing body of knowledge*. It is important that your hypothesis emerges from the existing body of knowledge, and that it adds to it, as this is an important function of research. This can only be achieved if the hypothesis has its roots in the existing body of knowledge.

Finally, a hypothesis should be *operationalisable*. This means that it can be expressed in terms that can be measured. If it cannot be measured, it cannot be tested, and hence no conclusions can be drawn.

TYPES OF HYPOTHESIS

Theoretically there should be only one type of hypothesis, that is the research hypothesis – the basis of your investigation. However, because of the conventions in scientific enquiry and because of the wording used in the

construction of a hypothesis, hypotheses can be classified into several types. Broadly, there are two categories of hypothesis:

- 1 research hypotheses;
- 2 alternative hypotheses.

Alternative hypothesis: The formulation of an alternative hypothesis is a convention in scientific circles. Its main function is to specify explicitly the relationship that will be considered as true in case the research hypothesis proves to be wrong. In a way, an alternative hypothesis is the opposite of the research hypothesis.

The formulation of an **alternative hypothesis** is a convention in scientific circles. Its main function is to explicitly specify the relationship that will be considered as true in case the research hypothesis proves to be wrong. In a way, an alternative hypothesis is the opposite of the research hypothesis. Conventionally, a null hypothesis, or hypothesis of no difference, is formulated as an alternative hypothesis.

Let us take an example. Suppose you want to test the effect that different combinations of maternal and child health services (MCH) and nutritional supplements (NS) have on the infant mortality rate. To test this, you adopt a two-by-two factorial experimental design (see Figure 6.2). Within the framework of this study you can formulate a hypothesis in several ways. For example:

- 1 There will be no difference in the level of infant mortality among the different treatment modalities (Null hypothesis usually written as H_0).
- 2 The MCH and NS treatment groups will register a greater decline in infant mortality than the MCH-only treatment group, the NS-only treatment group or the control group.
- 3 Infant mortality in the MCH treatment group will reach a level of 30 per 1000 over 5 years.
- 4 Decline in the infant mortality rate will be three times greater in the MCH treatment group than in the NS group only over 5 years.

Let us take another example. Suppose you want to study the smoking pattern in a community in relation to gender differentials. The following hypotheses could be **constructed**:

- 1 There is no significant difference in the proportion of male and female smokers in the study population.
- 2 A greater proportion of females than males are smokers in the study population.
- 3 A total of 60 per cent of females and 30 per cent of males in the study population are smokers.
- 4 There are twice as many female smokers as male smokers in the study population.

In both sets of examples, the way the first hypothesis has been formulated indicates that there is no difference either in the extent of the impact of different treatment modalities on the infant mortality rate or in the proportion of male and female smokers. When you construct a hypothesis stipulating that there is no difference between two

STEP ONE FORMULATING A RESEARCH PROBLEM

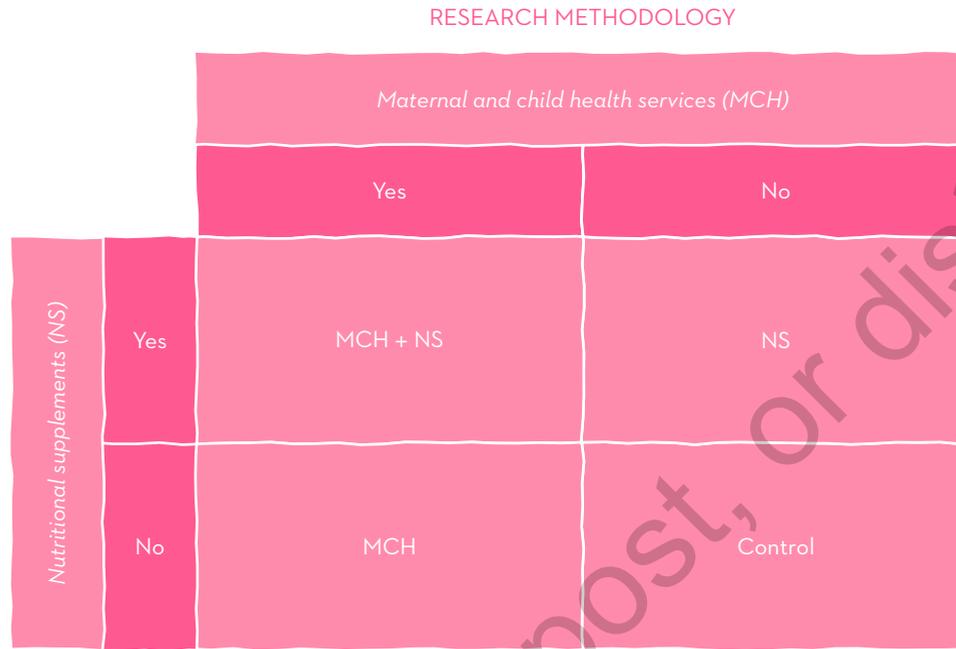


Figure 6.2 Two-by-two factorial experiment to study the relationship between MCH, NS and infant mortality

CHECKPOINT
Alternative and null hypotheses

Null hypothesis: A hypothesis stipulating that there is no difference between two situations, groups, outcomes, or the prevalence of a condition or phenomenon; it is usually written as H_0 .

Hypothesis of difference: A hypothesis in which a researcher stipulates that there will be a difference but does not specify its magnitude.

Hypothesis of point-prevalence: There are times when a researcher has enough knowledge about a phenomenon that he/she is studying and is confident about speculating almost the exact prevalence of the situation or the outcome in quantitative units. This type of hypothesis is known as a hypothesis of point-prevalence.

situations, groups, outcomes, or the prevalence of a condition or phenomenon, this is called a **null hypothesis** and is usually written as H_0 .

The second hypothesis in each example implies that there is a difference either in the extent of the impact of different treatment modalities on infant mortality or in the proportion of male and female smokers among the population, though the **extent** of the difference is not specified. A hypothesis in which a researcher stipulates that there will be a difference but does not specify its magnitude is called a **hypothesis of difference**.

A researcher may have enough knowledge about the smoking behaviour of the community or the treatment programme and its likely outcomes to speculate about the exact prevalence of the situation or the outcome of a treatment programme in quantitative units. Examine the third hypothesis in both sets of examples: the level of infant mortality is 30 per 1000 and the proportion of female and male smokers is 60 and 30 per cent, respectively. This type of hypothesis is known as a **hypothesis of point-prevalence**.

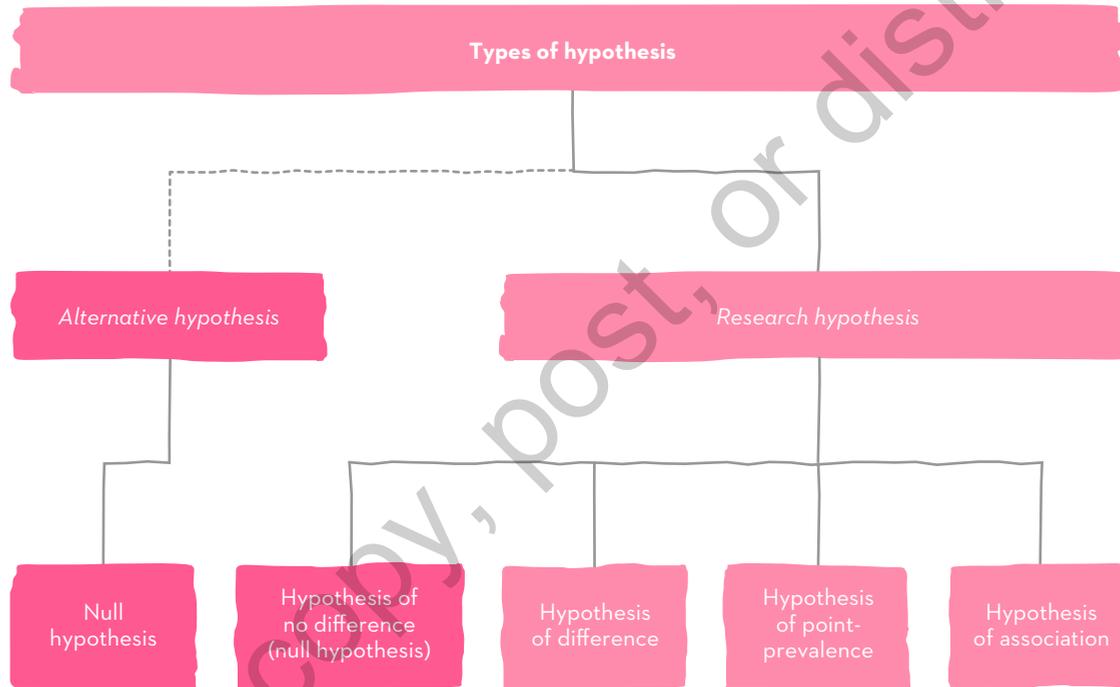


Figure 6.3 Types of hypothesis

The fourth hypothesis in both sets of examples posits a relationship between the impact of different combinations of MCH and NS programmes on the dependent variable (infant mortality) or the relationship between the prevalence of a phenomenon (smoking) among different populations (male and female). This type of hypothesis stipulates the extent of the relationship in terms of the effect of different treatment groups on the dependent variable ('three times greater in the MCH treatment group than in the NS group over 5 years') or the prevalence of a phenomenon in different population groups ('twice as many female as male smokers'). This type of hypothesis is called a **hypothesis of association**.

Note that in Figure 6.3 the null hypothesis is also classified as a hypothesis of no difference under 'research hypothesis'. Any type of hypothesis, including a null hypothesis, can become the basis of an enquiry. When a null hypothesis becomes the basis of an investigation, it becomes a research hypothesis.

Hypothesis of association:

When as a researcher you have sufficient knowledge about a situation or phenomenon and are in a position to stipulate the extent of the relationship between two variables and formulate a hunch that reflects the magnitude of the relationship, such a hypothesis formulation is known as a hypothesis of association.

ERRORS IN TESTING A HYPOTHESIS

As already mentioned, a hypothesis is an assumption that may prove to be either correct or incorrect. It is possible to arrive at an incorrect conclusion about a hypothesis for a variety of reasons. Incorrect conclusions about the validity of a hypothesis may be drawn if:

- ➔ the study design selected is faulty;
- ➔ the sampling procedure adopted is faulty;
- ➔ the method of data collection is inaccurate;
- ➔ the analysis is wrong;
- ➔ the statistical procedures applied are inappropriate; or
- ➔ the conclusions drawn are incorrect.

Any, some or all of these aspects of the research process could be responsible for the inadvertent introduction of error in your study, making conclusions misleading. Hence, in the testing of a hypothesis there is always the possibility of errors attributable to the reasons identified above. Figure 6.4 shows the types of error that can result in the testing of a hypothesis.

Hence, in drawing conclusions about a hypothesis, two types of error can occur:

- ➔ *Rejection* of a null hypothesis when it is true. This is known as a **Type I error**.
- ➔ *Acceptance* of a null hypothesis when it is false. This is known as a **Type II error**.

CHECKPOINT

Errors in hypothesis testing

Type I error: In testing a hypothesis, for many reasons you may sometimes commit a mistake and draw the wrong conclusion with respect to the validity of your hypothesis. If you reject a null hypothesis when it is true and you should not have rejected it, this is called a Type I error.

Type II error: In testing a hypothesis, for many reasons you may sometimes commit a mistake and draw the wrong conclusion in terms of the validity of your hypothesis. If you accept a null hypothesis when it is false and you should not have accepted it, this is called a Type II error.

HYPOTHESES IN QUALITATIVE RESEARCH

One of the differences between qualitative and quantitative research is around the importance attached to and the extent of use of hypotheses when undertaking a study. As qualitative studies are characterised by an

When a null hypothesis is actually:

	True	False
Accept	Correct decision	Type II error
Reject	Type I error	Correct decision

Figure 6.4 Type I and Type II errors in testing a hypothesis

emphasis on describing, understanding and exploring phenomena using categorical and subjective measurement procedures, construction of hypotheses is neither greatly advocated nor significantly practised. In addition, as the degree of specificity needed to test a hypothesis is deliberately not adhered to in qualitative research, the testing of a hypothesis becomes difficult. This does not mean that you cannot construct hypotheses in qualitative research; however non-specificity of the problem as well as methods and procedures make the convention of hypothesis formulation far less practicable and advisable. Even within quantitative studies the importance attached to and the practice of formulating hypotheses vary markedly from one academic discipline to another. For example, hypotheses are most prevalent in epidemiological research and research relating to the establishment of causality of a phenomenon, where it becomes important to narrow the list of probable causes so that a specific cause-and-effect relationship can be studied. In the social sciences formulation of hypotheses is mostly dependent on the researcher and the academic discipline, whereas within an academic discipline it varies markedly between the quantitative and qualitative research paradigms.

SUMMARY

Hypotheses, though important, are not essential for a study. A perfectly valid study can be conducted without constructing a single hypothesis. **Hypotheses are important for bringing clarity, specificity and focus to a research study.**

A hypothesis is a speculative statement that is subjected to verification through a research study. In formulating a hypothesis it is important to ensure that it is simple, specific and conceptually clear; can be verified; is rooted in an existing body of knowledge; and can be operationalised.

STEP ONE FORMULATING A RESEARCH PROBLEM

There are two broad categories of hypothesis: a research hypothesis and an alternative hypothesis. A research hypothesis can be further classified, based upon the way it is formulated, as a null hypothesis, a hypothesis of difference, a hypothesis of point-prevalence and a hypothesis of association.

One of the main differences in qualitative and quantitative research is the extent to which hypotheses are used and the importance attached to them. In qualitative research, because of the purpose of an investigation and methods used to obtain information, hypotheses are not used and almost no importance is given to them. However, in quantitative research, their use is far more prevalent though it varies markedly from one academic discipline to another and from researcher to researcher. On the whole it can be said that if the aim of a study is to explore where very little is known, hypotheses are usually not formulated; however, if a study aims to test an assertion by way of causality or association, validate the prevalence of something or establish its existence, hypotheses can be constructed.

The testing of a hypothesis becomes meaningless if any one of the aspects of your study – design, sampling procedure, method of data collection, analysis of data, statistical procedures applied or conclusions drawn – is faulty or inappropriate. This can result in erroneous verification of a hypothesis: Type I error occurs where you reject a null hypothesis when it is true and should not have been rejected; and Type II error is introduced where you accept a null hypothesis when it is false and should not have been accepted.

Now that you have read the full chapter...

CHECK YOUR UNDERSTANDING

- Do you understand the meaning and application of all of the keywords at the start of the chapter? If not, visit the online resources and use the glossary flashcards to get to grips with their definitions.
- What is a hypothesis and what functions does it serve in a research study?
- What are the different types of hypothesis? What is the main function of a null hypothesis?
- What are the two types of error in testing of a hypothesis? Explain them.
- The validity of a hypothesis test is dependent on a number of prerequisites. What are these requisites?
- To what extent do you think that the use of hypotheses is relevant to social research?

APPLY IT TO YOUR OWN PROJECT

- Formulate two or three hypotheses that relate to your own areas of interest and consider the factors that might affect their validity.

CONFUSED?

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→ <https://study.sagepub.com/kumar5e> ←

CHECKPOINT: What is the difference between a hypothesis and a research question? Visit this website.

CHECKPOINT: What is a null hypothesis? Watch this video.

CHECKPOINT: What are the two types of hypothesis errors, and how do they differ? Visit this website.

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Get up to speed on key terms with *glossary flashcards* and test yourself on important concepts with *multiple choice questions*.

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CHECKPOINT: What are some of the most bizarre social science hypotheses researchers have tried to test? Visit this [website](#).

CHECKPOINT: What are some examples of alternative and null hypotheses? Watch this [video](#).

CHECKPOINT: How do you reduce errors in hypothesis testing? Visit this [website](#).

READY TO WORK ON YOUR OWN PROJECT?

Start building a portfolio of your ideas with the exercise workbook and get support tailored to your specific assignment with the assessment toolkit.

DEVELOPING A RESEARCH PROJECT: A SET OF EXERCISES FOR BEGINNERS

Application is the essence of knowledge. However, there always remains a gap between theoretical knowledge and its application. It is only with practice that this gap can be narrowed. A beginner attempting to apply theoretical knowledge needs direction and guidance. This set of exercises, each one of which is attached to an operational step, has been developed with this belief in mind. Working through them will help you to develop a research project.

The main aim of these exercises is to provide you with a broad framework that is central to the operationalisation of each step of the research process. In most cases, a separate exercise is provided for quantitative and qualitative studies, so it is important that you know before you start which approach you are going to take. Within each exercise, there are brief reminders of some of the key issues relating to the process and a series of questions to help you to think through procedures and provide a framework for the development of your study.

Answers to these questions and awareness of the issues that the exercises outline will put you in a position to complete the framework suggested for writing a research proposal (Chapter 13), and therefore these will also constitute the core of your research proposal.

It is important for a beginner to work through these exercises with considerable thought and care.

Congratulations!

Now you have learnt how to take the first step towards your research journey. By this time you should have a reasonably good understanding about how to formulate a research problem. You should be ready to put your knowledge and skills into practice by actually working through the process of formulating

a research problem. This exercise is designed to help you to formulate a research problem of interest to you. Good luck!

Exercise I: Formulation of a research problem

Quantitative studies

Now that you have gone through all the chapters that constitute Step I of the research process, this exercise provides you with an opportunity to apply that knowledge to formulate a research problem that is of interest to you. As you know, selecting a research problem is one of the most important aspects of social research, so this exercise will help you in formulating your research problem by raising questions and issues that will guide you to examine critically various facets and implications of what you are proposing to study. The exercise is designed to provide a directional framework that guides you through the problem formulation path. Keep in mind that the questions and issues raised in this exercise are not prescriptive but indicative and directional, hence you need to be critical and innovative while working through them. Thinking through a research problem with care can prevent a tremendous waste of human and financial resources.

A research problem should be clearly stated and be specific in nature. The feasibility of the study in terms of the availability of technical expertise, finances and time, and in terms of its relevance, should be considered thoroughly at this stage. In studies that attempt to establish a causal relationship or an association, the accuracy of the measurement of independent (cause) and dependent (effect) variables is of crucial importance

Template of
Exercise I

and, hence, should be given serious consideration. If you have already selected a problem, you need not go through this process.

Start by identifying a *broad subject area* of interest to you; for example, health, education, crime, immigration, public health, tourism, recreation, parenting, crime, social justice. This exercise is designed to help you to dissect and then select the subarea(s) of interest to you to become the basis of your study. Chapter 4 of this book will help you to work through this exercise.

STEP ONE Select a broad area of study that interests you from within your academic discipline.

Having selected an area, the next step is to 'dissect' it in order to identify its various aspects and subareas. For example, suppose your broad area of interest is migration. Some aspects or subareas of migration are:

- a socioeconomic-demographic profile of immigrants;
- reasons for immigration;
- problems of immigrants;
- services provided to immigrants;
- attitudes of immigrants towards migration;
- attitudes of host communities towards immigrants;
- the extent of acculturation and assimilation;
- racial discrimination in the host country.

Or perhaps you are interested in studying a public health programme. Dissect it as finely as possible in order to identify the aspects that could be studied. List them as they come to you. For example:

- a socioeconomic-demographic profile of the target group;
- the morbidity and mortality patterns in a community;

- the extent and nature of programme utilisation;
- the effects of a programme on a community;
- the effectiveness of a particular health promotion strategy.

Or your interest may be in studying delinquents. Some aspects of delinquency are:

- delinquency as related to unemployment, broken homes or urbanisation;
- a profile of delinquents;
- reasons for delinquency;
- various therapeutic strategies.

STEP TWO 'Dissect' the broad area that you selected in Step 1 into subareas as discretely and finely as possible. Have a one-person (with yourself) brainstorming session.

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____

To investigate all these subareas is neither advisable nor feasible. Select only those subareas that would be possible for you to study within the constraints of time, finance and expertise at your disposal. One way to select your subarea is to start with a process of elimination: delete those areas you are not very interested in. Towards the end it may become difficult but you need to keep eliminating until you have selected a

subarea(s) that can be managed within your constraints. Even one subarea can provide you with a valid and exhaustive study.

STEP THREE From the above subareas, select a subarea or subareas in which you would like to conduct your study.

- 1 _____
- 2 _____
- 3 _____

STEP FOUR Within each chosen subarea, what research questions do you hope to answer? (Be as specific as possible. You can select one or as many subareas as you want.)

Subarea	Specific research questions to be answered
1a	1 _____ 2 _____ 3 _____
1b	1 _____ 2 _____

- 1 (a) _____
(b) _____
(c) _____
(d) _____
(e) _____
- 2 (a) _____
(b) _____
(c) _____
(d) _____
(e) _____

- 3 (a) _____
(b) _____
(c) _____
(d) _____
(e) _____

The research questions to be answered through the study become the basis of your objectives. Now you need to formulate your study objectives. In so doing, use action-oriented words. The main difference between research questions and objectives is the way they are written. Questions are worded in question form and objectives are statements referring to the achievement of a task.

Your main objective should indicate the overall focus of your study and the subobjectives, its specific aspects. Subobjectives should be listed numerically. They should be worded clearly and unambiguously. Make sure each objective contains only one aspect of the study.

STEP FIVE On the basis of your research questions, formulate the main objective and the subobjectives of your study.

Main objective (the main focus of your study):

Subobjectives (specific aspects of your study):

1 _____
2 _____
3 _____
4 _____
5 _____

STEP SIX Carefully consider the following aspects of your study.

Task	What is involved	Time needed	Approx. cost	Technical expertise needed	Gaps in knowledge and skills
Literature review					
Instrument construction					
Data collection					
Data analysis					
Draft report					
Final report					

Now you have developed the objectives of your study. Take some time to think about them. Be clear about what tasks are involved, what time is realistically required and what skills you need to develop in order to conduct your study. Consider these areas carefully again.

STEP SEVEN Double-check:

- Are you really interested in the study?
Yes No Uncertain
- Do you agree with the objectives of the study?
Yes No Uncertain
- Are you certain you want to pursue the study?
Yes No Uncertain
- Do you have adequate resources?
Yes No Uncertain
- Do you have access to an appropriate study population?
Yes No Uncertain

If your answer to any of these questions is either 'no' or 'uncertain', re-examine the selected aspects carefully and make the appropriate changes in your objectives.

What, in your opinion, is the relevance of this study to theory and practice? How will your study contribute to the existing body of knowledge, help the practitioners in your profession and assist in programme development and policy formulation?

Relevance to theory:

Relevance to practice:

Now that you have formulated your research problem, it is important to examine your objective, research questions and hypotheses to identify if you have used any concepts in their formulation. When you convert concepts into variables an understanding about variables plays a very important role. Concepts are highly subjective as their understanding varies from person to person and, as such, they may not be measurable. Any concept, perception or imagination that can be measured on any one of the four measurement scales (nominal, ordinal, interval or ratio) is called a variable. It is important for concepts used in a study to be operationalised in measurable terms so that the extent of variation in a study population's understanding of them is reduced, if not eliminated.

At this stage, when you have formulated your objectives, it is important for you to think how you will operationalise any concepts used in the objectives, research questions or hypotheses formulated: what are their indicators and how will they be measured?

The following table suggests how you might operationalise the concept of 'effectiveness', in relation to a health education programme on AIDS. It lists the indicators of effectiveness (you can have other indicators), sets out the variables that measure the indicators and describes the unit of measurement for the variables.

Concept	Indicator	Variable(s)	Unit of measurement
Effectiveness	Awareness of AIDS	Extent of change in:	Change in the proportion of the population, before and after the health education programme, with respect to:
	Knowledge about AIDS	Awareness Knowledge Practice	Awareness of, and knowledge about, different aspects of AIDS
	Use of contraceptives (practice)		Use of contraceptives for safe sex

This part of the exercise is designed to help you operationalise the major concepts used in your study. Refer to Chapter 5 for additional information on variables.

STEP EIGHT Operationalise your concepts.

Objectives/ research questions/ hypotheses	Major concepts	Indicators	Variables	Unit of measurement

Objectives/ research questions/ hypotheses	Major concepts	Indicators	Variables	Unit of measurement

It is essential to develop a working or operational definition of your study population. For example, who would you consider to be a patient, an immigrant, a youth, a psychologist, a teacher, a delinquent or a Christian? Working definitions play a crucial role in avoiding ambiguities in the selection of a sample and help you to narrow your study population.

STEP NINE Operationally define your study population.

Skip this section if you are *not* constructing a hypothesis.

As discussed, some believe that one must have a hypothesis to undertake an investigation; however, in the author's opinion, hypotheses, although they bring clarity, specificity and focus to a research problem, are not essential for a study. You can conduct a valid investigation without constructing a single formal hypothesis. On the other hand, you can construct as many hypotheses as you think appropriate. In epidemiological studies, to narrow the field of investigation, one must construct a hypothesis as to the probable cause of the condition to be investigated.

A hypothesis is a hunch, assumption, suspicion, assertion or idea about a phenomenon, relationship or situation, which you intend to investigate in order to find out if you are right. If it proves to be right, your assumption was correct; hence, you prove that your hypothesis was true. Otherwise, you conclude your hypothesis to be false.

Disproving a hypothesis is as important as, or more important than, proving it. As a hypothesis is usually constructed on the basis of what is commonly believed to be right, your disproving it might lead to something new that has been ignored by previous researchers.

A hypothesis should be conceptually simple, clear and specific, and be capable of verification and being expressed operationally.

There is a specific way of writing a hypothesis, with which you need to be familiar (refer to Chapter 6).

STEP TEN Construct your hypothesis or hypotheses for each subobjective/research question.

Objectives/research questions	Hypotheses to be tested
	1
	2
	3
	1
	2
	3
	1
	2
	3

Qualitative studies

As mentioned earlier, the difference in qualitative and quantitative research studies starts with the way you think about and formulate your research problem. In qualitative studies, it is preferred that the research problem is broad, flexible and continuously formulated as the information is collected. In the process of data collection, if you find something interesting relating to your broad area of study, you add the aspect(s) and change the focus to accommodate the new vision.

This flexibility is an important strength of qualitative research but it is also important that you develop a conceptual framework of issues and questions for your study, as non-specificity about what you want to find out can often create problems for your respondents. Many do not feel comfortable or are not in a position to articulate the multiple aspects of an area without being prompted. For situations like this it is important that you are fully prepared with a framework in mind for your enquiry. No doubt you can develop this framework during data collection, while talking to your respondents, but this may create a problem in terms of completeness and comparability with the information obtained during the early phase of the study. You can minimise some of these problems by developing a conceptual framework in advance. It is also important that you communicate with respondents in specific terms without bias or influencing their thinking.

Remember, these are not the questions that you will ask of your respondents. These are just reminders for raising issues or questions if nothing much is forthcoming from a respondent.

In qualitative research the following would be considered as broad areas of interest:

- What does it mean to have a child with ADHD in the family?
- How resilient is this community?
- What is community responsiveness?
- Living with HIV/AIDS.

