Guide lines for The Preparation of A Thesis/ Disseration

Malcolm A Fernando

Board of Study Community Medicine
Postgraduate Institute of Medicine
University of Colombo
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Of A Thesis/Dissertation

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This document provides general guidelines for preparation of Thesis/Dissertations.
Please note that candidates submitting Thesis/Dissertations for an examination should comply with the required specification for that examination.

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Guidelines For The Preparation
Of A Thesis/Dissertation
1. Preparation of Thesis/Dissertation
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FOREWORD

The Postgraduate Institute of Medicine (PGIM) has taken vast strides in improving the training programs leading to the postgraduate qualifications of MD, MS, MSc and diplomas.

However, the research component of the training may be considered inadequate in some fields and perhaps needs strengthening in all fields. MD by thesis is available only in a few fields like Community Medicine, Family Medicine and Medical Administration. Many Boards have a thesis, dissertation or casebooks as a requirement for sitting the exit examination or fulfilling criteria for Board Certification as a specialist.

Prof. Malcolm Fernando, the author of this comprehensive booklet, was for many years the coordinator for the Board of Study in Community Medicine. He performed a yeoman service in providing guidance to the trainees and even the trainers regarding preparation of thesis and dissertations and conduct of research. This booklet will be a boon to all trainees who have to prepare a thesis or dissertation and may also be useful even to the supervisors and experienced researchers.

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FCCP, Hon.SLCGP
Director
Postgraduate Institute of Medicine.

14th August 2002.

From the Author ……

This is an attempt to guide a graduate seeking postgraduate qualifications to prepare and write a thesis or dissertation; especially in the field of Community Medicine. However, the general principles are applicable to other disciplines as well.

In the early part of this document, I have given the Order of Elements for such a document and made comments on each of them. This is followed with guidelines for each chapter. Some candidates may be in the planning stage, some may have initiated the study while still others may have completed the fieldwork. Therefore the language used is a mix of tenses, which should be appropriately changed.

I have given some of the guidelines in the form of questions so as to focus attention on what should be or have been done. If the study is in the planning stage the guidelines may be useful, if however the fieldwork has been completed, some of the questions may help the researcher to identify the limitations of the study.

I wish to thank Professor D.N. Fernando, Head, Department of Community Medicine, University of Colombo, for correcting the drafts of this paper and giving me useful advice. I also wish to thank Miss Kanthi Gamanayake of the Postgraduate Institute of Medicine and a public health academic who wishes to remain anonymous for preparing this document for publication.

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Dr. P. H. (Harvard)

1. Introduction

A thesis or dissertation is a document presenting the research of a single author in a prescribed form and submitted for an academic degree or professional qualification; often in partial fulfilment. I will deal especially with the preparation for theses and dissertations on biomedical non-experimental research. However, the basic principles are the same for other types.

The framework for both the thesis and dissertation is the same. However, there are differences between them. The thesis is submitted for a Doctoral or Master of Philosophy degree, while the dissertation is for a Masters or Diploma degree. The thesis is more comprehensive, original, uses sophisticated methods of data analysis and contains more references than a dissertation. It is recommended that a thesis should contain 15,000-20,000 words while the dissertation around 8000 words (excluding annexes and appendices). The thesis has to be defended at a viva voce while it may not be necessary for a dissertation. Both documents will henceforth be referred to as a thesis, unless stated otherwise. (Refer regulations in the Community Medicine Prospectus of the Postgraduate Institute of Medicine). There may be minor differences from what is stated here, depending on the requirements of the examination for which the thesis/dissertation is submitted.

Before I proceed further I would like to state five rules that should be observed in the preparation for a thesis.

(1) Do not borrow thoughts and writings of other authors and present them as your own. This is plagiarism which is dishonest, unethical and illegal under the law for protection of intellectual property rights.

(2) Do not use the name or initials of a patient, Bed Head Ticket number, or photographs of patients referred to in the text without "blotting at eye level" and without their permission. If photographs, tables and illustrations are those given by others, permission should be obtained to reproduce them (in some instances) and indicate the source.

(3) Do not exclude findings of the research that appear to be or are unfavour able to the anticipated outcome.

(4) Do not make inferences and draw conclusions from inadequate data.

(5) Do not manipulate the data to serve the research purposes.

2. Order of elements

The thesis consists of the following major parts (1).
2.1. Front matter
2.2. Body of thesis
2.3. Annexes and appendices

2.1. Front matter

The front matter consists of the following in the order given.

2.1.1. Cover (inside and outside)
2.1.2. Title leaf
2.1.3. Abstract
2.1.4. Table of contents
2.1.5. List of tables
2.1.6. List of figures and illustrations
2.1.7. List of abbreviations and symbols (if necessary)
2.1.8. List of annexes and appendices

2.2. Body of the thesis

The body of the thesis consists of the following chapters in the order given.

2.2.1. Introduction
2.2.2. Objectives (General and specific)
2.2.3. Literature review
2.2.4. Methodology
2.2.5. Results
2.2.6. Discussion
2.2.7. Conclusions and recommendations

2.2.8. Limitations [1]
2.2.9. Acknowledgements
2.2.10. List of references

2.3. Annexes and Appendices

[1] Limitations need not be presented as a separate chapter but may be included in the discussion to examine how the limitations have affected the study results

2.1. Front matter

2.1.2. Title Leaf

The title leaf should contain the title of the thesis on top, the author's name and degrees in the middle, and at the bottom of the page a statement that the thesis is submitted in partial fulfilment of the requirements for the degree of …….of the University of ….. .
(if applicable). Below this give the year of submission.

The title should neither be too short nor too long. If it is long make it shorter without losing its meaning. It should be relevant, clear and self explanatory. Abbreviations should not be used. I will give examples of titles used (T) make comments (C) and give the more correct title (CT)

Example: 1 (T) A study on accidents

(C) It is short and not self explanatory. The type, area of study where it occurred and the reference period is not given

(CT) Incidence of Road Traffic Accidents in the city of Colombo during 1999.

Example 2 (T) The prevalence of neuropathic foot ulceration in Sri Lankan diabetic patients attending the diabetic clinic of the Sri Lanka National Hospital, Colombo.

(C) The title may be shortened from 22 to 18 words without losing its meaning.

(CT) Prevalence of neuropathic foot ulceration among Sri Lankan diabetics attending the clinic at the National Hospital, Colombo.

Examples 3 (T) Risk factors for CHD among ……

(C) Prefix with "on some" and do not use abbreviations.

(CT) On some risk factors for Coronary Heart Disease among ……..

Note: It is not necessary to use prefixes such as " A study on" or "Investigations on …….

2.1.3. Abstract

The abstract is a summary of the research. "It should be written with serious thought and utmost care for precision and elimination of redundancy, obscurities and errors"(2) It should be given in one or two pages and include:

(1) Purposes or objectives
(2) Methodology
    Describe briefly the study area and units, design, sampling and size, collection of data, measurements, tests and equipment if used. Mention briefly the techniques and data analysis.
(3) Results
    Give the main findings and the significance levels with confidence intervals where relevant.
(4) Conclusions and recommendations

It is recommended that the abstract be written after the body of the thesis is completed. Below the abstract, give up to ten descriptors/key words or phrases for indexing and retrieval
Example - "Prevalence of endemic goitre among school children in Sri Lanka."

Key Words: Prevalence, endemic goitre, school children, Sri Lanka.

2.1.4. Table of Contents

Under each chapter heading list the main subheadings as in the text, giving the starting page. It will also include the page numbers of the list of references, annexes and appendices.

2.1.5. List of tables

List the table number, the caption and page number.

2.1.6. List of figures and illustrations

The list will include line graphs, histograms, bar diagrams, maps, photographs, illustrations etc. Give the figure number, legend and page number.

2.1.7. List of abbreviations and symbols (if necessary)

The list includes signs, symbols, units which have been abbreviated. This may not be necessary in most instances since the abbreviation is given within parenthesis after each "Full term" is used in the text for the first time. e.g. Medical Officer of Health (MOH). Subsequently the abbreviation may be used.

2.1.8. List of annexes and appendices

The questionnaire (in English), a medical record, picture or diagram and other records used in the study should be given as annexes. Explanatory notes, details of measurements, tests done, modifications of instruments, equipment used etc. should be given in appendices. The page number should be given if necessary.

Note: Pagination up to this point should be in Roman numerals e.g. I, III, V, VI, X after which it should be in Arabic numerals.

2.2. Body of the thesis

The main text should begin with the introduction and end with the limitations and recommendations. It should be divided into chapters, each being numbered in Arabic numerals. The word `Chapter' should be in capital letters, and be centred, without a period (full stop). The main headings should be in capitals and centred. The sub headings should be placed at the left margin, in lower case and bold type and be numbered in Arabic numerals (the decimal system may be used). The headings should be short, and abbreviations should not be used.

Under each of the sub headings, are paragraphs, each explaining one thought. Do not present a single line paragraph. If an author's statement is quoted it should be within double quotation marks "……", and the reference given. It should be given exactly the same way, including capitalization, spelling and punctuations, even though it may be considered wrong. If there is a quotation within a quote, this part shall be within single quotes '……'. If the author of the thesis wishes to interpolate a word or phrase for emphasis, this should be within a square bracket. It is unethical not to acknowledge the author quoted. If part of a quoted sentence is omitted, indicate this by three periods and if a paragraph is omitted indicate this by a full line of periods …….. Material that need not be included in the text but necessary as a clarification, give this in an appendix.

Write in simple language, check for grammar, spelling and punctuations, avoid colloquial language; e.g. words such as don't won't, can't. Avoid repetition and

redundancy. Initially, chapters may be written in any order e.g. literature review first, and bring them into the prescribed order later. Do not fail to include relevant literature that has been published, during the conduct of the study.

2.2.1. Introduction

The introduction is the first chapter which gives an overview of the study. Mention the background, rationale, justification and usefulness of the study.

The background may be given as a separate chapter if necessary. Describe the country where the study was done and give relevant information.

Give reasons why this study was selected and the location for it. It may be that the principal investigator (PI) is familiar with the area, good rapport is expected and also familiarity with this field of research.

If the same or a similar study has been done in this country or in another what are the reasons for this study? It may be to repeat a previous study for confirmation. This is not recommended for a thesis, which requires originality. If this type of study has not been done in this country it is useful. It may also be to rectify gaps in other studies. The magnitude of the problem may be a justification.

2.2.2. Objectives

The main or general objective is given followed by more than one specific objective. The general objective may be the same as the title, expanded if necessary to make it comprehensive and clear. Based on the general objective the specific objectives should be developed. These should be listed in such a manner, so that the construction of the questionnaire, review of literature, presentation of the results and discussion will have a logical sequence.

2.2.3. Review of literature

Literature available in books and journals on the proposed subject of study should have been searched before a final decision is taken on the research project. The search should continue throughout the study for the more recent publications. This search for relevant literature is essential although tedious and difficult in view of the paucity of journals in the medical libraries in Sri Lanka.

It is suggested that in the first instance to get a recently published article on the subject of interest or closely related to it and note the relevant references, and obtain reprints or photocopy them. There is an interlibrary loan system in place and this facility may be used. Other sources are data banks and review journals. A good source is a meta analysis on the subject such as the one on low birth weight by Kramer (3). Other search methods are Med-line, Index Medicus. Compact Disk Read Only (CD-ROM) and the Internet.

For electronic search the key words or short phrases may be used for retrieval. The availability of Internet facilities provides an easy access to required literature.

In the review, only material relevant to the study should be used although you may have more. The reviews should be given in an orderly manner, preferably in the same order as the stated specific objectives. Do not include all the results and conclusions given in the article, the p values may be given where relevant.

When citations are made in this chapter and in others, the Harvard or Vancouver system should be used: not both in the one document. The Harvard System is preferable for a thesis.

(1) Harvard system

In the Harvard system the reference in the text consists of the surname of the author(s) and the year of publication within parenthesis e.g. It has been shown that the prevalence of ……(Fernando 1986).

However, if the authors(s) form part of the sentences it is given as Fernando (1986) has shown that …… or stated that …..
If the publication cited is by two authors both surnames are given at each citation e.g. Fernando, Balasuriya.(1977).
If more than two authors, the surnames of all of them (in the same order as in the publication) followed by

year is given in the first instance, if cited subsequently the surname of the first author only is given followed by et al and the year.

If the citation refers to different authors with varying times of publication, they should be given in chronological order and separated by semicolons e.g. Fernando (1980); Balasuriya, Fernando (1988); Martens et al (1990) stated that …. If reference is made to more than one publication by the same author(s) in the one year, the letters a, b, c is used in lower case, after year.

(2) Vancouver system

In January 1978 a group of journal editors met in Vancouver, British Columbia, Canada and decided on a standard system for references both in the text and list of references for articles submitted to journals. This system has been adopted by several medical journals (4).

In this system the surname and year is not given as in the Harvard system but a number in Arabic numerals is placed as a superscript or given within parenthesis or square bracket at the end of the citation. These numbers should differ from those used in the text, using a smaller font. If this is also not possible use Ref. before the number within parenthesis e.g. (Ref.4). The numbers should run consecutively, the first citation being (1). If however another quote is taken from (1) at the fifth citation then (1) should be used again. If a statement made is relevant to more than one citation give the numbers separated by semicolons within a single parenthesis e.g. (1; 3;

8;11). The same numbering is used in the reference list (see later). Whichever system is used every citation in the text should be given in the reference list and vice versa.

(3) Common to both systems

The text may include "personal communications" and "unpublished observations". If it is a personal communication give the name of the communicator within a square bracket [M.A. Fernando, personal communication] or the name of the authors(s) if unpublished.

These should not be listed in the reference list. If a paper has been accepted for publication, this may be cited and the phrase "in press" should be added. It is advisable to limit the number of personal communications to the minimum.

2.2.4. Methods and Materials/Methodology

In a descriptive study without measurements use of laboratory equipment and tests, the chapter heading is methods (omit materials). In general the methodology should give sufficient details, so that another researcher could replicate the same, to determine whether the results differ or not.

2.2.4.1 Research Design

The research design is a framework or a strategy designed to collect relevant data from specified population units and process such data in a scientific manner to achieve the research objectives.

Research may be broadly classified as non-experimental or experimental. The non-experimental may be descriptive or analytic. Survey research is in general non-experimental (observational) Descriptive studies may be cross sectional and include one or more groups. Intervention studies may be either after intervention only or before and after. In both types, the intervention package should be described. Indicate what alternatives (if any) were used for the control group. Here the time lapses between the first assessment and the intervention and that between the intervention and the second assessment should be mentioned.

Analytic studies may be either case-control or cohort which may be historical or concurrent. In a case-control study, describe how cases and controls were selected, and their numbers since it is possible to have more controls than cases to improve the power. In cohort studies which may be one or more cohorts; indicate how obtained. Since they are prospective, indicate the observation period and what measures were taken to deal with losses.

Experimental studies are randomised (single or double blind) clinical studies or community trials (e.g. vaccine trials). They may be true or quasi experimental. Here the independent variable is

manipulated. Describe the research design used giving reasons why this design was used in comparison to others.

2.2.4.2. Variables

A variable is a characteristic of a person, family or group which may be qualitative (categorical) or quantitative (numerical). It has to be defined and expressed in operational terms this is referred to as operationalization. For example to operationalize waiting time in a diabetic clinic, "waiting time" should be defined. Is it the first visit or subsequent visits? Is it from the time of arrival to departure or from time of arrival to consulting the doctor or other health provider etc.? These findings may be qualitative such as long or short time or quantitative such as less than 10, 10-19, 20 or more minutes. These are then scored or graded for processing.

If the study is on some risk factors (independent variables) for a given outcome (dependent variable) indicate those that may be confounding and how this was dealt with initially or during analysis.

2.2.4.3. Study area, population and units

Indicate the area where the study was done. If not in the entire country, a map of the area and its surroundings may be given. The reasons for selecting this area should be explained. The study population may be an entire community, or special groups such

as married women, school children, occupational groups and elderly.

The general characteristics of the study population such as stability or mobility, clustering of groups (ethnic, religions etc.) chief occupation, may be useful information. It may not be practical to study all of them, hence, select a representative sample. The underlying principle is that each study unit should have an equal chance of appearing in the sample.

The study period should be indicated - a Gann chart may be helpful. If unexpected events occurred during this period, mention them and explain what action was taken to overcome or minimise their effects on the study.

2.2.4.4. Sampling and size

If the entire population is used, sampling is not necessary. In most studies a representative sample is drawn from a sampling frame or a reference population. There are several methods of sampling, one or more may have been used, indicate the method(s) used giving reasons. The sample size should be given indicating the formula used for its calculation. The symbols used should be described.

If an over sample is drawn it should be done at the time of the regular sampling. If used as replacements the first drawn should be the first replacement and so on. Do not permit the interviewer to make replacements.

2.2.4.5. Data Collection

1. Methods of Collection

There are several ways of collecting information for the study; these may be either primary or secondary data or both. If it is secondary data describe the source, how collected and by whom. Was the data obtained using a pre designed format or from available records such as Bed Head Tickets, records maintained by private institutions or doctors, other service providers (Family Health Workers) or from records or parts of them kept by health care users? Mention the reliability and limitations of such data. Unless it is pre-formatted data or from well maintained standardised records such data may not be suitable for a thesis.

In research a commonly used instrument is a planned, well-constructed questionnaire. This may be self or interviewer administered. The self-administered questionnaire may be completed also in groups under supervision. If it is interviewer administered it may be through a face-to-face interview, by telephone or by using electronic devices. The questionnaire may be mailed or hand delivered to the respondents. Explain what action was taken to ensure an adequate response rate.

I will deal chiefly with the face-to-face interviewer administered questionnaire.

2. Construction of the questionnaire

The construction of the questionnaire should be planned, and time spent will be rewarded. Prior to construction of a questionnaire to be used in a community study, it is suggested that discussions with key informants and focus groups be held in the community in addition to obtaining help and critical advice from the supervisors.

Although the questionnaire is included as an annex, give the general layout in the text such as sections and subsections.

Example:
Section 1 - Demographic and identifying information
Section 2 - Knowledge, attitudes and practices
Section 3 - Use of health care services etc

Indicate whether structured pre coded questions were used and whether the questions were open, closed or both. If some were open, state how they were categorised for processing.

(For details, refer Community Health Surveys: 4 Questionnaire Design, by Linda Lockerbie and W. Lutz published by the International Epidemiological Association, 1986, and other sources).

Another method of obtaining information is by **observation**. This may be useful for an in-depth study of some variables usually using a sample. It may be by participant observation where the investigator observes the respondents, while taking part in certain activities and communicating with

them, while the other is non-participant observation where the investigator observes openly or concealed without communication. Either method may be used in addition to the interview method. If, such a procedure was used describe how it was done, observation periods and by whom.

3. Measurements, tests and clinical examinations

If measurements, tests, clinical examinations and treatment are done, indicate how they were collated and linked with information.

If anthropometry was done, weighing scales, stadiometers, skin callipers and measuring tapes may have been used. Describe the equipment, their standardization and how the measurements were done ensuring validity and reproducibility. Indicate the time at which the weights were taken especially if it is a comparative study. Indicate the degree of accuracy employed e.g. to the nearest 0.01 kg, cm, mm. etc. If accepted standardized methods were used give the reference (5).

If the study involved measuring blood pressure state the type of instrument used; (usual or the zero-muddler sphygmomanometer). Were they standardized? How often were they checked? What precautions were taken to ensure validity? If several persons performed this measurement, how was the inter-investigator variability controlled? Did the PI check a sample to confirm the reading? In general, if equipment and, methods were modified, mention

them giving reasons. The modifications may be given in an appendix.

If the study was to determine the prevalence of endemic goitre among school children by the palpation method indicate how it was done, and the classification used (6). If it was that given by WHO, give reference. If ultrasonography was used to measure the thyroid volume, describe the apparatus (a portable one is available) and the echo patterns (7). The differences between the two methods may be discussed here or later.

If standard formats were used for example to test intelligence and development quotients, give the reference. If modifications were made to suit local conditions were they validated? If a questionnaire of another researcher was used with modifications, make reference to that researcher

If the study included collection of samples e.g. water, blood for laboratory analysis indicate the source, date, time of collection; type of container, labelling and transport to the laboratory. Indicate the time taken from collection to examination, how stored and examined, giving the name of the laboratory.

For tests such as for lead, fluoride and iodine, special precautions taken should be described.

Example: Iodine content of water.

"The sample was collected in iodine free containers transported to the laboratory of Department of Biochemistry, Faculty of Medicine, Peradeniya, stored at 4° C and examined within 24 hours using the

iodometer coupled to model 90-99 single function reference electrode and model 94-53 iodide specific electrode purchased from Orion Research Incorporated, USA, all measurements were done in plastic ware in a dust free air conditioned room maintained at 25° C" (8).

If urine or water is collected in the field for bacteriology indicate how they were collected, transported and examined without delay using standard procedures.

If stool specimens were collected in the field for geohelminth ova, indicate what advise was given to participants for its collection, volume required and to place it in labelled duppies (small glass containers with a spoon fitted to the cork). Describe how these were collected, transported and stored until examined. If a preservative was used mention what it was. How long after collection were they examined where done, and by whom? If standard accepted methods of examination were used, give the reference.

If blood specimens were taken (requires ethical clearance and informed consent) were disposable syringes used to ensure non-malefficience, and were the respondents informed of the volume of blood to be taken? Were standard procedures used to collect, label and transport the specimens to the laboratory, mention the time interval between collection and examination and how stored during this lapse of time.

If it was a prospective cohort study with one group having regular worm treatment for a period of time (e.g. Piperazine citrate) while the controls were given a

placebo, were the participants informed of the methodology? As a compensatory measure were vitamins added to the placebo and were the participants informed? Were the controls informed to use the usual treatment given to them at clinics and other medical care services?

In general the laboratory equipment should be described, how they were standardised or calibrated and what quality control measures were taken. Were the sensitivity and specificity determined?

4. Selection and training of interviewers

Selection

Indicate the category of persons selected as interviewers, how they were selected, the number; were they medical, non-medical or both? If medical, were they doctors, pre or post interns awaiting their appointments, nurses, public health nurses, family health workers, public health inspectors. If they were non-medical were they, sociology students, schoolteachers, members of the community and such like. Were they only of one sex or both? If of one sex give reasons. If both, give the number of males and females. What was the mean age of the interviewers? If the respondents were of different ethnic and language groups how was this dealt with? Were more interviewers than required recruited in case replacements were found to be necessary? If the sole interviewer was the principal investigator (PI), which is unusual, indicate what precautions were taken to

minimise a unidirectional bias. How many field supervisors were selected, how and why?

Training

Were each of the selected interviewers given a copy of the draft questionnaire prior to the training, requesting them to come up with any suggestions or comments? When and where was the training given? What was its duration? Was the training given to all on the same occasion or given to batches on different days? Was it by a single trainer (e.g. PI) or by more than one? If by more than one, how was uniformity ensured?

What methods were used for training, such as didactic lectures to explain the objectives, questions, prompts and probes? Were visual aids, role-playing and tape recordings used? Were the techniques of taking interviews (how the question should be asked) and the proper behaviour at the interview explained, so as to ensure cooperation and reliable information?

Were the interviewers trained on how to enter the data using symbols and numbers and to code them when necessary? Were they informed that the responses to open questions should be recorded verbatim and not to summarise them? If the space given in the questionnaire was not sufficient were they told what should be done? Were the interviewers trained to edit the questionnaire on site? If the PI had to return the questionnaire to the interviewer for needed corrections, was it explained how it should be done, such as a revisit? What measures were taken to confirm that the revisit was made? Were the

interviewers informed that information obtained is strictly confidential? Was informed consent obtained, and how this was done.

5. Pretest

Pre testing is a try out of the draft questionnaire. Was it discussed with colleagues, friends and the supervisor(s)? Was it tried out on persons other than the study units, but having similar characteristics? Where was it done? Did the respondents including the least intelligent, understand the questions? Were the delays in responding due to illogical sequencing of questions? Were the respondents embarrassed at some questions especially the sensitive ones? What were their comments and were these recorded? Were some of these used in redrafting the questionnaire? Were the responses to some questions placed in the "dumping" category because they were not clearly stated? Were these modified so as to obtain more positive responses? Were the prompts and probes effective, or had they to be modified or changed?

How many of the selected interviewers were used? If not all, give reasons. Was the rapport satisfactory? Had changes to be made to improve this? Was the inter-interviewer variability checked? Was a "mini reproducibility" check done? After the pretest was the questionnaire redrafted and retested?

6. Pilot Study

"A pilot study is a 'dress rehearsal' of the drama of data collection and analysis"(9). It is an essential precursor to the study proper. Where was this

conducted? Was it in an area with similar characteristics of the study population, but not in the study area? What was the size of the sample? Did the selected interviewers conduct it and were they supervised? Were there further corrections to be made? Were the findings quickly processed (pilot analysis) and redundant and unreliable questions eliminated? What was the average time required per questionnaire? This may help to revise the timetable.

If measurements and tests were included in the questionnaire was a rehearsal done of the methods and materials, so that the observations could be used in the main study which is to follow.

7. Implementation

Mention the measures taken to effectively administer the study. eg. Were the interviewers allotted quotas to be done within a specified time frame? Were some interviewers given more than the others? If so why? If cluster sampling was used how were these allocated; at random or for convenience? Was a suitable introduction made to obtain informed consent? If some respondents were not contactable or refused to participate were replacements made and how? Was the over sample used correctly? Was an attempt made to obtain the reasons for refusal? Was it possible to obtain some identifying information from them? Were there problems in selecting controls? What were they and how were they dealt with? Did the field supervisors monitor the progress of the study? How many of them? Was the response rate adequate? If not

what action was taken to improve it? If the study included taking measurements, tests and clinical examination, were these performed as planned?

8. Editing, Coding and Analysing

Editing, coding and analysing is usually done after completing the study. However, it should be planned in the stage of preparation and mention how these were done.

Editing

Data editing is a continuous process and should be done by the interviewer at site, the field supervisors and the PI, before processing. Immediately after the interview and before leaving the respondent the interviewer should check the questionnaire for completeness, contradictions, possible wrong answers, and for inconsistencies using the in-built "check" questions. Further editing should be done by the field supervisor and the PI. Cleaning data could be done by the computer. Mention the procedures used for editing.

Coding

Coding is transforming the responses into numbers for analysis. If pre coded single choice questions were used then the codes given may be directly punched into the computer. However if multiple response or open questions are used they will need hand coding or derived codes.

It is therefore better to have "boxes" in the right margin of the questionnaire to enter the appropriate codes. This will also help the data entry operator. How were the responses given to open questions transformed into options and coded? Was it done by the PI, another person or by a panel consisting of persons knowledgeable in the subject? Were the answers to the given option - "others-specify" categorised and coded to be used in the analysis? If so, how was this done? Was a coding guide prepared and used?

Analysis of data

The information obtained through questionnaires, other records, measurements and tests are referred to as raw data. On examination of such data, obvious errors may be detected. The data entry operator may make some errors. Therefore, obtaining frequency distributions and basic tables may be helpful to detect errors. If these are not corrected at this stage, these will continue unnoticed into further analyses. Was the data cleaned before analysis? How was the data analysed? If a computer was used indicate the software packages. What data was rejected? Give reasons for rejections.

2.2.5. Results

The chapter on results is meant to present the findings of the study and their interpretations. The results are a mix of brief texts, tables, bar diagrams, histograms and other illustrations. These should be placed close to the first reference in the text.

This section should be planned to answer the questions posed in the specific objectives in an orderly manner. Since a computer is used for most theses, it can produce tables, diagrams, graphs, significance tests, p values and 95% or 99% confidence intervals etc. Mention the significance test used, and indicate the level of significance and the confidence intervals. Do not give the results of significance tests to several decimal places, although the computer may do so. The degree of accuracy should not be grater than that of the measurement. Some of the computer derived data may be irrelevant and should not be used so as to increase the number of pages of the thesis. However, do not omit data which is necessary for the reader or examiner to assess the findings critically. Consult the statistician once again.

It is stated that "it is the essence of science to disclose both the data upon which a conclusion is based and the methods by which the conclusion is attained"(10).

I will not give details for the construction of tables and figures but offer some comments. (Refer Presenting survey information by Joycelin Chalmers and W. Lutz published by International Epidemiological Association, 1989 and other sources).

2.2.5.1.Tables

1. In general, tables are used to tabulate the data. An initial table should be given describing the study units their number, and if two or more groups are used to show comparability. The number of study units (n) should be the same in subsequent tables, however, if

it differs, the reasons should be given in a foot note to each such table.

2. The legend (title) of the table is placed above the table and they are numbered consecutively in Arabic numerals. It should be short, clear, self-explanatory, and should include the horizontal and vertical components. In my opinion it is unnecessary to begin each legend with "Distribution of …" or "Frequency distribution of …" except the initial tables showing frequency.

3. In a table use only horizontal lines to separate the variables from the numerical data and if necessary to divide the same table into sections. Each row and column should be clearly labelled.

4. Do not overload the table; it should contain data on one aspect and be self-explanatory. If necessary make two or more tables.

5. In order to emphasis the basic requirements of a table an example is given of a poorly constructed one (T) comments(C) and the corrected table(CT).

(T) Table I Death rates by age.

Age	Death rate
1 2 3 Unspecified	30 20 10 02

(1) The table number should be in Arabic numerals
(2) The legend is inadequate and should not have a 'full stop'.
(3) Is the age in months, years or intervals?
(4) The reference year is not given.
(5) The base for the death rate is not given
(6) The totals are not given
(7) Vertical lines given

(CT) Table 1. Age specific death rates in 1995 for Sri Lanka

Age in years	Population	No. of deaths	Death rate*
**<1			
1-4			
5-9			
10-14			
Unspecified			
All ages			

- give relevant numbers
* Death rate per 1000 relevant population
** Death rate per 1000 live birth

6. Percentages and proportions are calculated based on the number of respondents (n) and not on the sample size. If the percentages total adds to (e.g.) 99.8 or 100.2 give it as that and not as 100.0, these differences are due to rounding of figures. Give percentages correct to one or two decimal places. Do not give a percentage as 50 (often so in a computer

print out) but as 50.00. It is also permitted to give percentages within parenthesis. Check the tables for totals of numbers and percentages.

7. If abbreviations, codes or symbols are used, explain them in either the text or in a footnote to the table.

8. A table cannot stand by itself, it should have an accompanying text. However do not repeat the data that is clearly given in the table, but refer to any important observations and those that should be stressed.
9. If the data is extensive give it in an appendix (e.g. Crude death rates in Sri Lanka 1900-1995).

10. If a table has been borrowed give the source in a footnote. It is unethical not to do so

2.2.5.2. Graphs

1. A graph consist of one or more lines plotted from one point to another to give a visual impression of the data given in a table, therefore it is not a substitute for a table. The purpose of a graph is to help the reader to visualize changes in magnitude and direction.

2. A graph has a vertical line (ordinate or x axis) and a horizontal line (abscissa or y axis) placed at 90 degrees; what they represent should be indicated. The x-axis usually gives the frequency variable while the y-axis usually the independent variable. It is best that the vertical axis begins at zero.

3. The scale of one axis should not be exaggerated compared with the other, such changes distort the graph. As a general rule the vertical axis should not be more than 75 percent the length of the horizontal.

4. The graph should not have many criss-crossing continuous lines, which is confusing. They may be in different colours or use lines that are discriminating such as ……. If the number of lines are many, use two graphs e.g. one for non-communicable, and the other for communicable diseases.

5. If a graph is meant to show a trend with time, (e.g. sex differences in mortality rates in Sri Lanka 1900-1955) then use of semi logarithmic graph paper will show better the magnitude of the increase or decrease in the rates.

2.2.5.3. Other diagrams

1. Qualitative data (categorical)

A bar diagram indicates pictorially the absolute number, frequency, proportion, percentage or rate, using bars of two or more variables. The length of the bar represents the value of each variable, irrespective of its width.

A pie chart refers to a single variable which is represented by a circle divided into segments. The size (area) of each segment is proportional to the percentage of persons or events in that category, e.g. distribution by age groups. The age groups may need to be amalgamated since small percentages may not

show clearly in the diagram. If these percentages are fed into the computer a pie chart may be obtained. These segments may be indicated in different colours, or different cross-hatchings or the value e.g. percentage may be written within each sector or on the side of the relevant sector.

2. Quantitative data (continuous)

The histogram is a diagram of vertical blocks or rectangles representing frequency or percentage components of a single variable. The widths of the rectangles (not length) are proportional to the values.
A frequency polygon is a line diagram connecting the plotted frequency points of one variable. This may give an indication of the kurtosis and type, skewness and whether it may be considered a normal curve. It may also be constructed by joining the mid points of the tops of rectangles in a histogram.

A scatter diagram is a representation with dots, each being the value of one variable with the other in the same person, for several persons e.g. pulse rate versus body temperature.

It is to check for possible association between the two variables. It may indicate no association, complete positive (+) or negative (-) correlation. The magnitude of the association may be calculated as the coefficient of correlation.

Note (1) For details consult a book on statistics

(2)The legend for a figure is usually given below the figure, numbered consecutively in Arabic

numerals starting with 1, independently of the numbers given to tables. The legend should be clear and self-explanatory.

2.2.6. Discussion

This chapter is difficult to write but the time spent on planning and writing it will be rewarding. The discussion should be based on the specific objectives or hypotheses, study design, methodology and results. It should be written in an orderly and logical manner. It may follow the same order as given in the specific objectives.
The material given in the previous chapters should not be repeated in detail, but pick out some important and relevant aspects for discussion. If the selected design differed from that of others, give reasons and discuss. Mention deficiencies (if any) in the methodology giving reasons and how they were minimised. State the main findings and discuss.

Mention and discuss the findings of other researchers on this subject, whether different or not. If there were deficiencies or gaps in their studies, indicate how these were overcome in the present study. Mention and discuss how reliability and validity of the data was ensured. Mention what data (if any) which indicated possible unreliability, was excluded.

Discuss the implications of the findings and possible areas for further research, indicating possible next steps.

2.2.7. Conclusions

The conclusions may be given in a separate chapter. They should link the goals, objectives and hypotheses with the findings of the study. Do not draw conclusions from inadequate data. Are they internally valid and not generalizable? Do not draw conclusions based on the PI's experience or emotions, but from facts shown in the study.

2.2.8. Limitations and Recommendations

The limitations of the study often form part of the discussion. In a thesis it may be necessary to indicate the limitation of time, money, manpower and facilities to mitigate for not having a more comprehensive and fuller study. However, if the limitations are serious, it may be due to poor planning, if so, the study should not have been done.

Mention the inherent and inadvertent biases and how they were dealt with. If unexpected events occurred during collection of data such as population displacement, natural disasters, civil commotions, disruption of transport and closure of schools and universities mention these as a justification for the response rate being less than anticipated. Ethical considerations may be a limitation in certain circumstances.

Recommendations should be relevant, practical, feasible, and clearly stated, giving a strategy for their implementation. These should be based on research

findings: Recommendations are necessary in Health Systems Research.

2.2.9. Acknowledgements

These may be given in three paragraphs.

1. Technical help

Mention the names and acknowledge those who gave technical help and advice. If laboratory tests were done, acknowledge the laboratory and those who performed the tests. If measurements were taken acknowledge those who did them. If the required materials were given or loaned for the study acknowledge this.

2. Contributors

Acknowledge the help and guidance given by the academic supervisors and others. Thank those who collected the data, participants and those who processed the data and typed the document

3. Financial

Acknowledge those who funded the study and gave material help.

2.2.10. References

The last chapter of the main text gives the list of references of the literature reviewed and cited. All citations should be in the reference list.

In general, the order in which a reference is given is as follows:

1. Author-may be a single author as for a thesis, or more than one. The surname followed by initials is given. If more than one, the chief author's name is given first. If there are more than five contributors, the Latin term et al (and others) is given after the fifth name. It may also be a corporate author (group author).

Note: It has been recommended that the year of publication be given after the name(s) of authors in addition to the usual (Please see Ref 1-note on P.8.)

2. Title of article or book, if book give edition
3. Full name of the journal (not abbreviated) or if it is a book give the name and address of the publisher.
4. Year of publication
5. If it is a journal article, give the volume in bold type.
6. Page numbers (beginning and end) if it is a journal article, if for a book give the page number(s) where the citation many be found.

The sequence of listing is different between the two systems. In the Harvard system it is in alphabetical order of the surname of the first author, similar to that in a dictionary, irrespective of the point of citation in the text. In the Vancouver system the

sequence is ordered according to the superscript number given for the citation.

In the Harvard system if more than one article of the same author is cited, they should be given consecutively in the order of the year of publication.
e.g. Fernando M.A.....1983
Fernando M.A. 1985
Fernando M.A, Balasuriya S. 1987

Do not use the Latin term ", ibid" (same author) but repeat the name. If more than one article by the same author published during one year, is cited use (a) (b) (c) after the year and list in the order of the month of publication
e.g. Fernando M.A.....1986(a)
Fernando M.A. .....1986(b)
Fernando M.A. .....!986(c)

In the Vancouver system the first citation in the text is placed first in the list and so on. If an author is cited with the superscript (1) and the same article is re-cited on the 8th occasion in the text, then (1) in the reference list holds. However if the same author is recited with reference to part 2 of the same article (having different page numbers) or another article in the same journal or in a different one at the 8th position in the text, then this should appear as (8) in the reference list.

Examples:

1. Journal article - single author. Fernando J.S. The prevalence of neuropathic foot ulceration in Sri Lankan diabetic patients attending the diabetic clinic

at the Sri Lanka National Hospital, Colombo. Ceylon Medical Journal 1996;41:96-98.(note positioning of the semicolon and colon).

2. Corporate author : e.g. World Health Organization (WHO) Ministry of Health, Department of Census and Statistics and other research groups.
WHO, Diabetes Mellitus. Technical Report Series. No. 727, Geneva 1985. If an individual has an article in a WHO publication; Jeyaratnam J. Survey of pesticide poisoning in Sri Lanka. Bulletin of the WHO 1982;60:615-19.

3. Book.
Hetzel BS. The story of Iodine deficiency Oxford University Press.1989. (Give edition number if available after the title).

4. Chapter in a book
Herath HMSSD. Prevention of occupational disease. In Occupational Health-a hand book for doctors eds. Seneviratne R de Alwis, Herath HMSSD., Fernando D.N. Lankatilleke K.N. Department of Community Medicine, Faculty of Medicine. University of Colombo, Sri Lanka.1998:91-99.
5. Proceedings of conference, workshop etc.
Fernando M.A. Similarities and dissimilarities between systems of medicine. In V. Basnayake (Ed). Traditional medicine and medical school curriculum Proceedings of a workshop, 5th December 1987. Faculty of medicine, Peradeniya, 1988;108-124.

6. Dissertation./Thesis
Give name of author, title(Dissertation/Thesis) give name of University or Institution to which it was submitted and the year it was accepted.

7. Article accepted but to be published. Give author/s, name, title of article, name of Journal (In press)

8. Unpublished papers or personal communications should not be listed, however they may be mentioned in the text. Avoid listing abstracts.

Note (1)- See Ref 4 in the reference list of this document - Examples of correct forms of references-p.340.
(2) A summary for listing the commonly used references is given in page 50.

2.3. Annexes and Appendices

Annexes consist of material used for the study but not included in the body of the text. The questionnaire, translated into the appropriate language, should be an important annexure for a thesis or a dissertation. Others may be maps, photographs etc. that were used during the study.

Appendices consists of additional information such as details of tests or their modifications, detailed tables which are not essential in the text, but may serve as further explanations.

Both annexes and appendices are numbered using the capital letter of the alphabet consecutively starting with A. independently of each other.

Continue the pagination from the text in Arabic numerals.

References

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Summary - Format for listing references

Type of Reference	Author/s	Title	Name of Journal	Publisher	Year	Volume	pp.
1.Journal individual	+	+	+	-	+	+	+
2. Corporate	+	+	+	-	+	+	+
3. Editorial	-	+	+	-	+	+	+
4.Anonymou s	Anon	+	+	-	+	+	+
5.Book	+	+	Edition/	+	+	-	?
6.Chapter in book	+	+	*	+	+	-	+
7.Monograph number	+	+	Number	+	+	-	+
8. Proceedings	+	+	**	+	+	-	+
9.Thesis/Disseertation	+	+	T/D	-	+	-	-
10.Newspaper	+	+	Name	+	Date	-	+
11. Magazine	+	+	Name	+	+	?	+

Note: See reference 4 given in this article for details

* In. Ed(s) Title

** In., eds, date conference/seminar held

Postgraduate Institute of Medicine

University of Colombo

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Colombo 7