Postgraduate Certificate
in Public Health

Module Guide
Measuring Health and Disease I: Introduction to Epidemiology

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School of Public Health
University of the Western Cape

Postgraduate Certificate in Public Health

Module Guide

Measuring Health and Disease I: Introduction to Epidemiology

Module Registration Number: 881520
Value of module: 20 credits
Study time required: 200 notional learning hours
Pre-requisites: None except those in the Rules for Admission

Qualifications serviced by this Module:
Postgraduate Certificate in Public Health

Study Materials for this module:
Module Guide, Module Readings and a copy of
J. P. Vaughan and R. H. Morrow's *Manual of Epidemiology for District Health Management (available online)*

Module Convenor: Ms Elize Batiste

Measuring Health & Disease I

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Vision Statement of the School of Public Health
University of the Western Cape

The **Vision** of the School of Public Health is to contribute to the optimal health of populations living in a healthy and sustainable environment in developing countries, particularly Africa, with access to an appropriate, high quality, comprehensive and equitable health system, based on a human rights approach.

The **Purpose** of the School is to contribute to developing policy-makers and implementers who are knowledgeable and skilled in the principles and practice of Public Health, whose practice is based on research, influenced by informed and active communities, and implemented with a commitment to equity, social justice and human dignity.

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I MODULE INTRODUCTION

1 LETTER OF WELCOME

School of Public Health (SOPH)
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Dear colleague,

Welcome to the module, Measuring Health and Disease I: Introduction to Epidemiology. This module was designed to meet the growing need for an applied course in the measurement of a variety of health indicators and outcomes. Whether you manage a health programme, a health facility, or simply have to interpret health data in the course of your work, this module sets out to increase your capacity to deal with health and disease information. It aims to assist you in applying epidemiological knowledge and skills to a variety of Public Health problems such as:

- *Is your DOTS programme succeeding?*
- *What does it mean if a TB prevalence is 850/100 000?*
- *Is this a Public Health problem or not?*
- *What is the "burden of disease" in different communities?*

Although the module also addresses many of the topics usually associated with the traditional approach to epidemiology, e.g. rates, screening, surveillance, causation, etc, it embraces a wider perspective on health measurement. It does this by addressing the social determinants of health as well as known biomedical features of community health. In addition, emphasis is placed on the application of epidemiological concepts and methods to solving Public Health problems.

The module is designed for self-study or flexible learning, which enables you to work through the course material at your own pace. Flexible learning also allows you to explore the material to whatever depth you prefer, and to skip over parts with which you are already familiar. This involves a variety of learning activities including reading, reflection, observation, analysis, research, calculation and application of theory and concepts to practice.

The Module Introduction outlines the module aims, learning outcomes and content that will be covered. It also includes the facts, figures and other information that you need to know about your assignment tasks and how they will be assessed, how to develop a work plan and other general information to help

you complete the module.

We would greatly value your feedback on how you found the experience of completing the Module. For your convenience, please use the Module Evaluation Form located on this site. We suggest you complete the Evaluation Form soon after you complete the module.

We hope that you will enjoy the module and find it useful in your own efforts to improve community health.

Sincerely

Elize Batiste
Module Convenor

2 INFORMATION ABOUT THIS MODULE

2.1 Module Aims and Rationale

The Vision of the School of Public Health is to contribute to the optimal health of populations living in a healthy and sustainable environment in developing countries, particularly Africa, with access to an appropriate, high quality, comprehensive and equitable health system, based on a human rights approach. The aim of this module is to enhance the measurement skills required to achieve this vision.

The module is designed to advance your skills, knowledge and capacity to:

- Critically review and interpret basic epidemiological texts.
- Define and measure health and illness events in communities.
- Assess the quality and relevance of data used to describe community health and illness.
- Apply descriptive epidemiology concepts and principles to achieve effective Public Health practice.

The module explores practical ways to measure health and health care outcomes in the course of your work. It also aims to equip Public Health workers in health programmes, health districts or other health facilities with the ability to critically assess the epidemiological information that they encounter, and to use this information to address Public Health problems and priorities.

2.2 Module Outline

The module consists of three units divided into a total of 15 study sessions. Each study session has at least one main reading or reference text and various learning activities or tasks designed to help you to explore the topics listed below. Study sessions vary in length, and may take between five and eight hours to complete. The three units are as follows:

Unit 1 - What is Descriptive Epidemiology?

Unit 2 - Measuring Health and Disease.

Unit 3 - Health System Applications.

The final session of each unit has been designed to assist you in preparing your assignments.

2.3 Learning Outcomes

By the end of this module, you are expected to be able to:
▪ Use appropriate indicators to measure health and disease. ▪ Describe health data using simple bio-statistics. ▪ Use simple graphical representation techniques. ▪ Critically read scientific literature. ▪ Interpret epidemiological data. ▪ Report an epidemiological event.

2.4 Texts and References

The following text is required for this module in addition to the Module Readings, and can be found online in pdf format:

- Vaughan, J. P. & Morrow, R. H. (1989). *Manual of Epidemiology for District Health Management.* Geneva: WHO. [ISBN 92 4 154404 X] [Online], Available: http://whqlibdoc.who.int/publications/924154404x.pdf [Downloaded 20/08/2010].

It would also be useful to own a copy or to borrow copies from a library of the following books:

- Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S. (1997). *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press. [ISBN: 0 19 571308 7]
- Beaglehole, R., Bonita, R. & Kjellstrom, T. (1993). *Basic Epidemiology.* Geneva: WHO. [ISBN 92 4 154446 5]

These books are available from Van Schaiks Bookshop, Parow (021 930 2480; fax 021 939 3767) or you can order them by e-mail: rsmith@vanschaik.com or vsparow@vanschaik.com.

You will also be expected to pursue relevant current literature and additional resource material for your assignment tasks.

Relevant Websites

The following websites may be helpful to you in the course of this module:

CDC	http://www.cdc.gov
WHO	http://www.who.int
Statistics South Africa	http://www.statssa.gov.za
Health Systems Trust	http://www.hst.org.za
World Wide Web Virtual Library: Epidemiology	http://www.epibiostat.ucsf.edu/epidem/epidem.htm
Dictionary of Epidemiology	http://www.kings.cam.ac.uk/~js229/glossary.html

Supercourse: Epidemiology, internet & global health	http://www.pitt.edu/~super1/

2.5 Module Evaluation

Once you have completed this module, we would appreciate it if you could fill in the evaluation form. A link to the evaluation form is located on the webpage menu. Please let us know how you find it as this will help us to improve the module for future students.

3 ASSESSMENT

3.1 Information about Assessment

Self assessment is built into the module in the form of Tasks, allowing you to check your progress and to study actively. You should try to do the tasks, as this is the best way to learn.

Two compulsory assignments are required to complete the module. It is important for you to take note that:

- The first assignment contributes 40% towards your final mark; and
- The second assignment contributes 60% towards your final mark for the module.

You will be allowed to rewrite your first assignment if you get less than 50%, because it is regarded as formative assessment. However, for the summative assessment (Assignment 2), you must pass with 50% or more, with no possibility of a rewrite.

3.2 Assignments for *Measuring Health and Disease I*

Preparing for the Assignments

Work through the module unit by unit completing the readings and the tasks as you go along. Without doing this, you will not understand the epidemiological concepts and calculations you must apply to the data. The final session of each unit will guide you through the assignment. Please note that this module requires you to follow a systematic process. You will not succeed if you start the assignments at the last minute.

Assignment Introduction

For the purposes of this assignment, assume that you are a Provincial Epidemiologist, and that your job is to report to your Ministry of Health on health priorities for the coming year based on the data coming from your province.

There are two assignments for this module, and drafts are encouraged for both. For Assignment 2, five marks have been allocated for the Draft. Together the two assignments will form an Epidemiological Report on a Public Health situation in a particular region.

The assignments require you to analyse a set of authentic data (see section 3.3) which has been presented to your office. Pretend that this data relates to the region where you work. First, you must find out more about the health condition reported in this data by reading some of the literature on this topic and writing a literature review; then you will analyse the data, and apply the concepts and measurement tools of epidemiology to it. Finally you will submit a written report in which you summarise the dataset and provide evidence of your analysis of the health status of this community.

The report is required to follow a specific format which is outlined in your module. In the report, you will make recommendations to the Ministry of Health office so that action can be taken. Remember that ultimately your report must be credible and convincing enough to persuade your manager and other officials to take action.

Your report should meaningfully describe what the data set provided in section 3.6 seems to be telling us about the state of Public Health in this province/region; based on this description, you should offer some advice and recommendations on how to understand and address the Public Health problems more effectively in future. In summary you will:

- describe what is evident in the data;
- read the literature on this condition and review it;
- assess the information evident in the data and present it in graphic form;
- compare it with what the literature says about this/these condition/s and make some appropriate recommendations which are directly related to your findings.

These findings will be used to guide Public Health interventions that will improve the health of the affected community. Remember that ultimately your report must be credible and it must persuade your manager and other officials to take action.

Please note:

- The quality of the data may influence your ability to carry out this task. Comment on this in your report.

- There may be sections of the population with positive attributes. Identify and comment on this phenomenon. Is there anything that could be learnt from this information which would assist in improving the health of other parts of the population?
- To clarify issues, prepare a few graphs or small summary tables to illustrate your report.

Here are the assignments. Further guidance can be found in the last session of each unit.

ASSIGNMENT 1: WRITE A LITERATURE REVIEW ON A SPECIFIC HEALTH PROBLEM IDENTIFIED IN THE DATASET

This section should be approx. 800 words long excl. Reference List.
40% of module result.

Note: One page in 1,5 spacing using Times Roman 12pt contains approximately 400 words.

For Assignment 1, you are required to write a critical review of the literature relevant to the Public Health problem identified in the dataset. Unit 1 Sessions 4 and 5 provide specific guidance on writing a critical literature review.

Assignment Instructions

Here is the process you could follow:

- Study the dataset provided and take note of the key health problem covered by the data.
- Spend several hours in an academic library or on the Internet and conduct a literature search on the health problem identified in the dataset. Gather at least ten journal articles, research reports, statistical reports or chapters in books which are relevant to the key areas of this health problem. You are welcome to use any relevant sources of information, e.g. local health reports or data sets. The literature may, for example, help you to define the health condition, to explore its natural history in detail, to understand the risk factors for it and to study previous interventions in comparable contexts.
- Define any new terms or concepts you encounter.
- Use this process to become familiar with the dataset and to clarify the main health problem that it addresses.
- Read and critically review this literature using the guidance in Unit 1 Sessions 4 and 5. During this reading process, identify a set of sub-topics or themes to structure your literature review, which will throw light on this health problem, e.g. Risk factors for this health condition.

- Write down all your references in full and prepare your reference list according to the Harvard Referencing MethodUse these criteria to guide your assignment.

Assessment Criteria for Assignment 1	**Marks**
a) The student provides a critical review of literature relevant to the dataset.	25
b) The literature review is well structured, clearly expressed and typographically sound, i.e. free of errors.	5
c) Correct use of referencing.	10
Total	**40**

ASSIGNMENT 2: A REPORT ON THE HEALTH PROBLEM IDENTIFIED BY THE DATASET
A typed report of 6-8 pages, but definitely not more than 10.
60% of module result.

For Assignment 2, you are required to improve your literature review using the feedback you received, and undertake an analysis of the data. You will present your findings (results) in graphical form (as graphs or tables) to show evidence of your analysis. You will describe and interpret your findings, and provide some recommendations for intervention, based on the literature and your own understanding of the problem. The report should be a reader-friendly and convincing response to the health problem revealed by the dataset and should provide the basis for a health authority to intervene to address the specific Public Health issue reflected by the data.

Session 5 of Units 2 and 3 will guide you through this assignment. You will have to manage your time well, as you are required to send in a draft up to two weeks before, but preferably well before the assignment deadline.

Analysing the Dataset

Take another look at the dataset in section 3.6 and identify some of the more prominent features of this Public Health problem, e.g. are more women affected than men? You will be guided through the process of analysing such data in the course of the module. You will, for example, calculate infection rates, compare percentages of the population affected, calculate medians in the infected

population and frequency distributions of particular variables. These findings (results) can be used to guide Public Health interventions to improve the health of the affected community.

Please note:

- In real life, data is not always perfect. The quality of the data may influence your ability to carry out this task. Comment on the data quality in your report.
- To clarify issues, prepare a few graphs or summary tables to illustrate your analysis.

The structure of your report should be as follows:

- **Introduction** to the health problem identified in the dataset and the purpose (aims and objectives) of the report (100 words)
- A revised **Literature Review** using your lecturer's feedback (approx 800 words)
- Findings or **Results** of your analysis of the data containing graphs and tables to illustrate your results; discussion of the limitations of the dataset (approx 800 words)
- **Discussion** of the Findings (approx 400 words plus diagrams and tables)
- **Conclusion and Recommendations** (approx 800 words)
- Revised **Reference List**

Assignment 2 is likely to be 6 - 8 pages in length and not more than 10.

Assessment Criteria for Assignment 2	**Marks**
a) Submission of a Draft (in time for feedback).	5
b) Revised literature review.	5
c) Systematic analysis of the dataset and information using description and graphical illustrations.	20
d) A clearly articulated, logical interpretation and discussion of the main findings.	10
e) Convincing argument for recommendations.	10
f) Clear, well-structured and typographically sound report, i.e. free of errors.	5
g) Correct use of referencing	5
Total	**60**

3.3 Assignment Data Set

Here is the data that you are expected to analyse, assess and report on.

The two assignment tasks will assist you in preparing this report – the **Final Assignment Task**, described above. You will need to assess the data, and then summarise and interpret it before constructing a report highlighting its main features and what this means for the health system.

Prepare a short report on the impact of HIV/AIDS in South Africa using the 2004 figures provided.

HIV and AIDS indicators, mid-2004

Births	
Uninfected births (over calendar year)	1 010 000
HIV+ births (over calendar year)	37 000
Infected through breastfeeding	26 000
People living with HIV/AIDS	
Total HIV infected	5 024 000
Adults (18-64)	4 728 000
Adult men (18-64)	2 180 000
Adult women (18-64)	2 548 000
Adults (15-49)	4 510 000
Adult men (15-49)	1 959 000
Adult women (15-49)	2 550 000
Youth (15-24)	961 000
Male youth (15-24)	225 000
Female youth (15-24)	736 000
Children (0-14)	245 000
New infections	512 000
Incidence in 2004 (%)	
Total population	1.3
Adults (18-64)	1.9
Adult men (18-64)	2.0
Adult women (18-64)	1.7
Perinatal (of births)	3.6
Breastfeeding (no. infected through breastfeeding/uninfected births in year)	2.6
Number adults (14+) infected by stage	
Stage 1	1 476 000
Stage 2	1 098 000
Stage 3	1 671 000
Stage 4 (those on treatment & those who have discontinued treatment)	534 000
Number children (<14) infected by stage	
Pre-AIDS	211 000
Stage 4 (those on treatment & those who have discontinued treatment)	33 000
AIDS sick	

New AIDS sick during 2004	419 000
Total AIDS sick mid-year	525 000

Notes

- Numbers rounded to nearest thousand to avoid spurious accuracy
- Total mid-2004 population = 45 672 727
- U5MR Under five mortality rate, the probability that a newborn dies before reaching age 5, 5*q*o (usually expressed as number dying out of 1 000 newborns)
- 45Q15 The probability of a 15-year old dying before reaching age 60, 45*q*15 (expressed as a percentage)
- Stages of HIV/AIDS used in this report)
  1. WHO stage 1: Acute HIV infection
  2. WHO stage 2: Early disease
  3. WHO stage 3: Late disease
  4. WHO stage 4: AIDS
  5. Receiving antiretroviral treatment
  6. Discontinued antiretroviral treatment

Population size and HIV frequency by age and sex, 2004

	Population		Cases of HIV	
Age	**Male**	**Female**	**Males**	**Females**
0-4	2511339	2477928	90408	89205
4-9	2611379	2584841	31337	31018
10-14	2381627	2364159	0	0
15-19	2188920	2190422	10945	166472
20-24	2249752	2303214	213726	568894
25-29	1933680	2005949	450547	595767
30-34	1715138	1843299	452796	494004
35-39	1424714	1600347	354754	363279
40-44	1264405	1448927	280698	243420
45-49	1031642	1205309	196012	115710
50-54	818920	970198	125295	36868
55-59	625833	786487	69467	7865
60-64	454030	625186	26334	1250
65-69	324353	494562	3244	0
70-74	222065	364607	0	0
75-79	143988	255525	0	0
80-84	81374	161355	0	0
>=85	47113	117413	0	0
Total	**22030273**	**22799730**	**2305563**	**2713752**

Mortality indicators, 2004

Deaths	
Total deaths during 2004	701 000
Non-AIDS deaths during 2004	389 000
AIDS deaths during 2004	311 000
Accumulated AIDS deaths mid-year	1 212 000
Percentage of deaths due to HIV/AIDS	
Adults (15-49)	70%
Adults (15+)	45%
Children (<15)	42%
Total deaths	44%
Mortality statistics	
Infant mortality rate (per 1000)	56
Child mortality rate *(5q0)* (per 1000)	87
Adult mortality *(45q15)*	54%
Adult male mortality *(45q15)*	60%
Adult female mortality *(45q15)*	48%
Life expectancy	
Life expectancy (*e0*) (years)	51.0
Male life expectancy (*e0*) (years)	48.9
Female life expectancy (*e0*) (years)	53.1
Maternal orphans (under 18)	
Total orphans	1 126 000
Total AIDS orphans	626 000
New orphans	252 000

C:\My Documents\MHD I 2003\Module\MHD I Unit 3 final 2003.doc

UNIT 1

What is Descriptive Epidemiology?

Introduction

> *As a clinician monitors the course of illness in the patient, so the Public Health worker must continually assess progress within the community. The most powerful tool at the disposal of Public Health workers to diagnose and monitor community health is epidemiology* (A. O. Lucas in Vaughan & Morrow, 1989).

Unit 1 is an introduction to epidemiology and provides a foundation for studying the rest of the module. The module begins by asking you to identify areas of your current work environment in which you are likely to undertake epidemiological tasks. It then proceeds to explore the meaning of epidemiology, its main characteristics and its role in understanding health and disease. Sessions 1 and 3 provide the conceptual foundation for the rest of the module, and guide you through the most frequently used measures and calculations you are required to use. Work through them carefully, completing all tasks to make sure you grasp the different concepts and epidemiological measures.

In Session 2, you are introduced to the investigative process that might be used by a health manager faced with a health problem in a community: you will try out a set of key questions that can be used to interrogate any set of data. In Session 4, you are guided through the process of reading critically for a literature review. The final study session is designed to support you in preparing your first assignment.

There are five study sessions in Unit 1.

Study Session 1: What is Epidemiology?

Study Session 2: Investigating Health Problems.

Study Session 3: Epidemiological Information.

Study Session 4: Reading Epidemiology Reports and Articles.

Study Session 5: Search and Review Relevant Literature (Assignment 1)

In the course of this unit, you will be encouraged to read texts and do a range of tasks that will lead to your achieving these outcomes:

Intended Learning Outcomes

By the end of this unit you should be able to:	
Health Measurement Outcomes	***Academic Learning Outcomes***
▪ Define common epidemiological terms and concepts. ▪ Describe the role of epidemiology in providing critical information on key health conditions. ▪ Recognise contextual influences on epidemiology in Africa. ▪ Develop a conceptual framework to describe community health. ▪ Critically review the technical content of scientific reports.	▪ Develop working definitions of key terms and concepts. ▪ Locate relevant data from complex tables and data sheets. ▪ Adapt a conceptual framework to your needs. ▪ Develop a strategy for effective reading and critique of articles.

Unit 1 - Study Session 1
What is Epidemiology?

Introduction

This study session introduces epidemiology, its terminology, definitions, and its different uses in research, clinical practice and community or district health management. In the course of the session, you will also focus on reading graphs and tables. This is an essential competence for studying in this field. The session is intended to provide you with a foundation for understanding and engaging in Descriptive Epidemiology. You are certain to discover that you have already encountered epidemiological information in some form or another.

Epidemiology will help you to answer questions like these:

- How do you know if a DOTS programme is succeeding?
- What does it mean if prevalence is reported as 200/1 000, or when a TB prevalence is 850/100 000?
- Is this a Public Health problem or not?

Examples will be used to illustrate how health activities are measured or monitored. Having understood these examples, we hope you will be able to analyse similar sets of data from elsewhere in the country and internationally.

The careful completion of the tasks in this session is important as this unit provides the foundation that you will need for the rest of the module.

Contents

Timing of this session

This session contains three readings, one of which is a glossary of terminology and eight tasks. It should take you up to three hours to complete depending on your familiarity with the terms and with graphs and tables.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session, you should be able to:	
Health Measurement Outcomes	***Academic Learning Outcomes***
▪ Identify the role of epidemiology in Public Health. ▪ Recognise the contextual influences on epidemiology in Africa. ▪ Define the concepts and terms used to describe the measurement of health and disease events in communities. ▪ Consider the quality and relevance of data describing community health and illness.	▪ Prepare your own definitions for new technical terms. ▪ Interpret simple graphical representations. ▪ Develop a systematic approach to reading reports and published research. ▪ Interpret a simple set of statistical data.

2 READINGS

The three readings for this session are listed below. You will be directed to them in the course of the session. The third reading is a glossary of terms that you may want to refer to during this session and later in the module.

Author/s	**Publication Details**
Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S.	(1997). Ch 1 - Introduction. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 3 - 9.
Beaglehole, R., Bonita, R. & Kjellstrom, T.	(1993). Ch 1 - What is Epidemiology? In *Basic Epidemiology.* Geneva: WHO: 1 - 11.
Vaughan, J. P. & Morrow, R. H.	(1989). Ch 14 - ABC of Definitions and Terms. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 155 - 167.

3 CLARIFY KEY CONCEPTS USED IN EPIDEMIOLOGY

Like many other areas of health and medicine, the study of how health and disease is measured has generated a variety of new terms and concepts. It will be important to develop your own working definitions in order to read the material contained in this module more effectively and critically. The following tasks help you to do this.

Start off by previewing the Katzenellenbogen, Joubert and Abdool Karim and Beaglehole, Bonita & Kjellstrom. You will find guidance on how to preview texts in the *SOPH Academic Handbook,* Section 5.3.3. Previewing helps you to read with focus and understanding.

Broadly, the two texts present a definition of epidemiology, its historical origins, current applications and achievements, its role in Public Health research and its particular value in the African context. The reading by Katzenellenbogen, Joubert & Abdool Karim provides an overview of what epidemiology entails, how it is applied in South Africa and what impacts on it in the African context, while the chapter by Beaglehole, Bonita & Kjellstrom takes a more historical approach in its introduction, and identifies some of the achievements of epidemiology. This reading provides a useful set of study questions on page 11. Bear them in mind while you read, then try to answer them.

Take note of the different branches of epidemiology described on page 5 of Katzenellenbogen, Joubert & Abdool Karim, remembering that this module focuses on *Descriptive Epidemiology*. Focus on the challenges faced by epidemiology which are listed at the end of this reading, on page 9; these may affect you in your work.

READINGS:

Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S. (1997). Ch 1 - Introduction. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 3 - 9.

Beaglehole, R., Bonita, R. & Kjellstrom, T. (1993). Ch 1 - What is Epidemiology? In *Basic Epidemiology.* Geneva: WHO: 1 - 11.

TASK 1 - DEVELOP A DEFINITION OF *EPIDEMIOLOGY*

When previewing, it is helpful to identify key questions to which you would like answers. If I were reading these two texts, I would try to find answers to the first two questions, as a way of focusing my reading:

a) What do epidemiologists do? (Figure 1.2 on page 4 may be helpful).

b) What is the main difference between the work done by clinicians and epidemiologists?

c) Once you have taken these notes, write your own definition of epidemiology.

FEEDBACK

The work of epidemiology differs most fundamentally from that of clinical health workers in that it addresses health issues at the population level, whereas most health workers are involved in treating individuals or small groups of patients. The information built up over decades of epidemiological research has provided clinicians with fundamental information about the natural history of the diseases they treat, about what causes them, what interventions work best and also about the distribution of disease and risk factors in the population at large.

The word *epidemiology* is derived from the Greek *epi* (upon) and *demos* (people). Most people would agree on a definition of epidemiology something like this: "The study of the distribution and determinants of health-related states or events in
specified populations and the application of this study to the control health problems" (Last, 1988, in Beaglehole, Bonita & Kjellstrom, 1993: 3).

The readings offer a variety of illustrations of epidemiology and its application to the assessment of different health and disease problems over time. Have you encountered any of the examples described before?

In the next task you will check and expand your understanding of key concepts used in epidemiology. The following reading lists some epidemiological terms.

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 14 - ABC of Definitions and Terms. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 155 - 167.

TASK 2 - IDENTIFY AND WORK OUT THE MEANING OF NEW CONCEPTS

a) Underline any terms or concepts that you have come across for the first time, or which are unclear to you.

b) Try to write down an explanation of these terms using your own words. Check their meaning in any of the three readings for this session. If these texts do not adequately clarify the meaning, consult Chapter 14 of Vaughan & Morrow (1989) or a good dictionary, e.g. *Chambers 21st Century Dictionary*, 1996.

FEEDBACK

Your list of new terms might have included the following concepts:

Public Health
Epidemic (note Greek origins)
Epidemiology
Mortality rate
Communicable diseases
Clinical Epidemiology

Descriptive Epidemiology
Analytic Epidemiology
Epidemiologist
Endemic
Health status information
Pandemic
Subclinical
Causation
Environment (Refer also to a dictionary)
Natural history (Reading 2 page 4)

Make sure that you are really clear about what these concepts mean as it is difficult to study or to read effectively without this clarity. Consult a more experienced colleague or the references if you are unclear about any of the terms.

4 EXPLORE YOUR EXPERIENCE WITH EPIDEMIOLOGY

Most people already know something about the subject they are starting to study and the same is probably true for you as you begin this epidemiology module. This section aims to identify areas of your work experience where you may already have encountered or even done some epidemiology.

TASK 3 - EXPLORE EXAMPLES OF HEALTH STATUS INFORMATION IN YOUR WORK

As a Public Health worker, it may be important for you to know the extent to which a particular health condition affects people in your district, e.g. the percentage of a district population affected.

a) List 2 - 3 health conditions encountered in your area or in the course of your work, for which there is information available. Try to find out what proportion of people in your area are affected by these conditions.

b) Where does this information come from?

c) What does this information tell you about the health status of your community?

d) If you work with this information, does that mean you are doing epidemiology? Explain.

e) What sorts of decisions are made in your workplace using this information?

FEEDBACK

Whether they know it or not, most health workers work with or come across information describing the health or illness of a population in the course of their work. This is one of the four main areas of epidemiology. Perhaps you simply have to record the number of cases of diarrhoea seen at a clinic, or the age and weights of children with malnutrition. All these pieces of information together provide a picture of the health status of your community, and they all contribute to the process called epidemiology. So perhaps without recognising it, you already know something about epidemiology because you have already been doing it.

TASK 4 - IDENTIFY OTHER EPIDEMIOLOGY TASKS YOU PERFORM

a) Make a list of the different types of health information you encounter as a health worker and make a note of what you actually do with this information.

b) Which of these activities fit the definition of Descriptive Epidemiology as you expressed it in **Task 2**?

c) How do these epidemiological activities contribute to the Public Health work of your organisation or institution?

FEEDBACK

Epidemiology has provided us with a very strong research basis for understanding health and disease events and patterns in populations. You may have recognised that information obtained from epidemiology research or data collection can guide your understanding of health events, or help you to make decisions. Epidemiology provides some very powerful tools for tasks such as problem identification, decision-making or even programme evaluation. The sad thing, however, is that it appears to be so under-utilised in the health bureaucracies of Africa.

Epidemiology can provide data that shows improvements in health status and may also identify serious failures or pitfalls in the health system. It may also be ignored or even deliberately concealed. This makes it a potential political football. Worse still, it may point to areas of causation located in underdevelopment, poverty and political incompetence. To address these situations requires massive resources and political will. See also Katzenellenbogen, Joubert & Abdool Karim, 1997: 6 - 7.

5 THE APPLICATIONS OF EPIDEMIOLOGY

From fairly focussed beginnings (which you read about in Beaglehole, Bonita & Kjellstrom, 1993) the field of epidemiology has grown to include and influence a wide range of clinical and Public Health activities. Some of the more prominent applications of epidemiology are identified in the next task.

TASK 5 – IDENTIFY CURRENT PUBLIC HEALTH APPLICATIONS

a) From your reading of the texts, identify at least four main roles or uses for epidemiology. Prepare a short written description of each of these applications.

b) Identify one example of each of these main uses of epidemiology from your own experience or from the readings. Beaglehole, Bonita & Kjellstrom (1993) contains several examples.

c) Explain how the knowledge in the example can contribute to an important Public Health strategy or decision.

FEEDBACK

a) A particularly neat, simple summary of the ways in which epidemiology has contributed to our understanding and practice of Public Health is found in Figure 1.2 on page 4 of Beaglehole, Bonita & Kjellstrom (1993). Here the main uses of epidemiology are grouped into four categories, namely causation, the natural history of disease, description of the health of populations and the evaluation of interventions. Note that these have relevance in both the clinical health care arena as well as in Public Health.

b) Katzenellenbogen, Joubert & Abdool Karim (1997) describe the uses of epidemiology in slightly different terms, relating the two broad areas of research and Public Health epidemiology to the local South African context.

c) In the section entitled *Achievements of Epidemiology,* Beaglehole, Bonita & Kjellstrom (1993) (pages 4 - 9), provide several examples to illustrate the uses of epidemiology. Here are some examples of the different categories of epidemiology and their contributions to Public Health strategies:

- One well-known example of using epidemiology to establish causation is the link between smoking and deaths due to lung cancer. Causation studies provided this information and numerous anti-smoking or smoking cessation programmes have been based on the premise that there is a link between smoking and death from lung cancer.
- In order to manage our TB programmes, we need to know what proportion of the population is affected in each area. A TB prevalence of 850/100 000 in a specific area tells us there is a massive problem to be addressed here.
- New antiretroviral drugs are a major new area of research which aims to evaluate which medications work best at controlling AIDS. These and many other interventions are the subject of epidemiological trials.
- Virtually every immunisation programme owes its existence to intervention studies that established the efficacy of immunisation against infectious diseases such as measles, tetanus, smallpox, etc.
- The natural history of SARS, a very recent disease outbreak, is only now becoming clear, as case records from numerous cases around the world are collated and reviewed.

- Both TB and HIV/AIDS are conditions where it is critical that we understand the natural history of these diseases. They both have long periods in which they exist as sub-clinical infections, that is, before they produce symptoms that the patient or health worker can detect. During this period, patients are unlikely to seek treatment and can infect their partners or those around them.
- Public Health workers are particularly concerned with the size and distribution of different diseases or health risks in the population, such as what proportion of the population has TB or how many new cases are occurring each month. This guides decisions as to how to respond, e.g. provide more TB beds, improve treatment adherence, extend BCG programmes, etc.

Having clarified some of the concepts and the role of epidemiology, the final section of Study Session 1 concentrates on another essential foundational block of epidemiology, namely reading and interpreting information presented in graphs and tables.

6 INTERPRETING GRAPHS AND TABLES

Epidemiological texts often make use of tables, graphs and other illustrations to present information. Beaglehole, Bonita & Kjellstrom (1993) include several graphs and tables that support the text. You need to be able to read and interpret graphs and tables with ease. Here are some examples to check your skills and to practise on. If you have difficulty, ask a colleague to help you to develop a simple strategy for reading them.

Make sure that you understand the concept of *ratio* and *rate* before you start (Katzenellenbogen, Joubert & Abdool Karim, 1997: 15 - 17).

We usually want to compare disease rates across different communities or areas. However, each community has a different size and also a different number of people that are ill. A percentage is an example of a rate multiplied by 100. When we deal with population figures that may be fairly large, we usually calculate rates out of 1 000 or 100 000 because the figures are then easier to grasp.

Example

Community A might have 250 people with TB. Community B may have only 100 cases of TB. So far we can see there is more TB in Community A.

If I tell you that Community A has a population size of 123 500, this means

250/123 500 people there have TB. Divide this number 250, by 123 500 using a calculator and you will get 0.002. Multiply this by 100 and you get 0.2%. If instead you multiply by 1 000, you will get a prevalence of 2/1 000 cases of TB. Alternatively, you could multiply this by 100 000 to get a rate of 200/100 000.

If Community B has a population of 25 000, this means their TB prevalence is 100/25 000. Divide this and you get 0.004. Multiply this by 100 and you get 0.4%. If you multiply by it 1 000 you will get a prevalence of 4/1 000. This is double the prevalence in Community A, so Community B actually has a much bigger TB problem than Community A.

TASK 6 - MAKE SENSE OF A TABLE

Beaglehole, Bonita & Kjellstrom (1993) (page 1, Table 1.1) provide summary data on deaths in a cholera outbreak that took place in two districts of London, in 1851.

READING: Beaglehole, R., Bonita, R. & Kjellstrom, T. (1993). Ch 1 - What is Epidemiology? In *Basic Epidemiology.* Geneva: WHO: 1 - 11.

a) Compare the number of deaths from cholera in the districts of Southwark and Lambeth.

There are two ways to express this, as a difference and as a ratio.
To calculate the difference, subtract the smaller figure from the larger one, i.e. Lambeth from Southwark.

b) However, this does not usually tell us how serious the problem is because of the differences in population size in the districts being compared. Calculating the proportion – or ratio – of the population of Southwark that died from cholera, and comparing that to the ratio of cholera deaths in Lambeth is of greater value to Public Health workers.

c) Roughly how many more deaths were there in Southwark than Lambeth?
20 times more ; 10 times more ; 40 times more ; 80 times more

d) Compare the populations of Southwark and Lambeth. How many times bigger was the Southwark population than the Lambeth population?
20 times bigger ; 8 times bigger ; 2 times bigger ; 50 times bigger

e) Why is it necessary to calculate the death rate per 1 000 of the population, as shown in the last column? From the figures provided, can you work out how to calculate the death rate?

f) What do these death rates tell us about the risk of getting cholera in these two districts in 1851? Would you rather have lived in Southwark or Lambeth?

g) Which column in the table contains the most important information? Why do you say so?

FEEDBACK

a) The difference in the number of deaths in the two areas is 826, but this tells us very little except that there were more deaths in Southwark.

b) To find out how many times more deaths there were in Southwark, you divide the smaller number of deaths (18) into the larger number (844), i.e. how many times does 18 go into 844? You will find that there were over 40 times more cholera cases in Southwark than there were in Lambeth.

c) For the epidemiologist, the number of deaths (on its own) means very little unless we recognise that the population sizes being compared are very different. This is why we use a rate to compare them. Divide Southwark's population of 167 654 by Lambeth's population of 19 133 and you get a rough figure of 8. Southwark therefore had a population 8 times greater than Lambeth.

d) The death rates are calculated by dividing No. of Deaths by Population in 1851 and multiplying by 1 000. In Southwark, (844 ÷167 654) × 1 000 = 5.0 (or 5 per
1 000), whereas in Lambeth it would be 18 ÷ 19 133 = 0.9 (or less than 1 per 1 000). The epidemic is therefore much more serious in Southwark.

e) A higher proportion of people got cholera in Southwark. If you lived in Southwark, the probability (risk) that you would be one of the victims of cholera was much higher than if you lived in Lambeth.

f) The main result in this table is to be found in the column entitled *Cholera death rate per 1 000 population.*

The role of water supply in causing cholera and the use of geographical mapping to trace the cause will be explored in Unit 2 session 4, in a description of the 1851 London cholera epidemic by John Snow.

Making Sense of a Graph

Now turn to Beaglehole, Bonita & Kjellstrom (1993), page 2, Figure 1.1. The reading illustrates a relationship between deaths from lung cancer amongst British doctors between 1951 and 1961 and their levels of cigarette smoking activity.

Two important elements found in graphs are variables and axes. A variable is a characteristic that can be measured. There are two in this example: the number of people who died of lung cancer, and the number of cigarettes each person smoked per day. In Figure 1.1 the two variables are plotted as follows: the y-axis (vertical) shows how many British doctors died of lung cancer between 1951 and 1961 out of every 1 000 doctors who died during this period. The x-axis (horizontal) indicates the number of cigarettes each of those doctors smoked per day before they died.

Your task is to interpret the graph and determine what kind of relationship there appears to be between the two variables. Have a look at Figure 1.1. According to its title, this graph looks at all British doctors who died of lung cancer between 1951 and 1961. It groups these doctors according to how many cigarettes they smoked each day. For convenience, it converts these into a rate, i.e. the number of doctors who died of lung cancer out of every 1 000 doctors who died. For example 1.5 out of every 1 000 doctors who died of lung cancer smoked 20 cigarettes per day.

Here is some guidance on how to read the graph. Focus on the black dots plotted on the graph. Find the dot that represents those doctors who smoked 15 cigarettes per day and experienced a death rate of 1.0. This death rate means that among the doctors who smoked 15 cigarettes per day, one doctor in 1 000 died of lung cancer. The fourth dot from the left represents those doctors who smoked 15 cigarettes per day. A horizontal line drawn from this dot onto the y-axis shows that this group of doctors experienced a death rate of 1.0 per 1 000. Now practise reading the graph.

TASK 7 - READ AND INTEPRET A GRAPH

a) What is the death rate for doctors who smoked:
   - 10 cigarettes per day?
   - 20 cigarettes per day?
   - 30 cigarettes per day?
   - 40 cigarettes per day?

b) What do you notice about the association between higher daily cigarette consumption and the lung cancer death rate?

c) Look at the straight line inserted across the graph. Notice that it is very close to all the dots and almost connects them together. The line was inserted to illustrate the relationship between the information on the x-axis and the information on the y-axis. What can such a straight line tell us about the relationship between the two variables, i.e. death rates and cigarettes per day?

d) This graph is an example of an x-y scatter plot. What do you think this means? What is the purpose of such a graph?

FEEDBACK

a) You should have determined the death rate for doctors who smoked:
   - 10 cigarettes per day as about 0.75 per 1 000
   - 20 cigarettes per day as about 1.6 per 1 000
   - 30 cigarettes per day as about 2.4 per 1 000
   - 40 cigarettes per day as about 3.3 per 1 000

b) Deaths from lung cancer are strongly associated with the number of cigarettes smoked daily. Because the line slopes up toward the right hand side, it means that there are more heavy-smokers who die of lung cancer than light-smokers. Put another way, the more cigarettes you smoke per day, the more likely it is that you will die of lung cancer.

c) The most striking characteristic of this graph is that the dots form an almost completely straight line. The line has been added to the graph to illustrate this. When you see this kind of "straight line relationship" you can usually assume that information on the vertical y-axis is strongly associated with the information on the horizontal x-axis.

d) An x-y scatter plot is a very simple and neat way of showing whether there appears to be a relationship between two variables, the one indicated on the x-axis and the other on the y-axis. If the dots cluster together in some part of the graph, there may be an association of some kind between the variables. If they are spread all over the graph, it is very unlikely that there is any association present.

Now try making sense of another kind of graphical illustration.

TASK 8 - READ A GRAPHICAL ILLUSTRATION

Take a look at Beaglehole, Bonita & Kjellstrom (1993), page 10, Figure 1.5 which illustrates some important features of the AIDS epidemic. Study this figure and try to identify what it tells you about the AIDS epidemic.

a) What is the main point this illustration is trying to make? Why is HIV/AIDS called the hidden epidemic?

b) Why have the authors chosen to use a pyramid shape to represent what is happening with the HIV/AIDS epidemic?

c) What are the consequences of the hidden nature of HIV/AIDS for the public? In what way does this affect our ability to accurately measure/monitor the size of the epidemic?

FEEDBACK

Figure 1.5 demonstrates how a good choice of graphical image can emphasise the main point the writer is trying to illustrate. The pyramid is a powerful and widely recognised symbol, with a prominent point at the top and a broad solid base below. Others have used the image of an iceberg floating with its tip above water and large bulk below.

As the title suggests, the illustration is trying to highlight one main characteristic of the AIDS epidemic, i.e. the fact that most people with AIDS are not identifiable because they are either in the sub-clinical phase of the disease and do not know they have it, or they are not sick enough to report to a clinic or doctor where they can be diagnosed. Like the iceberg or pyramid, there are far more invisible cases (below the shaded plane) than reported, visible cases of AIDS in the population. This makes accurate measurement of the actual extent of the epidemic in the population very difficult. This in turn makes it very difficult to lobby for resources or run programmes to respond to the epidemic. Many people still struggle to believe it is actually a major problem.

7 SESSION SUMMARY

In this session, you have explored the meaning of certain key concepts use in epidemiology, considered its role in Public Health and its application in your own work context. You have also practised your reading skills both of texts and graphical illustrations.

In the next session, we introduce a set of important questions you need to ask in order to understand and respond to a Public Health problem. This set of questions should become part of your own systematic framework for assessing the epidemiological profile of a given community or event for which you have responsibility.

Unit 1 - Study Session 2
Investigating Health Problems

Introduction

A wide variety of sophisticated and often quite complex epidemiological and statistical tools are available to measure the precise health status and health risks in a particular area such as a health district. However, rather than complicating the process unnecessarily, one simply needs to develop the skill of asking questions of the problem or of the data representing the problem.

This session provides the opportunity to try out questions which have been developed to guide you when investigating a health problem. An approach to investigating a problem is sometimes termed a conceptual framework: the one we present consists of themed questions which can assist you to identify, describe and even prioritise the most important Public Health problems in any given community, and therefore to understand the community's health status.

Contents

Timing of this session
There is one reading and four tasks in this session, one of which requires you to spend some time (if possible) working through some questions with colleagues. It is likely to take you about two hours, depending on how long you discuss the questions.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session you should be able to:	
Health Measurement Outcomes	***Academic Learning Outcomes***
▪ Describe the Public Health status of a selected community. ▪ Review a set of generic questions	▪ Apply a conceptual framework. ▪ Locate and organise local health information for easier

to describe community health status. ▪ Identify key epidemiology principles in community health measurement.	interpretation. ▪ Reflect on the process of assessment.

2 READINGS

There is just one reading in this study session.

Author/s	Publication Details
Vaughan, J. P. & Morrow, R. H.	(1989). Ch 2 - Epidemiological Principles. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 10 - 11.

3 RESEARCHING A HEALTH PROBLEM

In this section, you have the opportunity to apply epidemiological skills to a Public Health problem. This simple example demonstrates the kind of role that a Public Health manager might take when faced with a health status problem.

Read the case scenario below. Try to identify the nature of the problem and what information you will need if you are to successfully address the alleged problem. Note down the questions you would ask in order to get a better grasp of the situation.

Case scenario

You work for a local health authority and you hear that 150 children were treated at the local hospital for diarrhoea over the past weekend.

What is your immediate response to this problem? Do you consider it a problem? What assumptions did you make when you made this decision? This looks like an epidemic or outbreak of disease but we cannot know this until we have collected certain crucial information about it and about the general health status of this community.

TASK 1 - DETERMINE WHAT INFORMATION YOU NEED TO ADDRESS A PROBLEM

The key question that you should try to answer is:

- What do I need to know in order to understand enough about the problem to respond to it? and
- Where can such information be found?

Note down your answers.

FEEDBACK

The information that you have been given, that 150 children were admitted to hospital with diarrhoea, is very scanty. This is done on purpose in order to challenge you with the key question.

Understanding the seriousness of the problem arises from asking the right or most relevant questions, in other words, *researching the problem*. You will do this in more detail in the next task. At the same time, it is important *not* to ask questions that may
simply have curiosity value but do not focus on the immediate problem and how to
respond to it. An example of a curiosity question might be: *What is the socio-economic status of these children or the gender distribution of the illness?*

The children might indeed share similar poor circumstances, but right now we urgently need to find out:

- Did they attend the same event?
- Was there an exposure to disease risk factors that they all shared?
- What actually happened to the children over the weekend?

The best strategy is not to ask all possible questions, but to establish *just enough* reliable evidence upon which you can base a decision about how to intervene. It is likely that you may wish to apply a particular *case definition* of childhood diarrhoea. This established set of clinical signs and symptoms helps to clarify more specifically whether all the children in the sample have in fact got the same illness.

Another line of questions could be community health status questions like this:

- How often and where does diarrhoea “normally” occur in this area and in this group?

You would need to consider the immediate intervention options available and attempt to choose the best option. Later you will need to clarify the social and economic characteristics of the population affected, in order to determine what broader environmental risk factors need to be addressed (such as water and sanitation systems).

Now review your questions: Do your questions at least address these issues? Have you asked any unnecessary questions?

In the next task, you are asked to respond to this problem as a Public Health manager and make some recommendations.

TASK 2 - OUTLINE YOUR RESPONSE TO THE PROBLEM

Imagine now that you have found that these children all live in the same part of an informal settlement, which relies on a particular well for its water supply. After carefully reviewing this situation and consulting others, prepare a short outline report to your line manager assessing the situation. Indicate how you think the local health authority should respond to this situation.

Note that as a representative of the local health authority, your concerns should extend beyond just the hospital care procedures. Consider what you might do at community level, and what you could do through your clinical facilities.

FEEDBACK

In an emergency situation like this one, it is very unlikely that you will have all the information you want, but you will still have to make a report and decide what action should be taken. You may want to recommend that more information be gathered in order to respond more effectively. However this should not prevent you from acting decisively where you can.
In your recommendations, did you propose any community-level response? Did you recommend any preventive strategy that might have a longer-term impact in preventing a recurrence in this community?

A short-term response might include tracing further victims through community members, emergency treatment for those affected and some education concerning individual preventive measures. If a common water or food source is the cause, then the hygiene standards of the caterer concerned or the water source should be addressed. A faulty water source should be fixed or closed off and plans for alternative water provision should be urgently drawn up.

In the longer term, community education on basic health and hygiene, the early detection of childhood diarrhoea and the use of oral re-hydration solution could be a good investment of time and energy. Addressing environmental sources of risk with better sanitation, sewage and water supplies is fundamental to addressing this problem.

4 USING A CONCEPTUAL FRAMEWORK

In the previous task, you considered what information you really need in order to understand and address a specific health problem. In the next task you will consider the health situation of an entire community. You would benefit from working with a fellow student or colleagues as you apply a systematic set of questions to a community health situation with which you are familiar. Try to choose one where you or your colleagues have already made some interventions.

This set of questions is termed *a conceptual framework* for understanding the health status of a community. In other words, it is a way of systematically organising your information about a population so that you can understand it better. Each theme or section of the framework from (a) – (d) contains different potentially relevant questions that attempt to throw light on an aspect of the community's health status, e.g. the size and distribution of the problem and the source of the problem.

CONCEPTUAL FRAMEWORK FOR IDENTIFYING A HEALTH STATUS PROBLEM

a) Identify the problem

Question 1: What are the main health problems in your community or district?

b) Determine the magnitude and distribution of the problem

Question 2: How many cases or health events did you come across?
Question 3: When do these events generally occur?
Question 4: Where do these health events occur?
Question 5: Who is affected?

c) Analyse the problem

Question 6: Why does the problem occur? (What are the main factors involved?)

d) Take measures to address the problem

Question 7: What kind of measures were taken or could be taken to deal with it?
Question 8: What results were achieved? What difficulties were encountered?
Question 9: What else could be done? What kind of assistance is needed?

Using this framework is part of the aspect of epidemiology that Beaglehole, Bonita & Kjellstrom (1993) referred to as *Description of Health Status in Populations* in Figure 1.2 on page 4 of their book.

As a Public Health professional starting work in a new district or region, you will have to ask yourself what the main health problems are in this community. Some health issues may be more widespread or more urgent than others. You will need to recognise the main features of the population, its size, and its age and gender profile, etc. If you wish to make improvements in health status, you will also have to understand the risk factors at work in the environment as well as the infrastructure available to support you. Later you will also want to know whether you are succeeding in your work. For example, have disease rates dropped or are they increasing?

The following task sets out to explore the kind of information you will need in order to answer these questions.

TASK 3 – USE THIS CONCEPTUAL FRAMEWORK TO ANALYSE KEY HEALTH PROBLEMS IN A COMMUNITY

Put yourself in the role of a District Health Manager in charge of a district of your choice. Refer to a community that you know well for information.

Use the questions that follow to build up an understanding of the key health problems in that community.

a) Problem identification

Question 1: What are the main health problems in your community or district?

This pertains only to aspects of health status such as diseases, low weight, disabilities, etc, and not to health service-related problems.

Write down the three main problems encountered in the community you have chosen. Compare the problems you identify with the problems identified by others e.g. fellow students or colleagues you are able to consult.

Choose one particular problem for further exploration using the eight remaining questions. Choose the problem or condition in terms of:

- Severity: This refers to the number of deaths from the disease and the number of people disabled as a result of disease.
- People's concerns: This relates to the social stigma attached to the disease or the level of fear it generates.
- Sensitivity to Public Health measures: This refers to the feasibility of control and the costs involved.

Having identified the health problem, we now want to try to understand how widespread it is, who is and who is not affected and when they are affected. In this process we are looking for any kind of pattern in the distribution of illness. The next step in using this conceptual framework is to:

b) Determine the magnitude and distribution of the problem

Question 2: How many cases or health events did you come across?

Try to ascertain the actual extent of the problem in your selected community. Write a short summary of the situation. The answer should preferably come from your own experience, the knowledge of colleagues you consult or from information you or they are handling or producing. In formulating your answers to these questions, you may come up with new questions that need to be answered.

Question 3: When do these events generally occur?

Consider whether these health events occur at a particular time of year, in a particular week, or on a specific day. Record your answers with as much useful detail as you can derive from your own experience and knowledge.

Question 4: Where do these health events occur?

Are they limited to a particular area? Indicate their location on a map.
Record your answers.

Question 5: Who is and who is not affected?

Does the problem affect particular individuals – men, women, the very young, the old, families or particular ethnic groups? Are people of the same income level, similar habits, occupations or family structures more affected than others? Prepare a list that identifies and describes the individuals (or categories of individuals) who do and do not suffer from the disease. Continue to record your answers.

Now that you have gathered this background information, you should try to identify *why* the problem occurs. The patterns you will have noted in the answers to questions 2 - 5 might help you answer this question.

c) Analyse the problem

Question 6: Why does the problem occur? Or what are the main factors involved here?

Try to work out what causes and factors are at work here. You may need to ask further questions at this point. Respond to this question in the same way as you have done with the others.

d) Take measures to address the problem

Question 7: What kind of measures were taken or could be taken to deal with the problem?

List the most important solutions or interventions that you consider appropriate to cope with the problem you have identified. Try to work out which causes each intervention is supposed to address. Which interventions have you decided to exclude and why?

Question 8: What results were achieved? What difficulties were encountered in dealing with the problem?

Focus on the changes in health status of the community you are discussing. Can you identify which interventions were responsible for which changes? What are some of the difficulties you have encountered in the delivery or evaluation of interventions that really achieve meaningful results?

Question 9: What kind of assistance is needed? What barriers exist which may affect intervention? What else could be done?

Consider what support would be needed and what obstacles might affect the processes of intervention and health status assessment that you have been discussing. Which elements lie within and which ones lie beyond the confines of the health system?

Completing this questioning process should give you a fair understanding of key health problems in a community.

TASK 4 – MODIFY THESE QUESTIONS FOR YOUR SETTING

What do you think about using this same process of discussion and epidemiological exploration in your own clinic or community? Could it be useful in that setting? Prepare a modified set of questions for your personal use in the future which is relevant to your local context and based on the questions you used above.

FEEDBACK

Epidemiology is about asking the right questions, as well as about using many different tools or research methods to find answers.

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 2 - Epidemiological Principles. *Manual of Epidemiology for District Health Management.* Geneva: WHO: 10 - 11.

Vaughan and Morrow, 1989 (pages 10 - 11) present another short list of key epidemiological questions. However, these are expressed in a much more generic style, i.e. they suggest asking *What? Who? Where? When? How? Why?* The questions they propose are at the very core of the practice of Descriptive Epidemiology.

Clearly you will need to adapt the form of such questions to your particular area of enquiry if they are to have meaning. You can adapt these questions to reflect your own special disciplinary or research interest. Review your questions now in the light of this reading.

5 SESSION SUMMARY

In this session, we have practised the process of doing an epidemiological investigation of the causes of a health problem and considered how one might intervene. In doing this, you were practising the process that a Public Health manager might engage in when faced by a sudden health problem. You have also tried out a conceptual framework for the purpose of creating a health status report for a community. Hopefully you have adapted the framework to your own context and recognised the importance of doing so.

Your assignments require exactly the same kind of questioning approach. In the assignments, you are presented with a real situation with facts and figures reflecting some aspect of Public Health in a given population. Your task is to make sense of the health status of this community by analysing and interpreting the information, in order to respond with ways to improve their health status.

In the next session, we look in more depth at the kinds of information that are used in epidemiological investigations, and at the quality and sources of such information.

Unit 1 - Study Session 3
Epidemiological Information

Introduction

Most of us have encountered health and heath measurement information in various forms. However, most Public Health practitioners have experienced great difficulty in accessing relevant information they can use in their work. If the information does exist, they may discover enormous amounts of information of very poor quality.

As a Public Health worker, it is inevitable that you will be involved either in recording and organising health information, or in summarising and interpreting existing sets of data in order to make decisions. Knowing the different types of data that are used, where they can be found, and assessing their quality are therefore important issues in this process and form the focus of this study session.

In the course of this session (section 6), you will have to spend some time searching for some local data in order to perform the tasks required. Knowing where to find useful information and being able to critically assess its value, are essential skills for Public Health workers.

Contents

Timing of this session

There are three readings and four tasks in this session. If you search for the data required in **Task 3**, it could take you up to five hours to complete. This will really be worth your while as learning to locate relevant data will stand you in good stead in the assignments and in your work.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session you should be able to:

Health Measurement Outcomes	***Academic Learning Outcomes***
▪ Assess the quality, relevance and accessibility of community health data. ▪ Review the contents of a basic district health dataset. ▪ Interpret commonly reported epidemiological indicators.	▪ Locate different sources of (health) information. ▪ Compare different indicators in published (health) datasets. ▪ Interpret data in terms of its context.

2 READINGS

Author/s	**Publication Details**
Health Systems Trust.	(1996). *How to Conduct a Situation Analysis: A Guide for Health Districts in South Africa.* Durban: HST: 1 - 8 & 50 - 53.
Vaughan J. P. & Morrow, R. H.	(1989). Ch 1 - District Health Management. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 1 - 8.
UNICEF.	(1998). Basic Indicators. In *The State of the World's Children 1998.* Geneva: UNICEF: 92 - 97 & 102 - 105.

3 SOURCES OF EPIDEMIOLOGICAL DATA

For anyone working in the Public Health field, it is important to have easy access to the wealth of information available, although as we have said, it is often inaccurate and irrelevant.

Previous activities and readings, e.g. Beaglehole, Bonita & Kjellstrom (1993) Chapter 1, have illustrated the many different types of information or data used in epidemiology and the wide variety of sources from which they may be obtained.

READINGS

Health Systems Trust. (1996). How to Conduct a Situation Analysis: A Guide for Health Districts in South Africa. Durban: HST: 50 - 53.

Vaughan, J. P. & Morrow, R.H. (1989). Ch 1 - District Health Management. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 1 - 8.

Health System Trust's 1996 manual lists some useful sources of information from page 50. On page 4, Vaughan & Morrow (1989) also summarise the kinds of information that may be useful. These lists may help you identify data that is relevant to your own work and to compile your own list of useful sources on an ongoing basis, adding new sources as you find them. Becoming familiar with sources of data for your own district or area is crucial to being able to work effectively in this field.

4 FACTORS THAT INFLUENCE DATA COLLECTION

Effective data collecting should be as goal-directed as possible. That is, you should identify the specific questions that you wish to answer, and then search for the best possible sources of information to answer these questions. The sources you consult will vary with the type of information required, the context and purpose of data collection, e.g. to establish the cause of a health problem.

The role that health information plays at the local (community or district) level can be very different from the role it plays at provincial or national level. The way you collect, interpret and later apply the data to activities in your workplace can also be very different for rural and urban areas, and between affluent and poorer communities in your country. It is important to understand the context within which you will collect and work with the data, and how the context or environment influences this data.

4.1 The Influence of Context and Purpose

Study Chapter 1 of Vaughan and Morrow (1989) in which they approach the issue of data collection from the perspective of a district health officer who needs to know how to plan and manage the affairs of a district health system. It is important for you to be clear about *your* reasons for collecting health measurement information in your own work and context.

TASK 1 – EXPLORING FACTORS THAT INFLUENCE DATA COLLECTION

READING: Vaughan, J. P. & Morrow, R.H. (1989). Ch 1 - District Health Management. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 1 - 8.

As you read, try to answer the following questions.

a) What are the main purposes for collecting information in the district health context? See page 4 of Vaughan and Morrow (1989).

b) How does this compare with the data that you would need in your own context? How does context affect the data collection process?

c) According to this text, what are the two main sources of health information?

d) Why are these two types of information considered so important?

FEEDBACK

a) It has been made clear that the data collected as well as the data collection process must be in line with the reasons for wanting it in the first place. Think how such data could be used by the district health management team in carrying out its responsibilities as listed on page 3 of Vaughan & Morrow.

b) From the discussion on the health information needs of the district, you will have noticed that the circumstances in each district or community are unique, and different from community to community. Slightly different risk factors may be present, and the community may experience different levels of ill-health. These unique local circumstances require interventions customised to match local Public Health needs. The importance of having accurate, locally relevant data with which to work should be evident.

c) Health information can be collected using a surveillance system or reports and surveys.

d) They are important because they allow us to combine the continuity of routine data collection (a surveillance system), which is used to monitor trends in disease and health over time, with the detail that special surveys or investigations can provide on specific health problems.

Until the recent introduction of the District Health Management Information System (DHMIS) in South Africa, government health services collected vast amounts of data on health and health care activity. It was an entrenched administrative ritual in which many productive hours were lost. The private sector has excelled in collecting itemised health care billing information, but remains incapable of reflecting the health status of the community at large. Indicators that were inappropriate and unable to really tell us what was going on in the health system were collected uncritically but never used. On the other hand, such large volumes of data were collected that the task of analysing and interpreting it for local use was simply too difficult. The result was that very little data ever got used in management decisions or in the ongoing planning and evaluation of district health activities.

It is therefore essential to approach the process of data collection or review with a very clear, specific purpose. Ensure that the questions you want answered by this information (your epidemiological purpose for data collection) are clearly defined in your own mind before you collect any information.

It is also important to be critical of all data you receive as it may contain inaccuracies, gaps or may even be irrelevant. Sometimes though, the gaps can give you really important information or insights into the nature of the health problem you are investigating.

4.2 Understanding the Health Status of Communities

Another factor that influences data collection is the need to understand the health status of *whole communities*, rather than just the health of individuals. Broader social or geographical information may assist in the process of planning and implementing treatment or Health Promotion strategies, or evaluating their outcomes. The practical application of this concept is described as a "situation analysis" or "community diagnosis", as it is called in Vaughan & Morrow (1989), page 5.

READINGS:

Health Systems Trust. (1996). How to Conduct a Situation Analysis: A Guide for Health Districts in South Africa. *Durban: HST: 50-53.*

Vaughan, J.P. & Morrow, R.H. (1989). Ch 1 – District Health Management, in *Manual of Epidemiology for District Health Management*. Geneva: WHO: 5.

TASK 2 - EPIDEMIOLOGY, COMMUNITY DIAGNOSIS AND THE PLANNING CYCLE

a) What do you think is the main purpose of carrying out a "community diagnosis"?

b) Why does it include information that is not specifically about health and health care?

c) How does this kind of diagnosis differ from the clinician's diagnostic process?

d) Both the readings above refer to the *planning cycle*. What do you believe is the role of epidemiology in this process?

e) Where, in this cycle, do you think the community diagnosis might occur?

FEEDBACK

As illustrated in Vaughan & Morrow (1989) page 6, Table 1.1, the rationale for the community diagnosis is similar to that of a clinician trying to understand a patient's problem and prescribe treatment. The main difference is that where the clinician is concerned with the individual subject, in community diagnosis the community is the collective subject of the diagnostic process. The non-health information is vital as it has the potential to describe the major environmental influences or determinants that have the capacity to increase or decrease the risk of illness in the community.

Refer to your definition of epidemiology from Study Session 1: you might now conclude that epidemiology is only concerned with health data, *or* that it embraces the whole process of combining different types and sources of information that help us understand a health problem. Revise your definition if your understanding has changed.

In carrying out a situational analysis, you need to select a relevant set of variables that will enable you to conduct a community diagnosis. In the next section, we look briefly at data inaccuracy issues, which you are asked to comment on in your assignment.

5 RECOGNISING INACCURACIES AND GAPS

Those of you who collect data regularly will be familiar with the kinds of gaps and inaccuracies which are likely to occur. You will also probably be aware of the implications of poor data in health systems management. Here are some of them:

- If data are grossly inaccurate then managers, supervisors and staff will not use the information generated from the data.
- If people do not use the information, then all the effort and time that large numbers of people spent collecting the data and developing the information system will have been wasted.
- If the data are grossly inaccurate, but people do not realise this, and they use the information for planning and general decision-making, then it is likely that the plans will be flawed and poor decisions will be made, because they were based on inaccurate data.

Inaccurate data, if used in decision making, can therefore be very harmful, giving rise to unnecessary problems.

Errors can be detected using *General Accuracy Checking Measures*, which are those things that are well known and just common sense to do.

General Accuracy Checks include:

Checking Completeness	Are there any gaps, missing data?
Checking Proper Place	Is the data captured in right box, or is data entered wrongly due to typing error, e.g. unlikely valuables for variable (a man being pregnant, or low birth weight exceeding number of deliveries).
Checking Arithmetic	Are there any mistakes in adding?
Contradictions between variables	e.g. 100 births in a month when there are only 2 000 women of child-bearing age.

Good quality data should be correct, complete and consistent It should be reliable and accurate enough to support decisions. Finally it should be comparable i.e. using the same definitions. Ask whether the dataset you have been provided with complies with all these criteria.

In the next section, we will review a basic district health dataset.

6 ASSESSING A BASIC DISTRICT OR REGIONAL DATASET

How do we decide what variables to focus on in collecting health data in the district situation? How do we avoid time-loss and resource-wastage when planning our data collection strategy? Chapter 1 of Vaughan & Morrow (1989) has already suggested some key areas of information that may be needed at district level.

The task that follows requires you to conduct a situation analysis and to compile information about a district of your choice using the data collection sheet below. This list of community, health and health service variables tabulated below is designed to help you compile a brief summary of the main characteristics of your community, district or country and its health. It is a fairly arbitrary selection of variables and you will need to keep asking yourself how relevant each one is to your own community, or what changes you would make to improve it.

TASK 3 - COMPILE A MINI-SITUATION ANALYSIS FOR YOUR AREA

Once more, select a district or region for which you know you can locate statistical reports or survey data. Get reports from your local clinic, hospital, district or health department. If your health department or local health authority has a health policy document or annual report, try and get a copy of this to assist you. Use whatever

information you find to complete as much as you can of the table below. This particular data sheet is based on the format in the Health Systems Trust (1996) document on situation analysis. While some indicators might apply to your chosen district, you may wish to replace some with your own.

DISTRICT HEALTH DATA SHEET

Name of Community, District or Country (Choose one)	
Infrastructure (Is it good or poor?)	
Demography (Is it mainly rural, urban or peri-urban?)	
Population size	
Proportion of people under 15 years	
Proportion of people over 60	
Proportion of men and women	
Ethnicity (Is it mixed? What is the composition?)	

Socio-economic Status (High, moderate, low, very low)	
Type of economic activity (Is it mainly formal or informal?)	
Main economic activity (Agriculture, industrial, mixed, other)	
Per capita income per year	
Literacy levels (Give the percentage that is literate)	

Health Status (Use country data if local data is not available)	
The five most prevalent communicable diseases	
The five most prevalent non-communicable diseases	
The Infant Mortality Rate (IMR)	
Crude birth rate	
Crude death rate	
Top five causes of death	
Maternal mortality rate	
Prevalence of measles	
Prevalence of diarrhoea	
Prevalence of disability	

Health Services	
No of district, secondary or tertiary hospitals	

Hospital bed ratio	
Proportion of doctors in the public sector	
Proportion of budget spent on personnel in public sector	
Number of fixed clinics (PHC centres, etc.)	
Proportion of these that offer midwifery (MOU) services	
Proportion of budget spent on tertiary care	
Per capita Public Health expenditure (per year)	

After compiling your own dataset, answer these questions:

a) What are the most striking features of your district revealed by this data?

b) How does it compare with other communities in Africa and the world?

c) What seem to be the most significant health problems in your area?

d) Consider the quality of the data you located. Is it reliable? Why? Why not?

e) Was it easy to access?

f) How recent was the information?

g) Were there any serious omissions from the dataset that you noticed?

h) As a means of describing the main aspects of the health situation in your area, how appropriate are these particular indicators?

i) How complete and how accurate is the picture they give you?

j) How would you restructure or edit this data collection list to make it more appropriate to your district?

FEEDBACK

The quality and accessibility of this kind of information is notoriously poor. If you have emerged from the task determined to improve the data collection situation, then this task was worthwhile.

No single dataset is going to be perfect, but it is vital to ensure that every piece of data you include is there for a purpose. See page 7 of the Health Systems Trust (1996) manual for assistance.

READING: Health Systems Trust. (1996). How to Conduct a Situation Analysis: A Guide for Health Districts in South Africa. Durban: HST: 1 - 8.

Your set of indicators can now be used for comparing the health status of your district with other communities or other regions of the country. If you have two successive annual reports for your district, you can compare last year's data with this year's data to see if there were any improvements. It is also informative to compare your data with an adjacent district or region. You can also compare your indicators with stated national policy goals. Both provincial and national Departments of Health publish policy goals or targets for several of the indicators listed earlier. How well is your district doing in relation to these goals?

The next section will provide an opportunity to compare some of these indicators between countries.

7 COMPARING LOCAL AND GLOBAL HEALTH DATA

In the previous section, you compiled a dataset from local sources of health information. In your next task you will examine similar health indicators drawn from a number of national and international datasets. This has two purposes. The first is to see the kinds of indicators considered appropriate for publication in such global datasets.

The second is to enable comparison of health status across different continents and countries globally. You will be able to rank your own district or country in relation to others for which data is listed.

Take a look at the tables from the 1998 UNICEF *State of the World's Children* Report which are provided in the Reader.

READING: UNICEF. (1998). Basic Indicators. In *The State of the World's Children 1998.* Geneva: UNICEF: 92 - 97 & 102 - 105.

TASK 4 - WORK WITH TABLES OF INTERNATIONAL HEALTH INDICATORS

In this task, we ask you to make comparisons of data between rich and poor countries in the UNICEF data.

- Begin by scanning the title of each column to identify what data is included and what type of measurement is used to quantify it.
- Scan down the columns to get an idea of the range of the reported values, i.e. the largest and smallest figures. Also note whether there are any missing (or unreported) indicators. Why do you think this occurs? Does it influence any comparisons you may wish to make?
- Choose 2 or 3 countries and examine and answer these questions in relation to them.
- Look up any terms that are new to you in the glossary contained in Vaughan and Morrow (1989), Chapter 14 on page 155.

a) In the UNICEF Basic Indicators tables, select a country that interests you and make a note of its Under-5 mortality rate.

b) How has this changed from 1960 - 1996?

c) How does this country's Under-5 mortality rate compare with that of a much richer country, and that of a much poorer country?

d) How does this country compare with your own country or district?

e) Do any of the other indicators listed help to explain these differences between countries?

f) Does the Infant Mortality rate differ in the same way as the Under-5 mortality rate?

g) Which economic variable can tell you about the poverty or wealth status of each country?

h) Does there appear to be an association between poverty and mortality rates?

i) What is the relevance of including Adult Literacy, % Household Income and Primary School Enrolment in such a table?

j) Examine the Health table in the same way. Study *Measles Immunisation* and *Access to Safe Water* as the basis for comparison of the same 2 - 3 countries.

FEEDBACK

It is important to recognise that even the impressively large and well-organised WHO and UNICEF datasets are built up using summarised national data. This in turn was probably compiled from the same problematic district or regional data discussed in the previous task. A further complication of international datasets is the need to ensure that all reports use the same standardised definitions of the indicators. For example, we found that the calculation of maternal mortality was done differently in two published datasets. This makes comparison difficult. It is sometimes unclear whether the data has been collected over exactly the same periods. You also need to remember that all the figures reported are national averages, and they therefore hide any variations that may exist between groups within countries.

It is likely that as you compare richer countries with poorer ones, i.e. countries with high Gross National Product (GNP) and lower GNP values, you will notice that certain health indicators appear to be better in wealthy countries. However GNP is a very crude measure of the economic status of a country. While it tells you about the overall national income, it does not reflect the skewed distribution of income between a few extremely affluent people and the many more poor people in the population.

Consequently other more specific financial or social indicators may be more meaningful, such as household income or female literacy. Although these may not be health indicators in the narrow sense of the term, they are helpful in association with certain health status indicators. Why do you think this is so?

8 SESSION SUMMARY

This session explored several different sources of epidemiological data and emphasised the importance of goal-directed data collection. You gathered a substantial set of data from your own context, evaluated different indicators and compared data from national and international datasets. Competence in all these processes is essential for your assignment and other work you will do in this field.

In the next session, you will develop your own strategy for reading academic journal articles and epidemiological reports. This will provide the basis for future report writing and prepare you to start writing the literature review component of your first assignment.

Unit 1 - Study Session 4
Reading Epidemiology Reports and Articles

Introduction

This course and the others you are doing require you to spend a lot of your time reading. It is really important that you are well-equipped to cope with these reading tasks. In addition to improving your ability to read quickly and efficiently, it is essential that you develop a more systematic approach to the review and critique of epidemiological material for use both now and in the future.

One of the requirements of the assignment is a literature review which will acquaint you with the process of studying relevant recent literature when undertaking an epidemiology task in the course of your work. In addition, it is a step towards preparing yourself to write academic papers and your mini-thesis.

The topic is not entirely new to you: you have already completed the *Health Systems Research I* module in which you were introduced to writing a literature review. In relation to reading strategically, your *SOPH Academic Handbook* introduces a number of general reading strategies. However this session concentrates on reading scientific texts. Have the two texts just mentioned at hand while you work through this session, and reacquaint yourself with the requirements of the Literature Review in the assignment before you start.

Contents

Timing of this session

There is one prescribed reading in this session but you will also be required to review two others in order to practise the skills that are introduced in the session. In addition, there are four tasks to complete. It would be a good idea to send the final task to us for feedback. This session could take you up to five hours, and it would be worth your while to spend this time now, as it will equip you with important academic skills for your studies both now and in the future.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session you should be able to:	
Health Measurement Outcomes	***Academic Learning Outcomes***
▪ Critically review and interpret basic epidemiological texts.	▪ Develop a more systematic approach to reading scientific material. ▪ Develop a conceptual framework for the critique of epidemiological texts.

2 READINGS

Author/s	**Publication Details**
Mouton, J.	(2001). Ch 6 - The Literature Review. In *How to Succeed in your Master's and Doctoral Studies. A South African Guide and Resource Book.* Pretoria: Van Schaik: 86 - 97.
Sackett, D. L.	(March 1981). How to Read Clinical Journals: 1. Why to read them and how to start reading them critically. *CMA Journal,* 124: 555 - 558.
London, L.	(1996). Use of Rapid Appraisal Techniques to Evaluate Contact Tracing Activities at a Local Authority TB Clinic in the Western Cape. *South African Journal of Epidemiology and Infection,* 11(3): 77 - 81.
Moodley, J., Pick, W., Bradshaw, D. & Cooper, D.	(1996). The Infant and Under Five Mortality Rates for Children Born to Mothers in Griffiths Mxenge, Khayelitsha: A Community-Based Survey. *South African Journal of Epidemiology and Infection,* 11(3): 82 - 84.

3 ESTABLISH GUIDELINES FOR MORE EFFECTIVE READING

Tony Buzan, author of a number of books on academic skills, asserts that by following a few simple rules, anyone can develop a much more effective approach to reading. He elaborates on this in his book entitled *Use your Head* (1989) and in other books he has written. A brief summary of his suggested strategies for reading more effectively is included below.

TASK 1 - READ AND TRY OUT SUGGESTIONS FOR BETTER READING

Read through the notes included below and try them out on one of the readings. Compare this approach with the way you have been reading up to now. Use these ideas on reading to prepare your own set of guidelines to improve your reading speed and comprehension ability.

Preparation for Reading or Study

- *Allocate time*: Define and schedule reading or study periods, define learning units to be covered.
- *Set the amount:* Divide the work into smaller, manageable units.
- *Review prior knowledge:* Tune up your mind - What do you already know on this topic?
- *Establish the questions you want answered:* What? How? Who? Where? Why? What do you want to get out of it?

The Four Step Reading process

- *Survey the text:* View outline/composition of material - contents, summary conclusion.
- *Preview the text:* Identify headings, sections.
- *View:* Look for answers, keywords, make margin notes, etc.
- *Review:* Check aims/goals, make final notes, think through the meaning of what you read.

Further Improvement

- Visual guide: *Avoid hop/stutter and allow eyes to smoothly stride across page reading phrases not individual words.*
- *Speed:* Warm up before you begin, by reading a few lines as fast as you can.
- *Eye rest:* Avoid fatigue, do conscious blinking, press your palms over your eyes.
- *Visualising:* Rest and recall the mental images associated with what you read.
- Ensure you maintain a comfortable posture, relaxed breathing, adequate light.
- Identify and mark or record keywords.
- Make notes or mind maps as you go and when you review the material.

FEEDBACK

No amount of magic rules or special guidelines will make a real difference to your reading patterns unless they are accompanied by the discipline of regular practice. This can only start with a conscious decision to adopt a more systematic approach to reading, and to refine this approach over time. The long-term benefits can be enormous.

Effective academic reading needs to be complemented by an efficient note-taking and review process. We strongly suggest you consult the writings of Buzan and others for mind-mapping and note-taking methods to assist this process. See also Section 5.4 of the *SOPH Academic Handbook*.

4 LITERATURE REVIEWS

In any research that you may undertake, it is important for you to acquaint yourself with what has already been written on the subject. This is the process of reviewing the literature. As a researcher, you are also expected to acknowledge or note relevant findings in other research before embarking on your own contribution. A literature review is therefore a discussion of the research, and it precedes your investigation. The literature that you review must be selected for its relevance to your topic, and its sources must be fully acknowledged. Doing a literature review is a process of both getting to know what else has been written in the field, what methods have been used to investigate similar problems, and commenting on its value in terms of your own research. Take a look at the example of a literature review which you will find as Appendix 1 at the end of this *Module Guide*.

Read Chapter 6 by Mouton (2001) in order to understand the purpose and form of a literature review, and spend some time clarifying your understanding of the method of referencing or citation.

Referencing is explained in the *SOPH Academic Handbook*. It is worth your while to get your referencing technique correct starting now. It is one of those essential skills in the academic field which is taken very seriously by markers and fellow academics. All it takes is attention to detail. So do your best to get it right!

READING: Mouton, J. (2001). Ch 6 - The Literature Review. In *How to Succeed in your Master's and Doctoral Studies. A South African Guide and Resource Book.* Pretoria: Van Schaik: 86 - 97.

As you find relevant literature, make sure that you have all the relevant reference details: as you find them, discipline yourself to type them on a computer in the correct format (e.g. Harvard style). You will not only score marks this way, but

save time when you are under time pressure.

We will return to the process of writing a literature review in the final session of this unit, but first we focus on reading scientific studies critically.

5 A SYSTEMATIC APPROACH TO CRITICAL JOURNAL READING

Sackett (1981) describes a process similar to what we have called *reviewing* in the *SOPH Academic Handbook*. It is an excellent way to "tune up" your mind as Buzan calls it, or to create a mental framework or *schema* to receive new information.

READING: Sackett, D. L. (March 1981). How to Read Clinical Journals: 1. Why to Read Them and How to Start Reading Them Critically. *CMA Journal,* 124: 555 - 558.

TASK 2 - DEVELOP A SYSTEMATIC TEXT SELECTION PROCESS

Take a look at the reading by Sackett of McMaster University. Consider in particular the questions raised in Table 1, page 556 and Figure 1, page 557.

a) What is the main reason why you currently read scientific articles?

b) Would you add other reasons for reading scientific articles to the list provided by Sackett in Table 1?

c) Select an article of your choice, or use London (1996) or Moodley, Pick, Bradshaw & Cooper (1996) and follow steps 1 - 4 in Sackett's recommended process of sifting the literature.

d) Having a very specific reason to read an article improves the *efficacy* of your reading process and increases your motivation to read it. Do you agree? Note that *efficacy* means your sense of your own ability to do so.

e) Using the same article, try to answer Sackett's question: What is your intent in reading the article? Construct your own set of 3 - 4 points under this question and write down the main characteristics of the article you have chosen to read.

FEEDBACK

As you read faster and better, you will discover that you still do not have enough time to get through all the material you would like to read. There is simply too much and the speed of producing new knowledge increases all the time. One way to deal with this problem is to become much more selective about what you choose to read in detail. To reduce the amount of unnecessary reading, you need to develop an efficient process of selecting or rejecting *potential* reading material. It is also important to know which parts of a particular chapter or journal article is most likely to contain the information you are most interested in reading. An important assumption that Sackett makes is that you, the reader, set out to read the journal articles with a *clear purpose in mind*. It is assumed that you have some very specific questions that you want answered. Practise developing focus questions every time you embark on reading.

The next task is directly relevant to reviewing literature for your assignment (Assignment 1).

TASK 3 - DEVELOP A STRUCTURED APPROACH TO CRITICAL JOURNAL REVIEW

a) Read the notes on evaluating scientific papers included below.

b) Prepare a set of questions to use in the critical review of scientific articles.

NOTES ON EVALUATING SCIENTIFIC PAPERS

Introduction
Epidemiology helps us to be more systematic in our evaluation of population-based studies. We need to ask critical questions such as: *Does the hypothesis being tested relate to the problem? Does the study design warrant the conclusions? Can the findings be generalised beyond the study setting? Are the findings reproducible?* Such a critique must address the objective or hypothesis of the study in relation to the study's design, results, discussion, conclusions and significance.

Statement of Problem
The paper should provide the reader with sufficient background on the general problem area to allow an assessment of its importance. Relevant literature should be surveyed and critiqued to conclude what is currently known regarding the problem and what remains debatable or unanswered.

Study Objective or Hypothesis
A clear statement of the original objectives of the research is essential. Ideally, the objective will be clearly stated as a study hypothesis. Objectives are often not explicitly stated and the reader must then assess the conclusions to identify what the research was actually trying to prove. The objectives should clearly relate to the problem stated earlier.

Methods and Study Design
The *sample* must be clearly identified and must be appropriate for the study objectives and the generalisability of the results. Sample size and the selection process must be acceptable. The *study design* is one of the strongest factors affecting a study's conclusions and must be appropriate to the hypothesis. Many designs involve studies that determine the relationship between a health or disease outcome (e.g. death from lung cancer) and an exposure (e.g. smoking). In this case smoking is the independent variable which affects the other, dependent variable (death from lung cancer).

Study designs are of two types: experimental or observational - either descriptive or analytic - and can be further sub-categorised as cross-sectional or prevalence studies, case-control studies, and incidence or cohort studies. Other concerns include: adequate definition of independent and dependent variables, control of confounding variables, the validity and reliability of instruments and techniques used for measurement, sound ethical practice, etc.

Results
Data must be presented clearly and precisely with figures and summary statistics to allow the reader to agree or disagree with the author. You need to check whether the study design and methods of observation warrant the statistical analysis presented as the results. Certain biases in the method of observation or defects in study design may invalidate the results.

Discussion
This section of a paper allows the author to interpret the results as they relate to the study's objectives or hypothesis. Comparisons can also be made to what is reported in the literature. Difficulties or problems in study design or data collection leading to potential bias should also be discussed here.

FEEDBACK

Your set of critical questions (critique) may have included these questions:

a) What is the question that is being addressed?

b) Was the study sample appropriate? What were its limitations, if any?

c) What study design was employed?

d) What were the most important features of the study design?

e) Were the conclusions appropriate? Did the method bias the results?

6 CRITIQUE AN ARTICLE

In this section, you are asked to practise your review skills. This will be a good way to strengthen your skills before you undertake the assignment. Follow the strategies for better reading introduced earlier to read through both the articles listed below. Select one article to review.

READINGS

London, L. (1996). Use of Rapid Appraisal Techniques to Evaluate Contact Tracing Activities at a Local Authority TB Clinic in the Western Cape. *South African Journal of Epidemiology and Infection,* 11(3): 77 - 81.

Moodley, J., Pick, W., Bradshaw, D. & Cooper, D. (1996). The Infant and Under Five Mortality Rates for Children Born to Mothers in Griffiths Mxenge, Khayelitsha: A Community-Based Survey. *South African Journal of Epidemiology and Infection,* 11(3): 82 - 84.

TASK 4 – REVIEW A SCIENTIFIC ARTICLE

a) Use your critical questions from Task 3 to prepare a 1 - 2 page review of one of these articles.

b) Conclude this task by constructing a short list of the criteria that will help you assess whether your own research report or literature review is of good quality, e.g. Does my review address the study design?

FEEDBACK

As you prepare your review, reflect on the quality of the information contained in the article. It may be helpful to recall the main questions you asked of the article (as you did in **Task 2** while referring to Sackett, 1981, Figure 1) in order to arrive at a meaningful critique of their contents. Also comment on the readability of the article that you critique.

You are encouraged to send your responses to this task to your lecturer for feedback by e-mail or fax .Label it clearly for our attention, and give it the title: *Practice task: Review of Article for Measuring Health and Disease I, Unit 1 Session 4.*

Before you close your manual or take a break, recall the main steps you took to read through the articles. Are you managing to implement the reading strategies introduced earlier in this session?

7 SESSION SUMMARY

This session introduced techniques for more effective selection and reading of scientific texts. A set of guidelines for the systematic critique of scientific articles was then presented and used as a basis for reviewing a journal article.

The next session continues this theme by specifically addressing the task of searching, reading and reviewing material (literature) for your assignment. In order to make sense of this material, you will also need to apply your knowledge of general epidemiological concepts introduced in the preceding study sessions of this unit.

8 REFERENCES

- Buzan, T. (1989). *Use Your Head*. New York, NY: Dutton.

Unit 1 - Study Session 5
Search and Review Relevant Literature (Assignment 1)

Introduction

In each unit, the final study session focuses on a different aspect of the assignments. This study session guides you through Assignment 1. You will submit it and get feedback which you may incorporate into your second assignment - the final report. Take another look at Section 3.3 in the Module Introduction (on Draft Assignments) before you proceed. Remember also that you have an example of a Literature Review as Appendix 1 at the end of this *Module Guide*.

In this study session, you will begin by analysing the assignment as a whole. Once you are clear on its requirements, you can proceed to **Task 1**. Assignment 1 requires you to familiarise yourself with the problem presented in the dataset in section 3.6 of the Module Introduction. Once you have a good grasp of what the dataset represents, you need to locate as much relevant literature as is available on this issue. This literature may take the form of research reports, articles in journals, comparative data, annual reports or any other sources of information. Remember that finding relevant literature can take time, so start straight away. You must use the Internet for your search in order to get up to date studies.

You should then read this literature, select relevant material from it and critically review the literature in 2 - 3 pages. Here you should be selective, focusing on the issues in the literature which are relevant to the dataset. You should then submit this draft literature review to your lecturer for comment.

While you read the literature, you are urged to take notes which will feed into Assignment 2. This involves going beyond simply reviewing the literature and recording any insights you gain from the literature about the dataset. It is part of developing a systematic summary of your observations as you proceed.

Contents

8 Critically review health information
9 Session summary

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session you should be better able to:

- Define a health problem from a dataset.
- Search and locate information relevant to a specific health problem.
- Write a short, critical review of the available health literature.

ASSIGNMENT 1 REMINDER

Prepare a review of the literature and other information relevant to the dataset.

2 READINGS

Refer to all the readings listed in the preceding study sessions.

Refer to the assignment information in the Module Introduction (section 3) and use the dataset provided in the Module Introduction (section 3.6).

Author/s	**Publication Details**
Vaughan, J. P. & Morrow, R. H.	(1989) Ch 12 - Communicating Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 125 - 130.
Mouton, J.	(2001). *How to Succeed in your Master's & Doctoral Studies: A South African Guide and Resource Book.* Pretoria: Van Schaik: 86 - 97.
Depoy, E. & Gitlin, L.	(1994). Ch 5 - Developing a Knowledge Base Through Review of the Literature. In *Introduction to Research.* St Louis: Mosby: 61 - 76.

3 ASSIGNMENT SCENARIOS

For the purposes of this assignment, assume you are a senior public official responsible for this area of Public Health in your region. Your job is to collate and report on health information sent to you from your regions. In the case of this assignment, your role means that you are responsible to promote or care for the health of a particular segment of the community. Your objectives are therefore to understand a particular health problem within its context, and in comparison to other instances of it, to explore the factors that may be contributing to it, and to propose strategies to address the problem effectively.

You are required to identify some of the more prominent features of the Public Health problem evident in the data. Be aware that this dataset represents a real problem occurring in the world of Public Health practice. For this reason, you will want to draw on other sources of information in the literature, from your own experience, consult expert opinions or access the records of local health authorities available to you.

Your task is to assess this information, compare it with what the literature says about this condition, and report to your manager on the health status of the community of this region. These findings will be used to guide Public Health interventions that will improve the health of the affected communities.

Based on your interpretation of this information, you are expected to make some appropriate recommendations that are directly related to your findings. Remember that ultimately your report must be *credible* and it must persuade your line manager to take action.

Remember that this is a report, not a manuscript or article for a journal. Your reader (who is probably your manager) is already familiar with your region, so you do not have to explain everything about the context. A short introduction will be sufficient. Rather concentrate on the issues highlighted by this dataset, and the information you get from the literature which throws light on the problem.

Once you have completed Assignment 1, and received feedback, you should correct it and incorporate it into Assignment 2.

4 CLARIFY THE ASSIGNMENT REQUIREMENTS

Before plunging into your assignment, take a few moments to clarify what you hope to achieve, by when, and the resources available to you. A plan like this will help you to work systematically through all aspects of this task.

TASK 1 – PLAN THE PROCESS OF UNDERTAKING YOUR ASSIGNMENTS

After reading the assignment scenario above, use the Module Introduction, sections 3 and 4 and the last session of each unit to complete the table below.

a) Identify the marks allocated and due dates of the assignments. Write the draft and final submission dates onto your Work Plan.

b) Identify the main components of the Report required for the assignment.

c) Identify what you must do to complete each of these components.

d) Identify any resources that may help you with the assignments.

You could wait until later to clarify the actions to be taken for Assignment 2. They will become clearer after you have done an initial review of the literature, and clarified an outline for Assignment 1.

Assignment	Marks	Date Due	What section of the Report must be completed	Actions to be taken	Resources identified so far
1 (Draft Assignment)					
1 (Final Assignment)	40		Title, Introduction, Literature Review, Reference List.		
2 (Draft Assignment)	5				
2 (Final Assignment)					

FEEDBACK

Hopefully this gives you a sense of the process that lies ahead: the compulsory hand-ins are Assignment 1, Draft Assignment 2 and Final Assignment 2. You should add the required actions to this table as you work through this session, (e.g. search for comparable studies on Internet), and return to this table it to remind yourself of the process that lies ahead.

You have received an Assignment Schedule from the Student Administrator. The components of the Report required for each assignment is set out in the Module Introduction and explained in the final sessions of each unit.

Some of the resources that may be helpful include provincial or local authority

annual health reports, the Health Systems Trust's annual South African Health Review, World Health Organisation (WHO) reports or UNICEF documents. These might provide you with a basis for comparing your dataset with similar data from other sources.

In order to get a feel for the final report that you must produce, take a look at Chapter 12 of Vaughan and Morrow (1998), on different ways to present health information. The checklist provided at the end of Chapter 12 may also be particularly useful.

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 12 - Communicating Health Information. In *Epidemiology for Health Managers*. Geneva: WHO Publications: 125 - 129.

Before you even start the literature review, make sure that you have a good grasp of the nature of the problem represented by the dataset.

5 SCRUTINISE THE DATASET AND DESCRIBE THE PROBLEM

The purpose of **Task 2** below is to get a rough understanding of the problem represented by the dataset and to conceptualise how you will go about understanding it better. This will make it easier to handle and interpret, and also help you decide what kind of literature would be helpful.

In Unit 1, Session 2, you were provided with a conceptual framework to analyse a health status problem which included questions like: Where did these health events occur? Use these questions to help you get to grips with the dataset.

TASK 2 – EXAMINE THE PROBLEM AND IDENTIFY THE MAIN CHARACTERISTICS OF THE DATA

a) Look at the data provided to determine what is there.

b) Get an initial impression of the data using the questions from the conceptual framework (Unit 1 Session 2).

c) Summarise the problem you see in the data.

FEEDBACK

What does the data contained in the dataset represent? What diseases, conditions or Public Health problems have resulted in the problem presented in the data? You may find that there are categories or groups of data that are similar. What are these overall groups or sub-headings?

You need to identify what the data is that you are looking at before you begin your literature review. The categories of data and the individual items of data will provide a set of Key Words for you to use in your literature search in **Task 3.**

6 INTRODUCE THE REPORT

As part of Assignment 1, you should introduce your report covering a few key issues: first of all you should define key concepts, succinctly state the problem studied by the survey or data, explain the context in which it exists and establish why it is worth tackling.

TASK 2 – THE PURPOSE OF THE INTRODUCTION

What would you say is the purpose or role of an Introduction in a Research Report?

FEEDBACK

Take a look at this example of an Introduction by one of SOPH's past students from Tanzania, Jeremiah Mazala (2004) which is reproduced with his permission. The dataset that he studied was concerned with:

> ***THE SEXUAL AND DRUG RELATED RISK BEHAVIOUR IN ADOLESCENTS AGED 11 AND 15 YEARS IN REGION X.***
>
> ***Introduction***
>
> *There are different definitions of* risk beha~~viour by different writers. Richard (1998) defined it as behaviours that can directly or indirectly compromise the well being, the health and even the life course of young people. The World Health Report 2002 suggests that* risk *is "… the probability of an adverse outcome, or a factor that raises this probability" (WHO, 2002: 21). In other words any behaviour that will raise this probability is a health risk.*
>
> *Teenagers are at peak of risky behaviour because of their curiosity. They constantly experiment and test varieties of behaviours. In doing this, they become dangerously exposed to all kinds of behaviour associated risks. Amongst others, these include cigarette smoking, alcohol drinking, unsafe*
>
> sex, marijuana smoking, use of cocaine and mandrax, etc. Since the young

Defines key concepts

Develops context and establishes rationale for investigation

States problem and builds rationale

population is higher than other age groups in most of populations, the future working and economically viable population will be in jeopardy if these risky behaviours are left unchecked. This has an impact on future adult productiveness economically, socially and politically. So knowing the extent of the problem is important for productive interventions.

This introduction achieves all of these things, but the context could, in a real situation, be presented more specifically. Now try to draft an introduction to your report, submit it with your Literature Review, and revise it as your report develops.

6 SEARCH FOR HEALTH INFORMATION

In order to start your literature search, you must be fairly familiar with the dataset and the Public Health problem that it represents. Ask yourself what information is required to understand this health problem more deeply. This is the motivation for exploring relevant literature. You are trying to find out what is already known about this issue. Search for information about the condition, about other interventions which have been made to address this problem. Ask yourself: what other information may be important? This search for information might be divided into sub-sections or themes, e.g. risk factors for this condition or comparable interventions.

The purpose of **Task 3** below is to get started on your search for relevant literature or background information on the Public Health problem represented in the dataset. Your literature search will be guided by your description of the problem from the previous section. It could include an exploration of the kind of social and biomedical risk factors that may have an influence.

You will need access to a library and the Internet (if possible) for this task. It could take a few weeks to gather the information you need, so start early. Begin by identifying key words that will help you to locate appropriate literature, e.g. if the data focused on HIV/AIDS, you could search for literature using the keywords *HIV/AIDS* and *Risk Factors*. If the dataset focused on women with HIV/AIDS only, you would use Women + HIV/AIDS + Risk factors. You should search for these words and related terms on the Internet in established electronic databases such as MedLine, MedInfo and others. See section 2.4 of the Module Introduction for additional websites.

TASK 3 - SEARCH EXISTING DATABASES FOR LITERATURE

Here are some tips to get you started:

- Use your key words to search for information on this health problem.
- Ask colleagues for help in locating other more local sources of information relevant to the dataset.

- As you search for literature, look out for comparable studies by other researchers.
- Copy down or print out the reference details and abstracts of articles that seem to be useful.
- Record full reference details immediately using a standard reference style like Harvard.
- Save or request copies of the complete articles that appear to be particularly relevant.

FEEDBACK

You could use the list of variables included in the sample dataset and any synonyms that seem relevant as key words to begin with. Refer also to resources you have encountered previously such as the *SA Health System Review,* Department of Health Annual Reports and articles in the local medical literature. Remember that you must be selective. You are trying to narrow down your search to literature that will be relevant to this particular problem. "How many references will be needed?" is a question that is often asked. In a data or research report for a busy manager, you would generally expect to have 8 - 15 references.

Remember also that your Literature Review must have an alphabetical Reference List at the end of it, with full reference details, set out correctly, with accurate punctuation. You may use any style of referencing as long as you are consistent. We recommend, however, that you follow the Harvard Method of referencing which is explained in your *SOPH Academic Handbook.*

7 DEVELOP YOUR REVIEW WHILE YOU READ

You should already be aware that a Literature Review is more than just a summary of selected articles about a health problem. From Session 4, you have learnt the importance of critically reviewing what you read. However, a literature review must also be an integrated discussion of the literature on a topic. To write an integrated discussion, you need to know the contents of the literature well enough to select relevant information, and secondly you need to conceptualise an overarching framework for your review in the early stages of reading. This enables you to identify relevant points while you read, rather than reading everything and then trying to put it all together. Here is an example.

When presented with a dataset describing a high incidence of non-communicable or chronic diseases, this is a possible structure for the literature review:
a) Clarification of key concept/s, e.g. non-communicable diseases.

b) Global, national and local prevalences.
c) Physical and socio-economic impacts of chronic diseases.
d) Risk factors, including nutritional changes, physical exercise, etc.
d) Studies of Public Health interventions in this field, such a healthy eating campaigns.
e) Relevant methodologies used by other researchers, and critical reviews of available studies.

How did we arrive at these sub-topics or themes? Firstly there are some sub-topics that will be relevant to *any* epidemiological problem, e.g. physical and socio-economic impacts of chronic diseases. Then, you would need to discuss the effects or impacts of the problem in order to alert your manager to the scale or potential impact of the problem; and thirdly, you will want to know what others have done faced with similar problems: are there any lessons that you could learn from previous studies? Other topics will emerge iteratively as you study the dataset, and read articles relevant to this health problem.

A strategically sound way of preparing a literature review is to read purposefully, and selectively from the outset. The following readings by Mouton (2001) and Depoy & Gitlin (1994) explain that it is helpful to read with your sub-topics in mind, selecting information for the different sections of your literature review while you read. Depoy & Gitlin (1994) suggest two ways of "Charting the Literature", or organising it: the first way is according to key concepts or topics that arise from the study, e.g. drug-related behaviours, depression and suicide. This is what we have done in the example above. Mouton (2001) also suggests this approach.

Another way of structuring the content of the literature review is to use the framework provided by scientific papers (Depoy & Gitlin, 1994). Here you could focus on links and contrasts between study population, then focus on the sampling strategies and study methods, then on the findings, and so on. Whatever way you decide to structure your literature review, you need to integrate the literature into a discussion, with the aim of showing what is relevant to your study, what contradicts it and whether there are gaps in the research. Take a look at these readings, and then choose a way of structuring your review that suits you.

READINGS

Depoy, E. & Gitlin, L. (1994). Ch 5 - Developing a Knowledge Base Through Review of the Literature. In *Introduction to Research.* St Louis: Mosby: 61 - 66.

Mouton, J. (2001). *Ch 6 - The Literature Review. How to Succeed in your Master's & Doctoral Studies: A South African Guide and Resource Book.* Pretoria: Van Schaik: 86 - 97.

TASK 4 – DEVELOP A FRAMEWORK FOR YOUR LITERATURE REVIEW

Brainstorm a set of sub-topics for your literature review. Then read one of the texts you have found, and select information which fits into your structure. Every time you find something relevant, note it down with the page number, or code it clearly on the reading itself.

FEEDBACK

Amongst your sub-topics, you should at least have:

- Clarification of key concept/s.
- Global, national and local prevalences.
- Risk factors.
- Studies of Public Health interventions in this field.

In summary, choose subheadings to reflect the most important issues; organise the evidence or research findings in the literature in terms of the main themes, topics or questions you have identified. Then write an integrated summary of what the literature says about each of your thematic issues.

8 CRITICALLY REVIEW HEALTH INFORMATION

After you have assembled a set of relevant literature, try to systematically critique the studies. Being critical is difficult when you are not yet familiar with the topic. You will probably find that only once you have analysed your own dataset, will you really be able to comment critically on the other comparative texts you have found. Do as much as you can at this stage, but be prepared to revise your Literature Review after you receive feedback from your lecturer, when you are compiling the Final Report.

TASK 5 – UNDERTAKE A CRITICAL REVIEW OF THE LITERATURE

Having written a draft of your literature review, try to develop a critical review section which focuses on the research studies that you have read. Read these texts with the critical questions you developed in Session 4 (**Task 3**) in mind. Be sure to assess the quality and appropriateness of the research methods used to generate the results, and to comment critically on the findings and conclusions.

FEEDBACK

Hopefully you have asked some of these questions:

- What question is being addressed in this study?
- Is the context of the study similar to that in my dataset?
- Was the study sample appropriate?

- What were the limitations of the study, if any?
- What study design was employed?
- What were the most important features of the study design?
- Were the conclusions appropriate? Did the method bias the results?

It can also be useful to prepare tables that display the main findings from different researchers alongside each other.

It is now time to start finalising your first Assignment. Drafts are welcome as long as they are well ahead of the deadline. You will receive comments on your Literature Review, which will enable you to make improvements before final submission as part of the report (Assignment 2).

Remember that you should not simply repeat what was said in the articles you read. You must try to be selective, to analyse it and be critical as well, asking questions of the article and pointing out issues that have not been addressed. You should also comment, if possible, on the research methods used by the researchers. A variety of texts illustrate a systematic approach to critical journal reading. You may also refer to the *Health Systems Research I* module for further guidance.

9 SESSION SUMMARY

By now you should be well on your way to completing your first assignment. So far, it should have a Title, a short Introduction to the topic and problem, a Literature Review with proper in-text referencing, and a corresponding Reference List in the correct format. Have a look at the example which you will find as Appendix 1 at the end of this *Module Guide*.

Submit it in draft form as soon as possible for comment. Unit 2 will further develop your skills in understanding the uses of epidemiological data and provide preparation for Assignment 2.

UNIT 2

Measuring Health and Disease

Introduction

To determine whether a particular disease or health event is a Public Health problem, it is important to be able to measure its distribution in the population. Public Health workers also need a way to effectively monitor the spread or containment of such conditions, and to know whether their intervention is improving the health of the community or not.

This unit explores the use of rates, indicators and other vital statistics in epidemiology, together with a brief introduction to some of the demographic influences that provide a basis for their measurement. Existing sources of epidemiological data are explored to assess their accessibility, reliability and relevance. The unit concludes by looking at effective ways to report epidemiological information.

There are five Study Sessions in Unit 2:

Study Session 1: Epidemiological Principles and Practice.

Study Session 2: Describing a Population.

Study Session 3: The Source and Quality of Epidemiological Information.

Study Session 4: Infectious Diseases and Outbreaks.

Study Session 5: Develop Critical Questions For Your Dataset.

Intended Learning Outcomes

By the end of this unit you should be able to:	
Health Measurement Outcomes	***Academic Learning Outcomes***
▪ Interpret commonly used rates and indicators. ▪ Discuss the implications of demography on Public Health.	▪ Understand the role of the numerator and denominator in calculating rates. ▪ Search health reports for information. ▪ Interpret and produce graphs, tables.

▪ Recognise the influence of data quality on Public Health practice.	▪ Recognise factors that influence data quality.

Assignments

The final session of this unit gets you started on Assignment 2, your epidemiological report on the dataset.

Unit 2 - Study Session 1
Epidemiological Principles and Practice

Introduction

In Unit 1, you established a working definition of epidemiology and its main uses and considered the key questions that epidemiology helps us to answer as Public Health workers. You have also been briefly introduced to various types and sources of epidemiological data. As you now know, many of the health or demographic conditions that were measured are called indicators, and how frequently they occur – rates – is one of their chief attributes that we are interested in measuring.

This study session takes a closer look at health indicators, considers the notion of *population at risk*, and describes the construction of rates and other important epidemiological concepts.

Contents

Timing of this session

This session contains two readings and eight tasks. It should take you up to two and a half hours to complete.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session you should be able to:	
Health Measurement Outcomes	***Academic Learning Outcomes***
▪ Define key terms. ▪ Evaluate different health indicators. ▪ Calculate rates.	▪ Define new technical terms. ▪ Carry out some simple calculations.

▪ Apply descriptive epidemiology concepts and principles to Public Health problems.	

2 READINGS

There are two readings in this session. You will use them mainly as references for clarifying your understanding of key concepts.

Author/s	Publication Details
Vaughan, J. P. & Morrow, R. H.	(1989). Ch 2 - Epidemiological Principles. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 9 - 20.
Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S.	(1997). Ch 2 - Key Concepts in Epidemiology. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 15 - 24.

3 DEFINE KEY TERMS

Earlier when you looked at district and global health indicators (Unit 1 Session 3), you encountered several questions about how many people are affected by a health condition and how often a condition occurs in the population. To arrive at answers to these questions, several forms of health measurement are required. Some examples of the indicators discussed in that session included various types of mortality rates, disease rates, immunisation coverage, per capita income, literacy levels, birth rates and others. It is important to establish a set of precise definitions or descriptions of these measurements, for use in the future.

There are two readings to help you familiarise yourself with some of the key terms in health management. Start with Chapter 2 of Vaughan & Morrow (1989), and then refer to Chapter 2 of Katzenellenbogen, Joubert & Abdool Karim (1997) for explanations of certain key terms.

READINGS

Vaughan, J. P. & Morrow, R. H. (1989). Ch 2 - Epidemiological Principles. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 12 - 20.

Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S. (1997). Ch 2 - Key Concepts in Epidemiology. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 15 - 24.

TASK 1 - READ A TEXT AND IDENTIFY NEW TERMS

Work through Chapter 2 of Vaughan & Morrow (1989), pages 12 - 20. List any terms with which you are not familiar. Some of these are in bold. Try to write a definition of each term in your own words, using the text as a reference.

FEEDBACK

The terms that are important to define at this stage include:

Incidence	Prevalence Rates	Population at risk
Numerator	Denominator	Episode
Case definition	Health indicator	Health status indicators
Morbidity	Mortality indicators	Crude death rate
Cause-specific rate	Random sample	

If you get stuck, consult the glossary in Chapter 14 of Vaughan and Morrow (1989), or a dictionary, for definitions of some of these terms. You will find clarification of key rates like *crude rate* and *specific rate* on page 16 of Katzenellenbogen, Joubert & Abdool Karim (1997).

A few can be found in the following reading.

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 2 - Epidemiological Principles. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 9 - 20.

- *episodes:* see the above reading, section 2.5.
- *case definition*: see the discussion under section 2.6 of the above reading.
- *health status indicators:* see the above reading, section 2.8.
- *mortality indicators:* see the above reading, section 2.10.
- *random sample* (and why it's used).

A good way to consolidate your understanding of new concepts is to use them in context. Although Vaughan & Morrow (1989) provide a number of examples to illustrate how these different rates are used (such as the kala-azar and leprosy examples on page 14), the best way for you to understand and remember them is to find a few good examples of your own.

TASK 2 - FIND YOUR OWN EXAMPLES OF THESE MEASURES

a) Draw on your own experience or reading and identify one example of each of the different rates and indicators given above. Include an incidence rate, prevalence rate, a health indicator, a health status indicator, a morbidity rate, a mortality rate, a crude death rate, a cause-specific mortality rate.

b) As you select your examples, try to identify how they were derived.

FEEDBACK

an incidence rate:	85/100 000 new cases of TB annually
a prevalence rate:	21,5% or 21,5/100 cases HIV infection
a health indicator:	74% in SA have access to clean water
a health status indicator:	6.4/100 000 SA males have oral cancer
a morbidity rate:	36% of students had colds in June
a mortality rate:	Infant mortality in SA is 54/1000 live births
a crude death rate:	SA death rate is about 1.8%
a cause-specific mortality rate:	Rabies death rate is 98% untreated

To illustrate one of these rates: TB incidence in Cape Town was given as 85/100 000. This means, out of every 100 000 people in Cape Town who do not already have TB, 85 people were diagnosed as new cases of TB in a given year.

As was emphasised in Unit 1 Session 3, to help health workers avoid spending all their time collecting data on unimportant health conditions or events, it is essential that health workers choose indicators very carefully according to what they require. For more information on indicators refer to Chapter 1 of Vaughan & Morrow (1989).

4 CALCULATE A SELECTION OF RATES

You may not need to calculate many of these rates in the course of your work, but there is no doubt that you will come across them in reports, discussions and journal articles. A clear understanding of how they are derived makes it a lot easier to interpret the reports or articles in which they appear. This section provides you with the opportunity to become familiar with calculating rates and with deciding whether to calculate the incidence or prevalence rate.

You will need a calculator to do this and you may find the following reading helpful in clarifying the rates and their calculation.

READING: Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S. (1997). Ch 2 - Key Concepts in Epidemiology. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 15 - 24.

Remember that *prevalence* means the total number of cases at a particular point in time, divided by the total population at that same moment. Notice that these rates require both a *numerator* and a *denominator*, and that the denominator is derived from counting the population in question. See Katzenellenbogen, Joubert & Abdool Karim (1997) above, page 16 for further clarification of these terms.

TASK 3 - CALCULATE MEASLES PREVALENCE

Suppose that a random sample survey of 300 Under-5 children in your district found 70 of them with measles.

a) What is the prevalence of measles in the sample, expressed as a rate per 1000 population?

b) How many cases of measles would you expect to find in the entire district at any given time, if the total population of Under- 5s is about 25 000**?**

FEEDBACK

a) A random sample of 300 Under-5 children shows that 70 have measles. We express this as 70/300 and treat it as a rate. To work out the rate per 1000, we divide 70 by 300 and multiply by 1 000 to get 233. This is the same process as working out a percentage, but you are doing so here out of 1 000 (instead of 100).

b) You would expect to find that 233 children in every 1 000 have measles, or 233/1000. Now, if the total population of Under-5s is 25 000, this means there are 25 sets of 1000 children, each containing 233 with measles. Multiply the 233 by 25 to get 5 825. So, in a population of 25 000, there are likely to be 5 825 cases of measles.

In the next task, using the same scenario as in the previous task, we calculate the incidence rate of measles in the following year for the same population.

TASK 4 - CALCULATE RATE OF NEW CASES OF MEASLES

In the year following the survey, 12 cases of measles are notified. Assume that the mid-year estimate of the population of Under-5s has increased to
26 000.

- Calculate the number of notifications per 100 000 population. Is this an incidence or a prevalence rate? Explain your answer.

FEEDBACK

Out of a population of 26 000 there are 12 notifications of new cases of measles. Because they are new cases, this means that we can calculate the *incidence* rate as 12/26000. Expressed as a rate per 100 000 this becomes (12÷26 000) x100 000 = 46 per 100 000.

Remember that *incidence* means the number of *new cases* occurring in a defined population within a given period, usually one year.

Now calculate annual incidence of spina bifida in newborns.

TASK 5 - CALCULATE SPINA BIFIDA RATES

Of 129 600 children born in Cape Town between January 1, 1992 and December 31, 1994, 212 were diagnosed with spina bifida at birth.

a) Which measure of disease occurrence can be calculated – prevalence or incidence rate?

b) Calculate this as an annual rate.

FEEDBACK

Because these children have just been born, they are new cases of spina bifida being recorded for the first time, and we can therefore calculate an *incidence* rate.

The dates cover a three-year period, so the three-year incidence of spina bifida is 212/129 600. Expressed as an incidence rate this becomes (212÷129 600) x 100 000 = 164 per 100 000. You can express this as an annual incidence rate by dividing this by 3. The annual incidence rate is then 54 per 100 000. Notice that the fact that these are new born infants enables us to calculate incidence, or new cases.

Now look at the implications when we deal with breast cancer rates.

TASK 6 - CALCULATE BREAST CANCER RATE

In a mass screening of 5 000 women, 25 of them were found to have breast cancer. During the next five years, 10 more women from the original screened group of 5 000, developed breast cancer.

Which measure of disease occurrence can be calculated? Calculate this.

FEEDBACK

We can calculate both prevalence and incidence. The prevalence of breast cancer in this group will be 25/5 000 or 5 per 1 000. The prevalence rate after five years is 10 + 25 = 35/5 000 i.e. (35÷5 000) x 1 000 = 7 per 1 000.

To calculate incidence, we look for new cases in a given period. The original identified 25 women still have breast cancer or have died and left the group and cannot be included as new cases. Since we are calculating incidence of *new* rates, and since they are not part of the population at risk of being a new case, they must be subtracted from the denominator (or total population) i.e. 5 000 – 25 = 4 975.

The
5-year incidence rate is then (10÷4 975) x 1 000 = 2 per 1 000.

Now think about the measure we would use for prevention programmes.

TASK 7 - CHOOSE A RATE FOR PREVENTION PROGRAMMES

Disease occurrence can be measured as prevalence or incidence. Which measure is better for the evaluation of preventive programmes, and why?

FEEDBACK

It is assumed that prevention programmes aim to provide people with ways of not becoming ill in the first place, i.e. they will hopefully never become a new case of the disease you are trying to prevent. You can measure your success (or failure) rate by monitoring the incidence of this disease. The appearance of a lot of new cases will suggest that your the programme is not working very well.

5 SELECT MEANINGFUL INDICATORS AND RATES

Many of you may have experienced the overloaded data collection process that exists in many parts of the health system. In earlier sessions, it was strongly suggested that any kind of health measurement activity should be goal-directed, i.e. health information must be collected for a specific purpose. For example, it could be collected to help you understand something important about the health problems in your area, or to assist you with decision-making and planning, or to help you evaluate the success or failure of your health intervention strategies. For this reason it is important to select very carefully the indicators that are most appropriate to the goals of your particular part of the health system.

TASK 8 - SELECT YOUR OWN DISTRICT *HEALTH STATUS INDICATORS* BASED ON NEEDS

Select no more than five priority *health status indicators* for your district. Briefly motivate your choice, saying what each indicator would be used for, from where you would get the data for calculating the indicator, and how you would ensure the quality of the data.

FEEDBACK

On page 20, Vaughan and Morrow (1989) suggest a list of six basic *health status indicators*. You might like to compare their list with the one you prepared for your area. How different is your list from Vaughan and Morrow's list? What were your

reasons for including a different set of indicators?

It is quite acceptable to include other indicators as long as they serve a useful, important purpose. It is also important to ensure that a number of different types of rates are used. There is clearly no point in only using mortality rates, which measure the worst possible outcome of disease or failed health care. Morbidity rates, disease specific rates or indicators of various aspects of health may be more important.

Take account of the fact that your selection is likely to change depending on your exact location in the health system in which you work. A dentist will want to know about tooth decay, oral cancer and oral HIV prevalence. A physiotherapist may be interested in the prevalence of back pain or skeletal deformity. A paediatrician in a hospital may want to know the case fatality rates for 2 - 3 prominent conditions she encounters, like upper respiratory tract infection, paraffin poisoning and diarrhoea.

6 SESSION SUMMARY

In this session, you have familiarised yourself with some of the important key terms used in epidemiology, and calculated *incidence* and *prevalence* rates, distinguishing the context in which they are used. We also reinforced the importance of collecting data which is goal directed and meaningful within the setting where it will be used.

In the next session, we concentrate on the epidemiological principles and terms used to define the population, and explore the Public Health implications of important characteristics of demography.

Unit 2 - Study Session 2
Describing a Population

Introduction

As Public Health practitioners, your concern is for the health of communities and populations, rather than for the individuals or patients you may have learnt to care for during your clinical training. It is therefore important for you to have a clear idea of the nature of the population that you now serve.

You will definitely want to know who is part of your population and how many people there are. You will probably want to know how many babies, young people and older people there are and their distribution by sex and location amongst other things. From this, you can calculate a variety of disease or health condition rates. Perhaps you have already noticed that almost all the rates you have already encountered require both a numerator and a denominator, and that the denominator in almost every case is derived from counting the population in question. This illustrates the importance of population measurement or demographic measurement. In this study session we examine the rates that tell us about the population and discuss some population dynamics that have implications for the health care system.

Contents

Timing of this session
This session contains three readings and nine tasks. It should take you up to three hours to complete.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session you should be able to:	
Health Measurement Outcomes	***Academic Learning Outcomes***
▪ Define key demographic terms. ▪ Calculate commonly used	▪ Use graphical representation techniques to illustrate

demographic indicators and rates. ▪ Apply demographic concepts to the interpretation of epidemiological rates.	(demographic) information. ▪ Compare, interpret and draw conclusions from graphs.

2 READINGS

There are three readings to which you will be referred in the course of the session.

Author/s	Publication Details
Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S.	(1997). Ch 2 - Key Concepts in Epidemiology. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 15 - 24.
Vaughan, J. P. & Morrow, R. H.	(1989). Ch 3 - District Population. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 21 - 32.
Vaughan, J. P. & Morrow, R. H.	(1989). Ch 4 - Epidemiological Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 39 - 42.

3 CLARIFY DEMOGRAPHIC TERMS AND CONCEPTS

As in the study of any new field, the study of demography comes with a substantial number of technical terms you might not have encountered before. The word *demography* means "the study of populations in terms of factors like size, age, mortality, growth and social and economic variables" (Vaughan & Morrow, 1989: 159). For this reason, another short visit to the dictionary or your epidemiology index in Chapter 14 of Vaughan & Morrow (1989) may be necessary, if these terms are not clear from the text in which they are used.

Start your study of demography by working through Chapter 3 of Vaughan & Morrow (1989). As you do so, clarify the terms listed in **Task 1** and any others you come across.

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 3 - District Population. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 21 - 32.

TASK 1 - DEFINE NEW DEMOGRAPHIC TERMS

Ensure that you have a clear understanding of the following terms from the text. Write explanations in your own words where possible.

Demography	Population census	Maternal mortality rate
Population pyramid	Population density	Child mortality rate
Crude birth rate	Crude death rate	Population growth

Infant mortality rate Neonatal mortality Rate of natural increase

FEEDBACK

If you do not find all these terms in the Glossary in Chapter 14 of Vaughan & Morrow (1989), refer to the following reading, page 16, where a number of the terms are explained.

READING: Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S. (1997). Ch 2 - Key Concepts in Epidemiology. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 15 - 24.

4 USE RATES TO MEASURE A POPULATION

Perhaps you have noticed that almost all the rates you have encountered so far require both a numerator and a denominator, and that the denominator in almost every case, is derived from counting the population in question.

The tasks that follow will familiarise you with selected population data. Population data can tell you about the size, shape and other changing features of a population. Some of these can dramatically influence how you plan and deliver health services.

TASK 2 - ANALYSE DISTRICT OR PROVINCIAL *DEMOGRAPHIC* INDICATORS

Use some of the same reports you used earlier to locate local (where you live and/or work) indicators of health and health care. You may have located some of these indicators through the learning task in Unit 1, Session 3 when you searched for and evaluated a regional or district dataset. Where possible, quote the source and year of the figures you obtained.

a) This time specifically look for reported district or provincial demographic indicators such as those listed below.
   - Total population
   - Crude birth rate (CBR)
   - Crude death rate (CDR)
   - Infant mortality rate (IMR)
   - Maternal mortality rate (MMR)
   - Any other indicators that interest you

b) What do these indicators tell you about this population?

FEEDBACK

You might like to check on the boundaries (city, province, region, district, country, etc) within which this population has been counted, how recently this was done

and the method used to count, before trusting the reported population figures. Ensure that the same denominator is used for the crude birth and death rates. How different are the values stated in your data? You will usually find the CBR is much greater than the CDR. This tells you something about the rate at which the population is growing. You might like to try and calculate the number of people being added to the population each year using the method illustrated by Vaughan and Morrow (1989) in Chapter 3, page 28.

The IMR is a popular and very important indicator of the state of health and health care in countries around the world. If you recall from the UNICEF tables encountered in a previous session, a variety of social, economic and political variables seem to be quite strongly associated with the IMR in different countries. Consult these tables from UNICEF (1998) in your Reader and review this correlation.

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 4 - Epidemiological Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 39 - 42.

On page 39, Vaughan and Morrow comment that in many developing countries, 40% to 50% of all deaths occur in children. An acceptable IMR is probably between 10 and 15 per 1000 live births. The MMR is strongly related to the wealth of a country and is considered quite a strong indicator of the state of health care services in a given country, and of antenatal and maternity services in particular. The rate may also reflect the social and economic status of women in certain countries. An acceptable MMR should be less than 1 per 1000 births. Further information can be found in Chapter 2 of Katzenellenbogen, Joubert & Abdool Karim (1997) pages 23 - 24 on indicators and WHO indicators.

The next task draws your attention to indicators of the most frequent causes of death.

TASK 3 – CLASSIFY AND COMMENT ON THE MOST FREQUENT CAUSES OF DEATH

a) If the data are readily available for the hospital, district or region where you work, make a frequency table like that on page 39 of Vaughan & Morrow (1989) of the *ten most frequent causes of death* in hospital during 1998 (or the most recent data available). Indicate the percentage of the total number of deaths from each cause. Most Local Health Authority annual reports, or the reports from a national department of health, contain this kind of information.

b) You might find it useful to categorise these causes into infectious diseases, chronic diseases and other causes of death. Depending on their category, this can help you later to select the best type of intervention strategy to address these different causes of death.

c) Are you surprised by the causes at the top of the list? What do you think are among the causes of death that just missed the top ten?

FEEDBACK

As an example, here are the top 5 causes of death in five districts of Cape Town.

TOP 5 CAUSES OF DEATH 1999/00					
	Athlone	**Central**	**Mitchells Plain**	**Nyanga**	**CCT**
1	Cancer	Cancer	Cancer	Homicide	Cancer
2	Stroke	Heart Failure	Homicide	AIDS	Homicide
3	Heart Failure	Stroke	Stroke	Lung TB	Heart Failure
4	Heart Attacks	Heart Attacks	Heart Attacks	Cause Unknown	Stroke
5	Homicide	Pneumonia	Heart Failure	Cancer	Heart Attacks

TASK 4 - COMPARE YOUR DATA WITH TANZANIAN (OR CAPE TOWN) DATA

a) Comment on similarities and differences between your data (from **Task 3**) and the Tanzanian data in Vaughan & Morrow (1989) (Table 4.2, page 39). Try to explain any differences you see.

b) How accurate a picture does your data (or the Tanzanian data) present of the mortality in the entire district?

c) What demographic factors might influence the data?

FEEDBACK

a) Major differences could be explained by such social, economic and political variables as mentioned earlier. One unknown factor is the extent to which the average age of the population might influence the data.

b) Even within health districts, there can be variations within the population that are not evident in the averaged figures. Certain suburbs may experience higher levels of homicide; others might have more elderly people who are then more likely to die of chronic diseases or cancer.

c) An older population might have different conditions in the top ten to those affecting a young population.

In the next task, we ask you to clarify how births and deaths are registered. Understanding this process may help you to anticipate the potential for inaccuracies.

TASK 5 - DETERMINE HOW BIRTHS AND DEATHS ARE COUNTED

a) Briefly describe the system for registration of births and deaths in your district.

b) What are the common faults in this system?

c) What can be done to improve the system?

d) How does the registration of births and deaths affect health information?

FEEDBACK

Compare what you find out with what Vaughan and Morrow (1989) mentioned on page 42. Clearly, the efficiency of the documentation processes described can dramatically affect the accuracy of all your health information. In most developing countries, including South Africa, the system of birth and death registration has been notoriously unreliable or even non-existent in many parts of the country over many years. This inaccuracy has a substantial impact on the planning of health and other services. One example is the *per capita* allocation of health funds by central government to provinces. If, for example, a province has an under-estimate of its population, it will get less money for its health budget.

These are some of the critical aspects of demographic data. In the next section we consider the problems related to a changing population.

5 THE HEALTH IMPLICATIONS OF A CHANGING POPULATION

Having a clear picture of the distribution of young and old, males and females in the population and of the rate at which the population is changing in size over time can be important for planners of health services. Because it is difficult to visualise how these different variables impact upon a given population, a way of representing them graphically has been developed. This is called a *population pyramid*, so-called because of the shape it takes, particularly in developing communities or countries.

READING: Katzenellenbogen, J. M., Joubert, G. & Abdoo Karim, S. S. (1997). Ch 2 - Key Concepts in Epidemiology. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 15 - 24.

TASK 6 - DRAW AND INTERPRET POPULATION PYRAMIDS

South African census data from 1991 for two population groups (white and black, as defined in the now abolished apartheid era Population Registration Act) are included in the table below.

a) Use this data to draw two population pyramids on the gridlines provided on the next two pages [for males and females from the black and white *populations*]. Certain components of the population pyramids have been marked in to assist you.

   Refer to the Bangladesh example in Vaughan & Morrow (1989) Figure 3.1 on page 22. Take a look at page 21 which offers further examples of population pyramids.

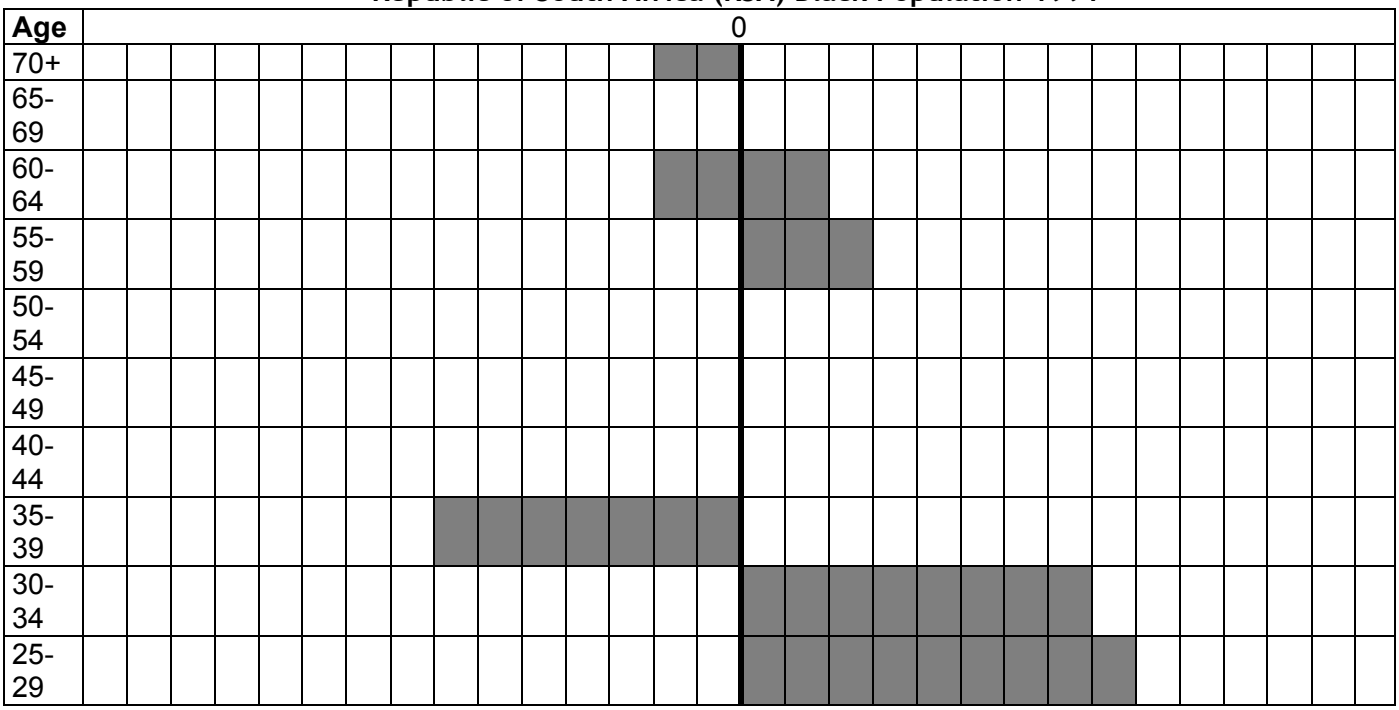
b) Once completed, you should look for symmetry between the male and female sides of the pyramid. Note any differences in these two parts of the population.

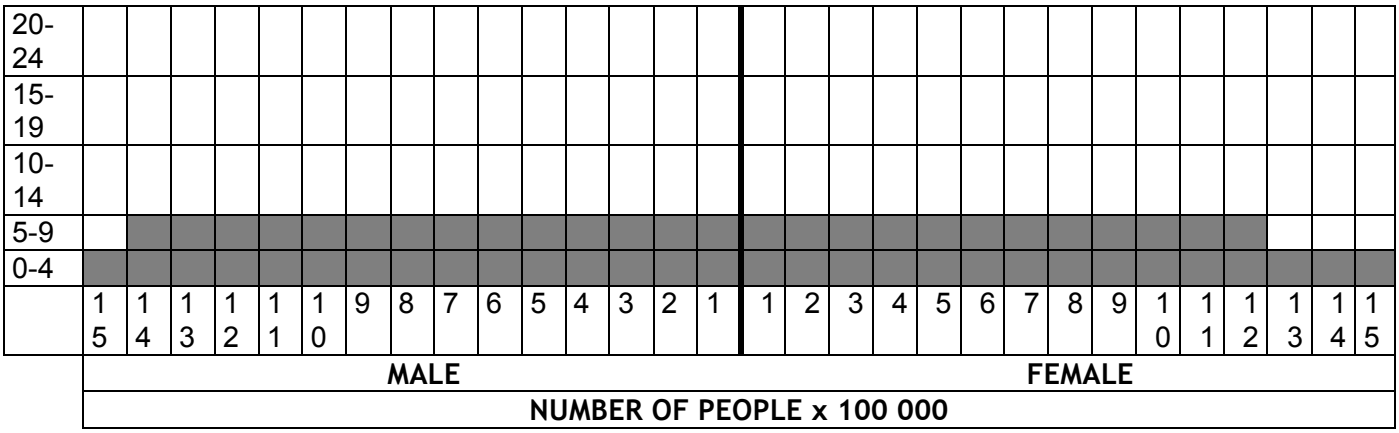
c) Compare the shape and size of the first and second pyramids. What do you notice about the population distribution? Note also the size of the steps in the pyramids between each age group. What does the difference in the length of the bars forming these steps tell you?

Age (years)	Black population group		White population group	
Gender	Male	Female	Male	Female
0-4	15.3	15.0	1.8	1.7
5-9	13.8	11.9	2.0	2.0
10-14	12.7	12.5	1.9	1.8
15-19	11.4	11.3	2.2	2.2
20-24	10.6	10.4	2.2	2.2
25-29	9.7	9.2	2.1	2.1
30-34	8.7	8.1	2.1	2.0
35-39	6.9	6.5	1.9	1.9
40-44	5.5	5.2	1.9	1.8
45-49	4.2	4.2	1.7	1.6
50-54	3.5	3.6	1.4	1.4
55-59	2.7	2.9	1.1	1.1
60-64	1.9	2.2	0.9	1.0
65-69	1.2	1.6	0.7	0.9
70+	1.8	2.6	1.2	1.9

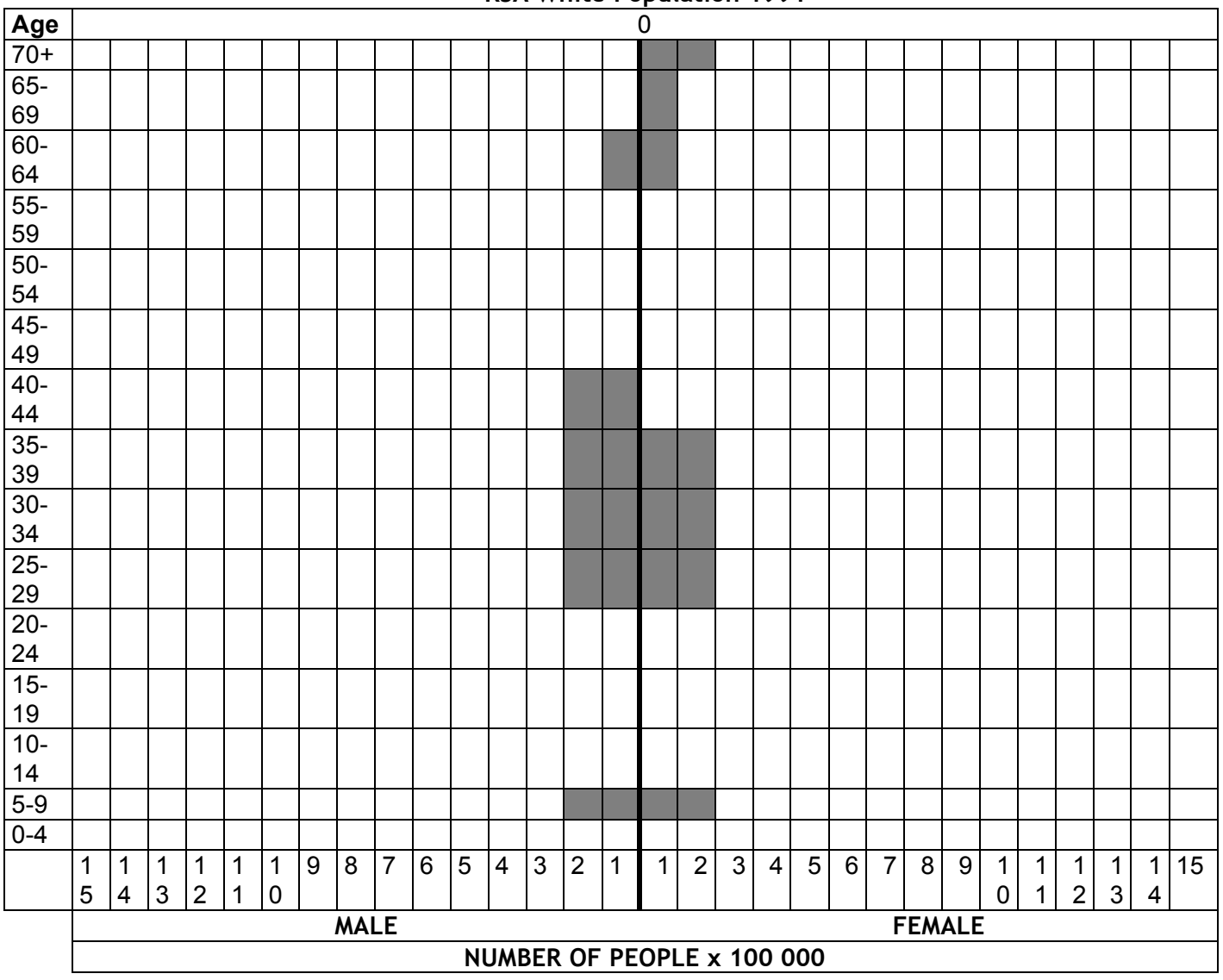
Population numbers have been rounded off to the nearest 100 000

Republic of South Africa (RSA) Black Population 1991




20-24
15-19
10-14
5-9
0-4
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
MALE
FEMALE
NUMBER OF PEOPLE x 100 000

RSA White Population 1991



FEEDBACK

The difference in the length of the bars forming the steps of the pyramid approximates the number of people who die before reaching the next age group. The step is usually largest in the 15 - 25 year age groups in developing countries.

In the example, note that the black population has a much higher proportion of young people, while the white population has an almost even distribution of people in every age group.

You are already aware that the economic status of a community has a significant impact on health. Now analyse comparative data in terms of economic status.

TASK 7 – COMPARE POPULATION PYRAMIDS OF RICH AND POOR COMMUNITIES/ COUNTRIES

a) Compare the features of the two RSA pyramids above, with Figure 3.1 on page 22 of Vaughan & Morrow (1989). What do all the pyramids show?

b) The Bangladesh example uses percentages to construct the pyramid while the South African (RSA) example uses the number of people. Which method is best and why?

a) What are the implications of this kind of pyramid for health services? You can safely assume that the economic status of the RSA white population is much higher than that of the RSA black population.

FEEDBACK

a) The Bangladesh pyramid (Vaughan & Morrow, 1989, page 22) has a very similar shape to the RSA black population pyramid. This suggests some of the same factors might influence the shape of both these pyramids. The steps formed by the higher death rate result in the pointed pyramid shape in the RSA black population pyramid. A much lower death rate from year to year leads to a vertical column shape rather than a pyramid shape for the South African white population diagram. This columnar shape resembles that of populations in wealthy countries such as those in Western Europe and North America. Both birth rates and death rates have come down dramatically in these countries over the past 100 - 200 years. All these pyramids tell us about the size of the different age and gender groups that make up the whole population. Some of these groups are more at risk of ill-health than others.

b) The Bangladesh example uses percentages to construct the pyramid. This enables an even clearer illustration of the age and gender distribution of the population.

c) See **Task 8**.

TASK 8 – DISCUSS THE IMPLICATIONS OF THESE DEMOGRAPHIC PICTURES FOR THE HEALTH SYSTEM

a) *Identify the main health needs and subsequent demands on the health system of a developing country population like that represented in the population pyramids for Bangladesh or black South Africans above. These populations have high proportions of younger people, high birth and death rates, and a relatively small proportion of elderly people.*

b) *Contrast this with the health needs, and subsequent demands on the health system, of the other populations such as white South Africans or Western Europeans.*
The second group has lower birth and death rates in every age group and a fairly high proportion of retired and elderly people. It is probably also a lot wealthier than the developing country populations.

FEEDBACK

On page 23, Vaughan and Morrow identify groups within the developing country population that are particularly at risk of ill-health, namely infants, young children, all children, women. This suggests that a population with a high proportion of younger people has many more people at risk of things like infectious diseases, and very limited health care services due largely to poverty. A wealthier population lives in a healthier environment and experiences much lower risks of ill-health and death. It can be shown that they may experience higher levels of chronic diseases and cancers because more of them live longer. Chronic diseases can require very complex and expensive health services to treat.

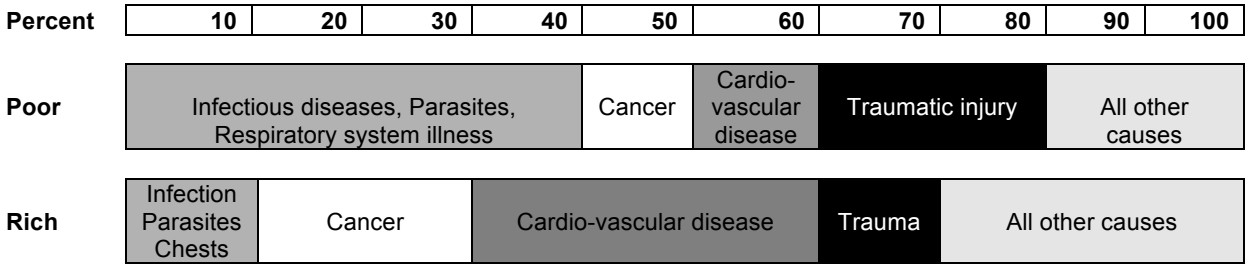
TASK 9 - HOW DO PATTERNS OF ILLNESS AND DEATH DIFFER BETWEEN RICH AND POOR POPULATIONS?

Examine the illustration below (adapted from Figure 2.5, Sanders, 1985).

a) Identify and rank the main causes of death in rich and in poor communities.

b) Offer an explanation as to why they differ in this way.

c) Compare the health system needs of rich and poor countries on the basis of this information.



PERCENTAGE DISTRIBUTION OF DEATHS BY CAUSE IN A POOR COUNTRY (OR COMMUNITY) AND A MUCH WEALTHIER COUNTRY (OR COMMUNITY)

FEEDBACK

a) Rich countries have their highest mortality rates attached to cardiovascular diseases and cancer. Poorer countries are most affected by deaths from infectious diseases and respiratory illness of every description and trauma in various forms.

b) Poor countries and communities generally face a wide range of infectious disease risk from which they can die. Their health system probably offers little protection against that risk. Infants and children who are malnourished and vulnerable can account for a high proportion of deaths from infectious diseases. Wealthy countries have a high proportion of old people who are more likely to die of chronic diseases, cancers and cardiovascular diseases. Their health systems can often assist in prolonging their lives, even at great financial cost.

c) Clearly the health system in the poor community or population will need to focus on basic health care requirements to address the risk of infectious diseases, parasitic infections and respiratory tract infections, in a mainly young population. Traumatic injuries arising from violence, war, traffic and alcohol related incidents are becoming increasingly demanding upon health services. These are less important problems in wealthier communities. Instead, these communities require care for chronic diseases of the cardiovascular system, cancer and a certain amount of trauma from things like traffic accidents.

6 SESSION SUMMARY

In this session, we have tried to familiarise you with a number of key demographic concepts and how to interpret demographic data for epidemiological purposes. In the process, you have worked with comparative data, recognising the very different patterns that emerge when data from poor and more affluent communities is compared. This has also highlighted the very different implications for health services in these populations.

In the next session, we look critically at the quality of data, an issue which is of critical value to anyone working within this field.

7 REFERENCES

- Sanders, D. with Carver, R. (1985). *The Struggle for Health: Medicine and the Politics of Underdevelopment.* London: Macmillan.
- Statistics South Africa. (1999). *Census 1998*. Pretoria: Central Statistical Services.

- Vaughan, J. P. & Morrow, R. H. (1989). Ch 14 - ABC of Definitions and Terms. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 155 - 167.

Unit 2 - Study Session 3

The Source and Quality of Epidemiological Information

Introduction

The previous study sessions introduced many different types of data which contribute to the process of health measurement in some way. These types of data include demographic and population data, health status information, health services information, disease rates, etc. We also discovered in the brief situation analysis carried out in Unit 1, that the data you need is unfortunately not always easy to access. Inevitably it is necessary to search through a variety of different sources of information to find the data you need. For this reason, it is important that you know where the best sources of information are located.

Once you have established the existence and location of this information, you then need to determine how reliable it is (its quality), and how to get access to it. These questions are the subject of this study session.

Contents

Timing of this session

This session contains three readings and five tasks. It should take you up to three hours to complete.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session you should be able to:	
Health Measurement Outcomes	***Academic Learning Outcomes***
▪ *Identify key sources of epidemiological information.* ▪ Assess the quality, relevance and	▪ Critically compare different types of information.

accessibility of community health data.	

2 READINGS

There are three readings to which you will be referred in the course of the session.

Author/s	Publication Details
Vaughan, J. P. & Morrow, R. H.	(1989). Ch 4 - Epidemiological Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 33 - 44.
Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S.	(1997). Ch 13 - The Use of Routinely Available Data in Epidemiological Studies. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 133 - 139.
Vaughan, J. P. & Morrow, R. H.	(1989). Ch 7 - Epidemiological Surveys. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 81 - 84.

3 IDENTIFY USEFUL SOURCES OF EPIDEMIOLOGICAL INFORMATION

The sources of information you decide to use will vary depending on the kind of work you are doing, your location in the health system and the specific questions you want the data to help you answer. The following activity enables you to examine a number of commonly used sources of information.

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 4 - Epidemiological Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 33 - 44.

TASK 1 – IDENTIFY USEFUL SOURCES OF INFORMATION

a) List 6 - 10 sources of information you might consider useful to your work. Give reasons for your choice.

b) Compare your list with the list discussed on page 35 of Vaughan & Morrow (1989) and the list included after the next task below.

c) Compare your reasons for the sources you chose with the comments presented by Vaughan and Morrow. What do you notice? Draw your own conclusions.

FEEDBACK

Some additional sources of information are discussed in Vaughan and Morrow on page 53. Under certain circumstances, it may become necessary to supplement the routine data collection system with one or other of these more specialised

methods of obtaining information from these sources, e.g. investigations of outbreaks or surveys. Take a look at Chapter 13 of Katzenellenbogen, Joubert & Abdool Karim (1997) which also provides an overview of routinely available data, and includes a few interesting examples of data collection practices and problems.

READING: Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S. (1997). Ch 13 - The Use of Routinely Available Data in Epidemiological Studies. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 133 - 139.

TASK 2 - ASSESS THE ADVANTAGES AND DISADVANTAGES OF DIFFERENT SOURCES OF INFORMATION

Evaluate the advantages and disadvantages of 4 - 5 of the following sources of information: hospital clinic records, statistical data, data from other departments/organisations, health information systems, annual reports, internet, text books, research projects, district health profiles, journals, surveys, census data.

FEEDBACK

In a recent training programme with district health managers on health informatics, the group drafted a summary of their responses to this question in the table included below. See how similar your own comments are to those recorded by this group.

ADVANTAGES AND DISADVANTAGES OF DIFFERENT SOURCES OF DATA

ADVANTAGES	DISADVANTAGES
HOSPITAL CLINIC RECORDS	
• Regular, monitored, fits into overall system. • Basic information re: community. • Information on individuals, families and communities. • Shows health trends. • There is a statutory obligation to keep records.	• Too much data, taking too long to collect. • Poor feedback and communication. • Very seldom analysed. • Single geographical area. • Information from health sector only. • Only as good as record-keeper. • Only clinic visits are covered.
STATISTICAL DATA	
• Enables tracking of major trends. • Background information on broad social conditions. • Can go back to see trends.	• Not always accessible. • Causes of death not known. • Incomplete statistics. • Is not fed back to role-players. • Not always reliable.
OTHER DEPARTMENTS OR ORGANISATIONS	
• Gives more comprehensive picture. • Gives inside story on community profile re: political power, cultural influences. • Can provide information on perceived community needs.	• Limited data / Not easy to access. • Unknown reliability. • Subjectivity (influenced by personal agendas). • Systems not compatible (age, standards). • Poor training in interpretation and use.
HEALTH INFORMATION SYSTEM	
• Good source. • Linked up to other processes.	• Limited e.g. TB. • Questionable accuracy.

• Can be interpreted locally. • Can empower people.	• Needs intensive training of health worker. • Feedback and interpretation problematic. • Lack of incentive to analyse data locally.
ANNUAL REPORTS	
• Profile of needs and provision of services. • More textured than statistics. • Gives direction to other sources.	• Poor analysis. • Biased and not always inclusive. • Too broad - summary. • Out of date due to lengthy production time. • Boring/not user friendly so not read.

INTERNET	
• Huge source, instant access to e.g. literature. • Point of comparison e.g. international.	• Limited facilities for access. • Developing world less well represented. • Not always up to date!
TEXT BOOKS	
• Expert information. • Identify broad range of problems. • Provides models/formats.	• Out of date. • Not always applicable. • Too much text. • Theory does not inform implementation. • Costs/availability.
RESEARCH PROJECTS	
• Current information. • Time saving (if relevant). • Can be specific to a problem. • Pilots/demonstration projects.	• Costly and unsustainable. • Not always applicable or relevant. • Takes time so not often up to date. • Author biased. • Creates expectations.
DISTRICT HEALTH PROFILES	
• Readily available. • Gives "bird's eye" view. • Provides leads to other sources.	• Questionable accuracy and reliability. • Questionable validity of outdated profiles. • Takes time to keep updated.
JOURNALS	
• Current information. • Can get back numbers (old copies). • Summarised. • Different points of view.	• Difficult to access. • Can be biased. • More academic than practical. • High volume.
SURVEYS	
• Cost effective. • Focused/specific, pick up hidden information. • Can be spread over large areas e.g. national. • Correctly planned, much more comprehensive.	• Once-off information. • Influenced by questionnaire. • Might not empower people. • Create expectations.
CENSUS	
• Gives provincial/national picture. • Standardised denominators & baseline data. • Can compare with e.g. international data. • Useful for planning.	• Not available until years later. • Expensive. • Creates expectations. • Unknown reliability.

In general, it is important to realise that inaccuracy and unreliability can lead to bad planning.

4 ASSESS THE VALUE, QUALITY & ACCESSIBILITY OF HEALTH INFORMATION

Everyone will have slightly different data needs. What is important is to have a clear idea of why each item of data is important enough to collect and what you plan to do with it. This is the focus of the following task. Assessing the value of the data and checking for possible omissions should become a regular feature of your

work.

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 4 - Epidemiological Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 33 - 44.

TASK 3 - CRITICALLY ASSESS A SELECTION OF DATA

Critically assess a district health information data selection given by Vaughan and Morrow (1989) on page 43.

- Decide what you would use each group of data for.
- If you think certain data should be excluded from the list give your reason for this.
- If you think certain essential groups of data have been omitted, identify this information and give the reason for adding it to this list.

FEEDBACK

If the information can be made available without too much difficulty and you have established a clear use for it, then its existence is probably justified. However it is also important to determine its quality, to establish that it is valid, up to date and reliable.

One of the hardest things to evaluate is the quality of the data that you receive. At a later stage in the course, you will assess research data in terms of its validity and reliability. At this stage, it is important simply to determine whether the process of data collection and record-keeping is reasonably effective, for example, to check that the data is complete and up-to-date. This is the focus of the next task.

TASK 4 – EVALUATE THE QUALITY OF SAMPLE DATA

Check the information in the table on the next page and comment on the quality of the data collection process.

SAMPLE DATA ON FOUR PATIENTS

Name	Patient 1	Patient 2	Patient 3	Patient 4
Record No.	6781	346	2487	2351
Age	785	69	52	08
Gender	F	F	F	M
Weight	85	70	80	105
Height	1.6		1.7	2.0
BMI	33	24	38	26
Blood pressure 1	150/110	135/95	130/95	160/110
Blood Pressure 2	140/100	125/85	120/85	150/100
PAP smear result	neg	pos	neg	pos
Breast lump check	neg		neg	neg
Urine sugar	pos			pos

FEEDBACK

If a patient's weight is recorded as 650 kg, the chances are that someone made a mistake when writing down a 65kg weight. If the number of patients attending a clinic suddenly rises from an average of 500 per week to over 2 000, you need to find out what happened. The chances are that someone has added another set of data that you do not yet know about, or they simply sucked the figures out of their thumb! Or you need to ask whether the rules governing data collection have undergone a sudden change.

In the table above, there are several gaps. This may mean that data was not put in, or that the procedures from which the data arises were not carried out. It might also be that the data is irrelevant, for example a breast lump check in a male patient. The information might be written in the wrong place, such as a PAP smear result in the records of a male.

Digit preference can occur, for example rounding off to the nearest 0 or 5 in all the weight and BP readings. There may have been eagerness to show improvements in follow-up readings. Note that all the BP2 readings are exactly 10 lower than those in BP1.

Typing an extra digit makes a nonsensical age entry of 785 for Patient 1. A digit switch gives an age of 08 instead of a more likely 80 for Patient 4 who is clearly

adult age and size. A calculation or typing error enters a BMI of 38 instead of 28 for Patient 3.

The previous tasks suggest that a data collection process in any health facility needs to be goal-directed, evaluated, clearly structured and known by all participants. The implications of any changes of procedure should be recognised and clearly communicated to anybody who uses the data.

TASK 5 - ASSESS THE DATA COLLECTION PROCESS WHERE YOU WORK

Select one type of health data collected in the health facility where you work. Investigate the process by which it is collected, recorded and summarised. Look at your data sample and comment on its quality by asking these questions, and any others that you feel are relevant:

a) Is the data all there?

b) Is it reliable?

c) Is it true data or has it been fabricated?

d) Despite its limitations, can it still be useful?

FEEDBACK

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 7 - Epidemiological Surveys. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 81 - 84.

You might like to review the definitions of variables, repeatability and validity on pages 81 - 84 of the above reading. While these particular comments are more directly related to the collection of research data for surveys, they also have some relevance to the routine data collection process. Do not concern yourself too much with the more technical calculation of reliability at this stage.

A major objective of your data collection process is to ensure that data is adequate for decision-making. Is it good enough to help you assess what is going on? If the data collection process appears to be functioning properly and the dataset is complete, the information is probably good enough to use. Even if the quality is deficient in certain respects, you might still be able to use it if you know in which way this deficiency will actually affect its interpretation. For example, will a small error in the recording of repeat visits to your clinic lead to an underestimate or an over-estimate of the total patient attendance figures? (It gives you a small overestimation of patients served by the clinic).

5 SESSION SUMMARY

In this session, we examined different sources of information and considered how poor or erratic data collection procedures can distort findings. Your attention was drawn to questions that you should ask about any dataset. In the next session we move away from routine data collection to discuss outbreaks and infectious diseases.

Unit 2 - Study Session 4
Infectious Diseases and Outbreaks

Introduction

In many respects it was with the investigation of infectious diseases that the discipline of epidemiology actually began. Just over a century ago, the so-called father of modern epidemiology, John Snow, mapped a number of cholera outbreaks that occurred in England. You looked at some data from this outbreak in Chapter 1 of Katzenellenbogen, Joubert & Abdool Karim (1997). Although the experience of the plague, typhus, malaria and numerous other conditions had been around for some time, they had not been systematically recorded and analysed. Another early practitioner of epidemiology was Florence Nightingale, a nurse who made dramatic changes to the risk of death from disease by soldiers in the Crimean war, after a systematic analysis of death and disease patterns.

In this study session, a number of examples of infectious disease outbreaks are examined. They serve to illustrate some of the main characteristics of epidemics, some of the terminology associated with epidemiology, and various types of graphical representations used to display epidemiological data.

Contents

Timing of the study session

This session contains two readings and five tasks. It should take you about two and a half hours to complete.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session you should be able to:	
Health Measurement Outcomes	***Academic Learning Outcomes***
▪ Define and measure infectious disease events in communities. ▪ Analyse data from an outbreak of infectious disease.	▪ Illustrate a set of data using simple graphical representation techniques. ▪ Interpret a set of data.

2 READINGS

There are two readings for this session.

Author/s	**Publication Details**
Vaughan, J. P. & Morrow, R. H.	(1989). Ch 6 - Controlling an Epidemic. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 59 - 70.
Beaglehole, R., Bonita, R. & Kjellstrom, T.	(1993). Ch 7 - Communicable Disease Epidemiology. In *Basic Epidemiology.* Geneva: WHO: 97 - 102.

3 DEFINE AND CLARIFY NEW TERMS

As always, familiarising yourself with key terms enables you to work more effectively with new information. Use Chapter 6 of Vaughan & Morrow (1989) to clarify the terms for **Task 1**.

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 6 - Controlling an Epidemic. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 59 - 70.

TASK 1 – DEFINE NEW TERMS

Define the following terms using your own words. Where possible, include an example to illustrate the meaning.

epidemic
active case detection
point source epidemic
attack rates
reported cases
source of outbreak
propagated epidemic
pandemic
diagnostic criteria
epidemic curve
spot map

FEEDBACK

All of these terms are mentioned in Chapter 6 of Vaughan & Morrow (1989) or are listed in the glossary in Chapter 14 of the same manual. Hopefully you have used your own words to explain the terms and tried to identify an example to illustrate the meaning of each term. Keep your explanations where you can easily refer to them.

The next task offers you a chance to develop a deeper understanding of the terms *epidemic* and *endemic*. Use Chapter 6 of Vaughan & Morrow (1989) to assist you.

TASK 2 - DETERMINE WHETHER A HIGH LEVEL OF DISEASE IS AN EPIDEMIC

a) In a number of poorer areas of Cape Town, the TB prevalence is close to 700 per 100 000, and it has remained this high for the past 10 years. But we are told it was not a common disease in Cape Town before that time. In Johannesburg, the TB prevalence does not exceed 200 per 100 000 in any suburb. In Durban, it has not exceeded 50 per 100 000 for years.
   Is there a TB epidemic in Cape Town? Is there an epidemic in Johannesburg?

b) In a number of small towns in rural Mpumalanga and all of Mozambique, the annual incidence of malaria has been close to 40 per 100 000 for the past 20 - 30 years. Elsewhere in South Africa it rarely gets closer than about 1 per 100 000.
   Is malaria an epidemic or is it endemic in Mpumalanga and Mozambique?

FEEDBACK

a) Review your definitions of the terms *epidemic* and *endemic*.
   While the final verdict remains somewhat debatable, there is a strong argument to suggest that Cape Town is experiencing a prolonged *epidemic* of TB since it was not always present at such high levels.
b) Mpumalanga and Mozambique, on the other hand, appear to have always had a substantial number of cases of malaria. The verdict here is that malaria is *endemic* in this region.

Having clarified when a disease event is considered an epidemic, the next section introduces some of the processes we use to describe an outbreak of disease.

4 DESCRIBE AN OUTBREAK OR EPIDEMIOLOGICAL EVENT

The purpose of the next task is to interpret and graphically represent two sets of disease outbreak data. The first set is from the early history of epidemiology, and uses notes made by John Snow during the 1850 cholera outbreak in London, a period when the causative agent was still unknown. The second is more recent and looks at the Kaposi sarcoma data from New York during the early years of what later became the AIDS pandemic.

TASK 3 – PLOT AND INTERPRET EPIDEMIOLOGICAL DATA

a) Plot the data from Snow's notes on the London cholera outbreak (1850). First look at the data in the table to get an initial idea of what the outbreak is like.

b) Plot the two variables against the data on the supplied set of gridlines.

Use a coloured pencil to plot the deaths and another colour for the onset of illness. Join the dots to form two line graphs.

c) What do the shapes of these *epidemic curves* suggest about the nature of the epidemic?

d) What do these data tell you about the duration of the illness?

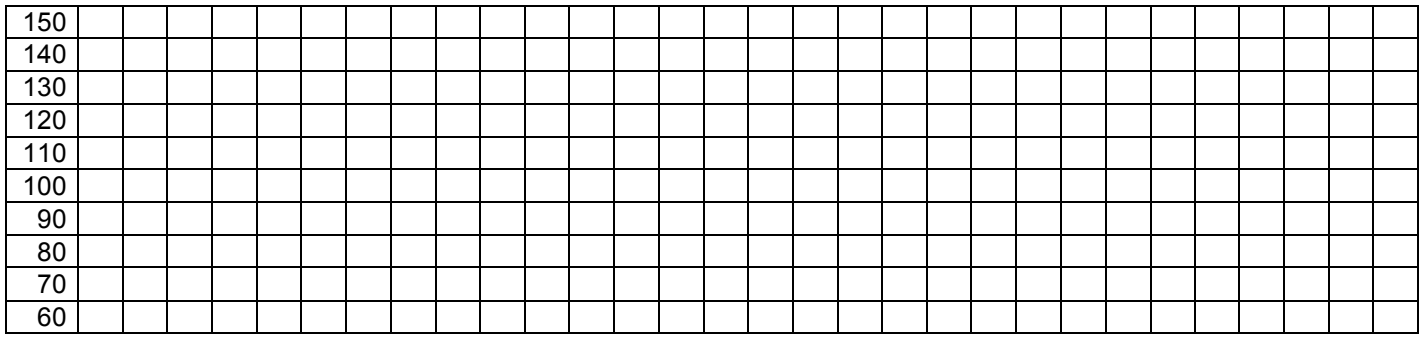
e) If the pump-handle was removed on the 7th September, what effect did it have on the epidemic?

JOHN SNOW'S GRAPH OF THE LONDON CHOLERA EPIDEMIC

Frequency of illness and deaths by date in the 1850 London cholera outbreak

Month	*Date*	*Number of attacks*	*Number of Deaths*	*Month*	*Date*	*Number of attacks*	*Number of Deaths*
August	27	1	1	September	11	5	15
August	28	1	0	September	12	1	6
August	29	1	1	September	13	3	13
August	30	8	2	September	14	0	6
August	31	56	3	September	15	1	8
September	1	143	70	September	16	4	6
September	2	116	127	September	17	2	5
September	3	54	76	September	18	3	2
September	4	46	71	September	19	0	3
September	5	36	45	September	20	0	0
September	6	20	37	September	21	2	0
September	7	28	32	September	22	1	2
September	8	12	30	September	23	1	3
September	9	11	24	September	24	1	0
September	10	5	18	September	25	1	0

◄Number of cholera attacks or deaths



50																													
40																													
30																													
20																													
10																													
0																													
Date	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

August **September**

DATE OF ATTACK/DATE OF DEATH

FEEDBACK

a & b) Compare your graph to the one on page 99 of Chapter 7 of Beaglehole, Bonita & Kjellstrom (1993).

READING: Beaglehole, R., Bonita, R. & Kjellstrom, T. (1993). Ch 7 - Communicable Disease Epidemiology. In *Basic Epidemiology.* Geneva: WHO: 97 - 102.

As you first look at the data, you will see that the numbers of people who get sick or die each day are very low initially. Over a short period from 30 August until the 8 September, the numbers of people getting sick or dying suddenly increase substantially and almost as quickly return to same low levels that were there before. You will also notice that almost exactly the same pattern of behaviour is evident for both the illness-onset (attack) data and the death data.

c) If you joined each dot plotted on the graph, you will have constructed two line graphs. They are almost identical in shape but separated by a period of about one day. This is roughly how long it must have taken for the disease to progress from onset to death. As you also noticed in the pattern of the raw data, the graph shows a steep rise and a sudden drop during the period 30 August to 8 September. This is a classic epidemic curve, rising rapidly above the normally encountered prevalence of the disease and then returning to the original low levels thereafter.

d) You might ask why the number of cases suddenly decreased. Did the epidemic suddenly disappear? Perhaps the source of the epidemic was removed. Perhaps the rest of the neighbourhood fled to other parts of the city to avoid the disease. Perhaps almost everyone who could get the disease had already died and there were no people left who could get sick.

e) Removing the pump handle on 7 September did not stop the epidemic. The number of cases had almost completely declined to pre-epidemic levels by the 7th. What removing the handle might have done was to prevent a new group of people returning to the neighbourhood some time later from drinking the water and experiencing a brand new epidemic. Another steep epidemic curve could then have been plotted from the time this new group of people started to get ill.

Now plot another set of data. This time use a *histogram* (a bar chart) in which the height of each bar represents the number of cases of Kaposi sarcoma.

TASK 4 – PLOT MORE DATA

a) The data obtained from Kaposi sarcoma notifications in New York for the period 1973-1982 are provided below. Use this data to draw a histogram in the diagram provided. The height of each bar represents the number of cases of Kaposi sarcoma.

b) Compare the bars on the right and the left and the general shape created. What do these suggest about the duration of the epidemic?

c) How does this compare with the data from the London cholera epidemic?

KAPOSI SARCOMA NOTIFICATIONS IN NEW YORK: 1973 - 1982

Year	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Cases	0	0	0	0	2	2	4	4	30	85

Notifications

90										
80										
70										
60										
50										
40										
30										
20										
10										
0										
	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982

Year in which notification occurred

FEEDBACK

a) As with the cholera data, start by looking at the raw data. Quite evidently the incidence of Kaposi sarcoma is very low initially and rises rapidly towards the end of the ten-year period represented here. Compare your graph to the one on page 98 of the following reading.

READING: Beaglehole, R., Bonita, R. & Kjellstrom, T. (1993). Ch 7 - Communicable Disease Epidemiology. In *Basic Epidemiology.* Geneva: WHO: 97 - 102.

b) In this chart, the bars toward the right are much taller than those on the left. This resembles the beginning of the epidemic curve drawn with the cholera data. The shape suggests this is the beginning of an epidemic and it is unclear when it might eventually start to turn around and return to the low levels of

1973.

c) As you may be aware, Kaposi sarcoma is one of the clinical outcomes of AIDS, but this relationship was unknown in the early days of the AIDS epidemic. This is similar to the 1850 cholera epidemic, when vibrio cholerae, the causative agent, had not yet been identified.

TASK 5 - SELECT STRATEGIES FOR CONTROL OF SNOW'S CHOLERA EPIDEMIC

Assume the same epidemic recorded by Snow occurred today in your neighbourhood. List briefly how you would attack the source of the epidemic, interrupt transmission and protect susceptible people.

FEEDBACK

Compare your suggestions to those in Table 6.2 on page 67 of the following reading.

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 6 - Controlling an Epidemic. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 59 - 70.

5 SESSION SUMMARY

Some of the earliest experiences in epidemiology arose from efforts to map epidemics of disease in the mid-19th century. By mapping the same data, we have illustrated some of the most prominent features of disease outbreaks, and helped to define key terms such as *endemic* and *epidemic*. The session also utilised several different types of graphical illustration.

The next study session will introduce the next stage in the preparation of your assignment. It will focus on the dataset provided - summarising, analysing and interpretation.

Unit 2 - Study Session 5
Develop Critical Questions for Your Dataset
(Preparing Assignment 2)

Introduction

In this study session which focuses on Assignment 2, you are asked to consider the Public Health problems represented in the dataset and to develop critical questions with which to examine it in more depth. Hopefully what you learned in your Literature Review will assist you in this process.

By developing a set of relevant study questions with which to analyse the dataset, you will be able to proceed with a systematic data analysis.

Here is Assignment 2 as a reminder.

ASSIGNMENT 2 REMINDER - DEVELOP CRITICAL QUESTIONS FOR YOUR DATASET

Draw on your literature review and your knowledge of epidemiology to ask critical questions of the dataset. List the most important questions you wish to ask of the dataset. Use these questions and appropriate keywords to prepare subheadings for your report. Organise the material into a logical structure for an outline of the report.

Contents

Timing of this session

There are three tasks in this session, all of which are designed to help you complete part of the assignment.

1 LEARNING OUTCOMES OF THE STUDY SESSION

By the end of this study session you should be able to:
▪ Define a clear set of study questions with which to assess a set of health data. ▪ Develop a structure for your report.

2 READING

Refer to the readings provided in the earlier study sessions.

3 IDENTIFY QUESTIONS TO RESOLVE THE PROBLEM

This section takes the process started in Assignment 1 one step further. As with any research task, it is essential that you begin with understanding the nature of the problem. In order to do this, you need to identify relevant questions that will assist you in analysing the problem.

Once again refer to Unit 1, Session 2 to assist you in asking relevant questions. Refer to the *Health Systems Research I* module for assistance with setting aims and objectives when faced with a health problem. If you have a copy of Katzenellenbogen, Joubert & Abdool Karim (1997), there is a useful section that addresses this on page 56.

TASK 1 - IDENTIFY QUESTIONS YOU NEED TO ANSWER TO RESOLVE THIS PROBLEM

Having defined the problem represented by the data, ask yourself:

a) *What do I need to do about it?* Then ask yourself:
b) *What do I need to know in order to respond adequately and with confidence to the problem at hand?*

The answers to these questions should help you to structure the different parts of your assignment and even provide a format for your report.

Your list of questions will be part of the draft of Assignment 2.

FEEDBACK

Once you have developed your questions, ask yourself whether they will lead to answering the key question posed by the original problem, i.e. What can be done to fix the Public Health problem which you are facing?

Generally you will identify one or more broad Public Health problems related to your data. These can be restated to be the AIMS of your study. For example the problem might be an increase in HIV/AIDS incidence in your district and you need to understand why this is happening so you can develop programmes to address this increase. This could be restated as the following study aim:

In this study, we are trying to understand the causes of the increasing HIV/AIDS incidence in District X and to develop programmes to reduce any further increase.

However, this is a very general statement, which may not provide enough guidance for you to plan your study and your data analysis. Therefore you will also want to develop a specific list of study questions that you will attempt to answer. These are also referred to as the Study Objectives. Refer again to Unit 1, Session 2 and the conceptual framework for identifying a health status problem. Here are examples of some specific study objectives/ questions that might be asked:

In this study, we will try:

a. To identify the change in HIV/AIDS incidence in the district over the last two years.
b. To identify who is affected or what population sub-groups are showing the highest increase.
c. To identify the likely causes of this increase, e.g. unsafe sexual practices, in-migration of sick individuals, intravenous drug use, lack of knowledge of HIV/AIDS in the population.
d. To identify possible programmes to address HIV/AIDS and make recommendations to the Provincial Government for action to address HIV/AIDS.

Note that the last objective is not generally one that will be obtained from your study data, but will likely come from your literature review, which should include a review of successful programmes discussed in the literature. This last objective is key, as it will be the component of your report that motivates actions based on your analysis of the data.

4 HOW YOUR STUDY QUESTIONS WILL GUIDE YOUR REPORT

Now that you have developed your study aims and objectives, you can use them to help you plan your study and your final report. If you were starting a study from the

beginning, the study questions would assist you to develop your study design. For this assignment, you have already been provided with summary data; therefore you can consider how the questions will guide your plan for analysing and reporting this data.

TASK 2 – USE THE STUDY QUESTIONS TO DRAFT AN OUTLINE FOR YOUR REPORT

Now consider whether the set of questions you have developed suggests a structure or a set of sub-headings for your final report. Once again, use Chapter 12 of Vaughan & Morrow (1989) for support.

FEEDBACK

Imagine that you have identified three key study questions. You will want to specifically state these questions in the *Aims and Objectives* section of your report. You will then want to use your data to answer these specific study questions. You need to make sure each study question has corresponding data to answer that question, and that data which is not related to any of your study questions is not included in your report.

In addition, you will want to make sure you have information in the literature review relevant to each of these questions. Finally, your discussion section will focus on an interpretation of the data pertaining to these questions, and your conclusion will provide summary answers to these questions. This is how you could structure your outline:

A POTENTIAL OUTLINE FOR YOUR REPORT

1. Introduction

Describe the overall study problem

2. Literature Review

a) Literature related to overall study problem prevalence/incidence
b) Literature related to Study Question 1
c) Literature related to Study Question 2
d) Literature related to Study Question 3

*Note that Mouton (2001) and Depoy & Gitlin (1994) describe this as organising your literature review around "Themes".

3. Aims & Objectives

a) Overall Aim
b) Objectives
    i. Study Question 1
    ii. Study Question 2
iii. Study Question 3

4. Study Methods

5. Results

a) Results related to Study Objective 1
b) Results related to Study Objective 2
c) Results related to Study Objective 3

6. Discussion

Discuss results and compare to them to the literature. Review other programmes which have

addressed this problem, from the literature or other reports.

a) Discussion of data related to Study Objective 1
b) Discussion of data related to Study Objective 2
c) Discussion of data related to Study Objective 3

7. Conclusion

a) Summary short answer to Study Objective 1
b) Summary short answer to Study Objective 2
c) Summary short answer to Study Objective 3
d) Summary short answer to overall Study Aim

8. Recommendations

Recommendations may address more than one study question and the overall aim, so this section will be organised in terms of the type of programme rather than the study questions.

The above is a very crude outline. For your outline, you would want to use actual key words, topics or themes derived from your study questions / objectives.

5 PLAN YOUR ANALYSIS

From the task above you can see that everything in your report is focused around your study questions or objectives. Therefore, it is a good idea to always keep your study questions in mind as you plan all aspects of your study. This will also be true of your data analysis.

TASK 3 – PLAN YOUR ANALYSIS

In Unit 3, you will have several sections related to making sense of your data and representing health information. However, you should not approach your analysis and interpretation of your data without a clear path for what you need to do. This path is also defined by your study questions. Based on the study questions/objectives you have developed, on the contents of your literature review and the knowledge you have acquired about epidemiological analysis in this module, carry out these tasks:

a) Check whether any of the literature you have gathered sets out to answer similar study questions. How do they do it? What methods did they use?

b) Apply your questions to the data and make sure that they can be answered.

c) Scrutinise the data and describe how you will carry out your analysis as a series of steps.

FEEDBACK

a) What may be helpful here is to look at your literature review references to see how those authors approached their data, and whether there are any similarities between their data and your dataset. This may suggest ways of

performing your analysis. It is often, but not always, a good idea to use a similar ways to present your data, so it can be easily compared with the literature.

If you look back to the HIV example introduced earlier, a possible study question is: Study Objective 2: *To identify who is affected or what population sub-groups are showing the highest increase.*

You could start by unpacking this question in relation to your literature:

- *First we need to define what we mean by "affected". In this case, we mean people who are HIV+*

Now we need to clarify what we mean by "sub-groups".

- *The literature may have suggested that the sub-groups of people affected by HIV/AIDS are often defined according to gender, age, socio-economic status, region where they live, race/ethnicity, etc. We might also have seen these defined as follows from the literature:*
  Sex = Male or Female
  Age = Children's Age 0-12; Teens' Age 13-19; Young Adults' Age 20-35; Older Adults' Age 36+
  Socio-economic status = Monthly income

These are just a few examples, from earlier sessions. You will realise that there are lots of ways to categorise or describe populations. However, through the literature, you should have come to understand which categorisations are most relevant to your problem, in this example HIV/AIDS.

At this point you could refer back to sessions in this module on defining your study questions, or to the sessions in the *Health Systems Research I* module.

c) *You should also make sure that you have linked all the data in your assignment with its corresponding study question or questions. Remember that some data may apply to more than one question.*

Consider:
- Do you have data to answer every question?, and
- Does each piece of data relate to a study question?

For example, from the literature, you know that age is a very important grouping for looking at HIV/AIDS. Therefore, if you want to use age as one of your sub-groups, you will need data on the subjects' age; otherwise you cannot answer this question. While this seems simple, when you start to deal with lots of study questions and lots of data, this kind of simple connection of "question to data" is often overlooked.

In relation to your dataset in the assignment, you need to make sure that you have all the data necessary to answer the study questions you have decided on in the previous task. Check this by linking each piece of study data to a study question. Look to see if you have any questions without data or any data without questions. If you find this, then you may need to revise your study questions.

d) Finally, we have to think about how we would use the data to answer the question.

For example, we have defined "affected" as being HIV+. Therefore, if we want to see if certain age sub-groups are *more* affected (that is have more HIV than other age groups), we would have to compare the rate of HIV in each of the sub-groups. Refer back to Unit 2, Study Session 1 for information on "rates". You might plan to look at the data as follows:

AGE GROUP	**HIV+ RATE**
Children 0 - 12yrs	……
Teens 13 - 19yrs	……
Young Adults 20 - 35yrs	……
Older Adults 36+yrs	……

Note that I have not filled in the actual HIV+ rates. This is because I will get this from my study data.

You will learn how to do this in Unit 3. At this stage, however, you have an idea of how you might want to use your data to answer one of the study questions in the HIV/AIDS example.

You are now ready to move on to Unit 3, where you will learn how to analyse and represent your data using specific analysis tools and graphics.

5 SESSION SUMMARY

In this session, you have been guided towards asking questions of your dataset, and preparing a structure for your draft report. In the third unit of this module, you are guided through the process and implications of using epidemiological information for Public Health and district health service planning or decision-making activities.

UNIT 3

Health System Applications

Introduction

The focus of Unit 3 is to connect the theoretical and research-oriented characteristics of epidemiology to the more practical day-to-day applications it can have in the field of Public Health. The unit examines the implications of epidemiological information for Public Health and district health service planning and decision-making activities.

More specifically it addresses the use of screening, survey and routine surveillance systems as sources of epidemiological data for Public Health practitioners. The unit concludes by considering ways to make sense of such information and looks at ways of effectively reporting it.

There are four Study Sessions in this unit:
Study Session 1: Screening and Surveillance.

Study Session 2: Making Sense of the Data.

Study Session 3: Representing Health Information.

Study Session 4: Report on an Epidemiological Event.

Study Session 5: Final Report (Assignment 2).

Intended Learning Outcomes

By the end of this unit you should be able to:	
Health Measurement Outcomes	***Academic Learning Outcomes***
▪ Evaluate the merits of routine data collection processes. ▪ Analyse and interpret routinely collected data.	▪ Relate a given set of data to your own context and to other sources of information. ▪ Effectively report and disseminate

▪ Critique current approaches to the compilation and dissemination of Public Health information.	information.

Unit 3 - Study Session 1
Screening and Surveillance

Introduction

Surveillance is an essential part of the control of communicable disease, and is often achieved by means of the routine notification system. Any occurrence of cases that are clearly in excess of what would normally be expected can be easily and quickly identified. This allows a swift and effective response from the Public Health authorities.

The steps in disease surveillance and outbreak response have been clearly documented by the World Health Organisation (WHO) in field guides for the priority diseases of the Expanded Programme for Immunisation (EPI). In South Africa, these priority diseases are polio, neonatal tetanus and measles.

This study session looks at the process of monitoring disease in the community using different methods of screening and surveillance.

Contents

Timing of this session

This session contains three readings and seven tasks. It should take you about three hours to complete.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session you should be able to:
▪ Describe the role of epidemiological surveys, screening, surveillance, notification and special investigations. ▪ Apply criteria for the introduction of screening or surveillance programmes.

2 READINGS

There are three readings in this session. You will be referred to them where relevant.

Author/s	**Publication Details**
Vaughan, J. P. & Morrow, R. H.	(1989). Ch 5 - Reporting and Surveillance Systems. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 45 - 58.
Beaglehole, R., Bonita, R. & Kjellstrom, T.	(1993). Ch 6 - Epidemiology and Prevention. In *Basic Epidemiology.* Geneva: WHO: 93 - 96.
Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S.	(1997). Ch 14 - Disease Surveillance. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 140 - 146.

3 DEFINE NEW TERMS

As with each of the other areas of health measurement, screening and surveillance also has a number of new terms and concepts to describe different aspects of the health and disease monitoring systems currently in use. The task that follows clarifies these terms.

READINGS

Vaughan, J. P. & Morrow, R. H. (1989). Ch 5 - Reporting and Surveillance Systems. *Manual of Epidemiology for District Health Management.* Geneva: WHO: 45 - 58.

Beaglehole, R., Bonita, R. & Kjellstrom, T. (1993). Ch 6 - Epidemiology and Prevention. In *Basic Epidemiology.* Geneva: WHO: 93 - 96.

Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S. (1997). Ch 14 - Disease Surveillance. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 140 - 146.

TASK 1 – DEFINE TERMS

Write definitions or descriptions of the following terms in your own words.

Use the three readings above and the glossary in Chapter 14 of Vaughan & Morrow (1989) to clarify your understanding. On page 93 of Chapter 6 - Beaglehole, Bonita & Kjellstrom (1993) you will find explanations of various sorts of screening. As in previous tasks of this sort, it can be extremely useful if you can illustrate your definition with an example.

extended programme of immunisation (EPI) notification
notifiable disease
probable case
routine surveillance
sentinel surveillance
outbreak investigation
screening
targeted screening
case-finding
sensitivity
possible case
definite case
community surveillance
special searches
surveys
mass screening
multiple screening
diagnostic test
specificity

FEEDBACK

Here are some of the key terms:

Mass screening	screening the whole population
Multiple screening	use of a variety of screening tests simultaneously
Targeted screening	screening groups with known exposure to risk
Case-finding or opportunistic screening	restricted to patients who visit a clinic or doctor
Sensitivity	proportion of truly ill people in the screened population, who are identified by the screening test
Specificity	proportion of truly healthy people in the screened population, who are identified by the screening test
Routine surveillance	every case of a particular condition seen must be reported and counted
Sentinel surveillance	uses data from a few selected sites rather than data from all sites

In the next section, we will explore surveillance activities in more detail.

4 COMPARE SURVEILLANCE ACTIVITIES

Before you examine of surveillance activities, it would be useful to clarify the purpose of such systems. There are a number of important uses of surveillance, and these are listed below.

A good surveillance system can enable you to:

- Report morbidity and mortality.
- Document distribution and spread of diseases.
- Establish long-term trends in disease occurrence.
- Detect epidemics.
- Identify high-risk groups.
- Estimate the magnitude of a health problem.
- Facilitate planning of control and prevention strategies.
- Evaluate interventions.
- Guide resource allocation in Public Health planning.
- Set research priorities.
- Provide information about the natural history of certain diseases.

Now compare two surveillance methods.

TASK 2 – ASSESS TWO SURVEILLANCE METHODS

Some health systems routinely encourage women over the age of 35 to submit themselves to an annual gynaecological examination, during which a small scraping of cells (PAP smear) is taken from the cervix for testing. The aim is to detect any early signs of cancer.

The regular self-examination of their breasts for abnormalities that may represent the early signs of breast cancer is another commonly promoted screening activity.

Assume that breast cancer and cervical cancer rates are fairly high in the community where these activities are promoted. We know these cancers are a serious problem.

What are the advantages and disadvantages of these two surveillance methods?

FEEDBACK

The PAP smear requires: a visit to a clinic, the collection of the scraping by a health professional, the laboratory diagnostic process and the reporting of results to the health care worker and the patient on completion of the laboratory process. This is a multi-stage, complex and expensive process. Even if the test itself is very

accurate in identifying pre-cancerous conditions, the huge costs of screening every woman over 35 in the country on an annual basis is a massive and costly undertaking. To make the system worthwhile, you would need to be convinced that you are detecting large numbers of potentially fatal cases or reducing expensive treatments for cervical cancer. You would also want to be sure that you were doing this for the group of women most at risk of getting cervical cancer. For this reason, 35 years of age might be a bit young as a starting point for surveillance.

Self-examination of the breast is a very different process. The main costs are the education and advertising process required to communicate the information and motivation that women need to effectively screen themselves for the early signs of breast cancer. This is clearly a lot less expensive as it does not require complex medical or laboratory procedures. These will only become necessary if the women detect an abnormality during their regular screening. A much smaller number of women would therefore require the more intensive level of investigation. The clinical infrastructure required to service this smaller group of women is much less than the annual PAP smear surveillance / screening system. One remaining concern is the ability of the breast self-examination to consistently pick up the pre-cancerous changes.

It is therefore important to evaluate proposed surveillance methods before implementing them.

TASK 3 – ASSESS SURVEILLANCE METHODS USING A SET OF CRITERIA

To assess whether to institute a screening programme, various textbooks and researchers have recommended the criteria listed below.

Criteria for instituting a screening programme

Disease	Must be serious. Shows high prevalence of pre-clinical stage. Natural history of disease is well understood. Long period between first signs and overt disease.
Diagnostic test	Sensitive and specific. Simple and cheap. Safe, acceptable (to the people on whom it is used). Reliable.
Diagnosis and treatment	Facilities are adequate. Effective, acceptable and safe treatment available.

Re-assess the two examples in **Task 2** using these criteria to determine which surveillance strategy should be implemented.

In the next task you will apply your understanding of surveillance methods to a specific

example.

5 ASSESS AN HIV/AIDS SURVEILLANCE EXPERIENCE

HIV sentinel surveillance, or surveillance from a few specific sites, has been operational in Zimbabwe since 1990. There are more than 22 sites where such sentinel activity is taking place. These sites include rural areas, growth points, commercial farming areas, small mining areas, medium size urban centres and the three major urban centres in Zimbabwe. At these sites, the population groups that have been under surveillance are pregnant women attending antenatal clinics (ANCs) and patients with sexually transmitted diseases (STD) attending outpatient facilities or STD clinics. At prenatal care clinics, blood which is earmarked for other tests (e.g. syphilis in pregnancy) is also tested for HIV. A similar process occurs for STD patients. The tests are carried out on an unlinked and anonymous basis. The selection process of persons to be included in these studies has been varied in the various sites. Random, systematic and convenient sampling procedures have been used. Sample sizes have also varied from year to year in the same sites and for the same group under surveillance.

TASK 4 - ASSESS THE SENTINEL SURVEILLANCE SYSTEM IN ZIMBABWE

a) Why is there a need for all the various sites indicated (e.g. rural areas, growth points etc) in this surveillance effort?

b) Discuss limitations of the data derived from sentinel surveillance, given the process of patient selection.

c) What needs to be done to improve the quality of surveillance?

FEEDBACK

a) Because sentinel surveillance does not collect data from the whole population, the sites selected must offer the best possible representation of the population at large. All parts of the society must be included. For this reason a wide variety of settings in which data is collected, is desirable.

b) This particular example relies on the testing of those who attend STD clinics and women attending ANC clinics. Since not everyone is tested, the sentinel system may miss important groups of people who may also be at risk of having HIV. You need to ask who attends these clinics and who does not. This sample includes those who are more sexually active (with more partners and a higher probability of STDs) and sexually active women of childbearing age who are now pregnant. All attend the public sector clinics. Men are under-represented. Less sexually active people and those without STDs, people who attend private medical clinics and women who are not pregnant, are all omitted. Such factors could have a substantial influence on the interpretation of the surveillance

results of the unless you know the HIV rates in these other groups.

c) If the system is extended to include these under-represented groups the surveillance data would be more reliable.

Probably the most well known surveillance system is that dealing with the notification of infectious and other diseases. The tasks in the following section look at notifiable diseases and the valuable information that notification provides.

6 CRITIQUE THE NOTIFICATION PROCESS

The routine notification of a finite list of infectious and non-communicable disease or health conditions is a central part of the surveillance system in most countries.

TASK 5 - IDENTIFY SOME CONDITIONS ON THE NOTIFIABLE DISEASES LIST

What conditions are notifiable in South Africa (or your own country)?

FEEDBACK

The list of notifiable diseases in South Africa (1995)

Acute flaccid paralysis	Meningococcal infection
Acute rheumatic fever	Paratyphoid fever
Anthrax	Plague
Brucellosis	Poisoning from agricultural or stock remedy
Cholera	Poliomyelitis
Congenital syphilis	Rabies
Diphtheria	Smallpox
Food poisoning	Tetanus
African Haemorrhagic fevers (Congo, Dengue	Tetanus neonatorum
Ebola, Lassa, Marburg and Rift Valley fevers)	Trachoma
Haemophilus influenza type b	Tuberculosis: Pulmonary and other forms
Lead poisoning	Typhoid fever
Legionellosis	Typhus fever (louse and rat flea borne)
Leprosy	Viral hepatitis A, B, non-A non-B and
Malaria	unspecified
Measles	Yellow fever
	Whooping cough (Bordetella pertussis)

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 5 - Reporting and Surveillance Systems. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 45 - 58.

TASK 6 - DESCRIBE THE NOTIFICATION PROCESS IN YOUR AREA

a) Briefly describe the system for notification of diseases in your district.
How frequent and how accessible are the reports on notifiable disease? What are the

common faults in the notification system?

b) Use the checklist in Vaughan & Morrow (1989) pages 57 - 58 to evaluate this system, then propose what could be done to improve the system.

FEEDBACK

Having compared what you noted down about the way notification works (or fails to work!) in your area of the health system, you should have been able to identify ways to improve the system in Chapter 5 of Vaughan & Morrow (1989).

You are now asked to consider the topical issue of HIV in relation to the list of notifiable diseases.

TASK 7 - CONSIDER INCLUSION OF HIV AS A NOTIFIABLE DISEASE

Including HIV on the list of notifiable diseases has been a contentious issue and continues to be hotly debated in different countries around the world. Just recently the South African Ministry of Health was on the verge of adding HIV to the list.
What would you have advised them to do?

FEEDBACK

The debate on this matter is far from resolved. Early in 1999, the South African Ministry of Health (MOH) decided to add HIV to the list. They thought that this would give them a better idea of the size, shape and rate of growth of this important epidemic. It seems that they did not seriously consider other, more effective ways to get this information. If you check the list of criteria for instituting a screening programme in Section 4, you will notice that there are very few of the criteria that HIV currently satisfies. This may change in the future, but the acceptability of the screening process will probably remain a major barrier.

The MOH proposal meant that any person who tested positive for HIV would, by law, have been identified by having their name and address recorded in the notifiable diseases records of their local health authority (LHA). These records are usually summarised and reported to the superintendents and management teams of all parts of the health service in the LHA area. Since there is still a profound social stigma and great potential for discrimination against people with HIV, this could have a disastrous impact on the lives of individuals. There is also an ethical argument around the compromise of doctor-patient confidentiality that this introduces.

What actually happened was that the new instruction to notify cases of HIV met with an almost complete refusal by health workers to implement it. This non-compliance with the new rules ensured its failure and eventual withdrawal.

7 SESSION SUMMARY

In this session, you have explored the concept, purpose and methods of surveillance and examined the routine recording of notifiable diseases as part of the surveillance mechanism.

Unit 3 - Study Session 2
Making Sense of the Data

Introduction

In your *Health Systems Research I* module, you explored different methods of data collection and analysis. At this stage, a far simpler approach will be taken, using only the most basic statistical tools. Whether you go on to actively engage in research, carry out routine data collection as part of a disease surveillance system or simply have to make sense of the information presented to you by someone else in a report or journal article, you need some tools to help you analyse such information and make sense of it.

This study session introduces a few simple techniques to assist you with the process of summarising, analysing and interpreting a set of epidemiological data. The first involves counting the frequency of occurrence of categorical variables, and testing for association between two categorical variables. The second approach involves calculating the mean, median, mode and range for continuous variables.

Contents

Timing of this session

This session contains one reading and three tasks. It should take you no more than two hours to complete.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session you should be able to:	
Health Measurement Outcomes	***Academic Learning Outcomes***
▪ Review an epidemiological report.	▪ Apply a systematic approach to

▪ Determine the Public Health implications of a given report or set of data.	the analysis of raw data. ▪ Employ simple statistical techniques.

2 READINGS

There is one reading to which you will be referred in the course of the session.

Author/s	Publication Details
Vaughan, J. P. & Morrow, R. H.	(1989). Ch 10 - Data Processing and Analysis. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 99 - 112.

3 PREPARE TABLES FOR DATA ANALYSIS

Without getting too far into the complexities of statistical analysis, you can learn a lot about the raw dataset by counting the frequency for each variable, in other words, how often the variable occurs within a given interval. The tasks that follow are based on Chapter 10 of Vaughan & Morrow (1989).

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 10 - Data Processing and Analysis. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 99 - 112.

For the tasks you are to assume that you or one of your colleagues carried out a small cross-sectional survey of 100 randomly selected villagers to determine the prevalence of hookworm infection and anaemia. The resulting data is contained in the above reading on pages 102 - 105.

You believe that there is an association between hookworm infestation and the levels of haemoglobin in the villagers and you want to test this theory.
The tasks will guide you through this process.

Before proceeding with the task it would be useful to read section 10.3 of Vaughan & Morrow (1989) on pages 101 - 102 for helpful advice on processing data.

Vaughan and Morrow (1989) make the following suggestions:

- When processing data, each variable can be counted and these counts can be summarised as tables. This enables one to draw graphs and diagrams.
- When preparing tables:
  - All data should be in a form that can be classified into categories.
  - All table categories must be mutually exclusive.
  - Each table should include all the *raw data*.

TASK 1 - PREPARE A FREQUENCY DISTRIBUTION FOR THE VARIABLES IN THE STUDY

Study the data supplied in Chapter 10 of Vaughan & Morrow (1989) on pages 102 -105. Note that the study provides information on four variables - age, sex, haemoglobin levels and presence/absence of hookworm infection.

Create four separate tables to summarise each of the variables.

The sex and hookworm data is discrete; it is M or F, + or -. It is much easier to simply count up the number of Ms, Fs, +s and -s. Note that the age and haemoglobin data is continuous, i.e. the range of possible values is infinite, or in other words, the numbers possible could range from any number between the smallest fraction (e.g. 0.0000124), to the biggest number (e.g. 135 367) and anywhere in between. Age ranges from 0 to 71 in this group. Haemoglobin ranges from 6.2 to 13.8.

For the continuous data you need to select appropriate *intervals.* This involves grouping certain ages together (e.g. 0-4, 5-14, 15-44, 45+), and the same process of grouping certain haemoglobin levels together (e.g. 6.0-6.9, 7.0-7.9 etc). Next you count how many people are to be found in each of those intervals, and how many people have haemoglobin levels that fall within each of those intervals.

FEEDBACK

Constructing a frequency count of data in this way is the simplest and most commonly used method of summarising a set of raw data. Compare your own tables with those displayed in Vaughan & Morrow (1989) pages 106 - 107.

The main question we wish to answer using the hookworm study data is: *Is the hookworm infection associated with low levels of haemoglobin?*

The next task shows how the data can be organised to make it possible to see if this association exists. It starts by formatting the data into intervals and constructing a two by two table.

TASK 2 - TEST FOR AN ASSOCIATION BETWEEN HOOKWORM INFECTION AND ANAEMIA

For most people, normal levels of haemoglobin range from 12 to about 16g per 100 ml of blood. Based on these figures for normal levels, anaemia is defined as a haemoglobin level of less than 10 grams per 100ml of blood. Using the data from the previous task (Vaughan & Morrow, 1989, pages 102 - 105), re-group it into the four groups represented in the shaded blocks of the table:

Distribution of people with hookworm infection and anaemia

Haemoglobin level	Hookworm infection		Total
	Present	Absent	

Anaemia (Less than 10g/100ml)	A **Number of people with Hk & with anaemia =**	B Number of people without Hk & with anaemia =	46
No anaemia (10g/100ml or more)	C Number of people with Hk & without anaemia =	D *Number of people without Hk & without anaemia =*	54
Total	59	41	100

Finally, compare the data for the two variables by asking the question: *Does hookworm infection appear to be strongly associated with the presence of anaemia or not?*

FEEDBACK

If the numbers of people in blocks **A** and **D** are high, then it means that hookworm is often present in the same people who have anaemia, and that hookworm is generally absent in the people who have no anaemia. This will mean that anaemia is strongly associated with the presence of hookworm infection. See Vaughan & Morrow (1989) page 108 for comments.

4 USE SIMPLE STATISTICAL TOOLS

It is possible to learn a lot about the raw dataset by counting the frequencies for each variable, as you did for the hookworm example. It is sometimes helpful to express such information as a percentage. For example, 59% of the subjects in the previous example had a hookworm infection and 76.1 % had anaemia.

Other commonly used methods describe the variables in terms of their range, mode, median or mean (average).

- The *range* is the difference between the minimum and maximum values recorded.
- The *mode* is the most commonly occurring value. It is more useful when applied to discrete variables or categories.
- The *mean* is the same as the average. It is calculated by adding all the values together and dividing the total by the number of people in the sample.
- The *median* is the value of the person in the middle of the sample once you have arranged the variables from smallest to biggest.

These methods are mainly applicable to continuous data such as age and haemoglobin levels in the previous example.

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 10 - Data Processing and Analysis. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 99 - 112.

Read Section 10.6 of Vaughan & Morrow (1989) for a few simple illustrations of these statistical tools.

TASK 3 – CALCULATE CHARACTERISTICS OF CONTINUOUS VARIABLES

Go back to the data in the previous example and calculate the characteristics of the continuous variables as indicated below:

a) Range
b) Mode
c) Mean
d) Median

FEEDBACK

a) *The range* is the difference between the minimum and maximum values recorded. For age it is simply 71 - 0 = 71years and for haemoglobin levels 13.8 - 6.2 = 7.6 g/100ml.

b) *The mode* is the most commonly occurring value. It is more useful when applied to discrete variables or categories. For age it is 4 years of age. There are 6 people of this age in the sample. For haemoglobin level it appears to be 10.9, which also occurs 6 times. You could also say that the interval with the most values in it is the 10-10.9 interval in which there are 24 people. So this interval could also be regarded as the mode of the distribution.

c) *The mean* is the same as the average. It is calculated by adding all the values together and dividing the total by the number of people in the sample. For age, the total of all the ages is 2463. There are 100 people therefore the mean age is 2463 divided by 100 which is 24.6 years. For haemoglobin, the total is 994.2 and the mean is therefore 9.9 g/100ml. The mean tells you that most of the other values are close to this mean value.

d) *The median* is the value of the person in the middle of the sample once you have arranged the variables from smallest to biggest. If you arrange the ages in this way, the 50th person in the sample is 20 years of age and the 51st person is 21 years old. This means the age at the middle of this sample of 100 people is 20.5 years. If you do the same thing with the haemoglobin levels, the median turns out to be 10.6 g/100ml. The median tells you where the middle of the distribution of values is located. It can be close to the mean in a very evenly spread out distribution.

It is a lot easier to sort and rank variables from smallest to biggest if they are entered into a computerised spreadsheet, database or table. If the data is in a database file, you can usually get a statistical programme such as *Epi Info* to do all

these calculations for you. These simple statistical tools can be used to do a preliminary analysis of almost any set of descriptive data.

5 SESSION SUMMARY

This session has introduced some important terms and tools for the analysis of epidemiological data. In the next session, we use the results of this analysis to prepare graphical illustrations. These can add emphasis and clarity to a research report.

Unit 3 – Study Session 3
Representing Health Information

Introduction

So far in this module you have read and interpreted graphical information in both your Module Guide and in the Readings. You have constructed line graphs, histograms and tables to make it easier to understand raw data. The translation of raw data into graphic form can add substantially to the impact it has on the reader. Such graphics can really help you emphasise the important features of the data. They are an essential component of any audio-visual reporting session and certainly liven up a printed report for those who need to read it and be persuaded by it.

Remember that doing the research is just the first step in the process of making people sit up and take note of your research findings. Your report needs to be persuasive. It must convince people to take it seriously and act to address the health problems you have illustrated.

In this study session, we look at what kind of graphical illustrations you might use. We discuss briefly how to decide what to illustrate and how.

Contents

Timing of this session

This session contains two readings and one task. This should take you about an hour and a half to complete.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session you should be able to:	
Health Measurement Outcomes	***Academic Learning Outcomes***
▪ Assess a variety of formats for representing different health data. ▪ Interpret health data presented in various graphical and numerical formats.	▪ Illustrate a set of data using simple graphical representation techniques.

2 READINGS

There are two readings to which you will be directed in the course of the session.

Author/s	**Publication Details**
Vaughan, J. P. & Morrow, R. H.	(1989). Ch 11 - Presenting Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 113 - 124.
Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S.	(1997). Ch 11 - An Introduction to Data Presentation, Analysis, and Interpretation. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 101 - 111.

3 USING GRAPHICAL REPRESENTATION TO ILLUSTRATE DATA

While graphical illustrations must never replace the text, they can be very effective in highlighting or emphasising certain features of the data. You also need to be wary of constructing a table or a graph for every piece of data you have summarised. Many smaller and less complex pieces of information can be clearly and easily stated directly in the text without the aid of graphics or tables.

Study the reading below, page 113 and then proceed to **Task 1**.

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 11 - Presenting Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 113 - 124.

TASK 1 - SELECT EFFECTIVE ILLUSTRATION METHODS FOR DATASETS

READING: Katzenellenbogen, J. M., Joubert, G. & Abdool Karim, S. S. (1997). Ch 11 - An Introduction to Data Presentation, Analysis, and Interpretation. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 101 - 111.

Consider which method mentioned in the above reading would most effectively illustrate the dataset that follows.

Decide which variables or relationships between variables you would represent in a table, a histogram, a pie chart, a scatter plot, a line graph or in the text.

A sample of 50 primary school children was surveyed to test the relationship between age (years), gender (M or F), weight (kilograms) and sugar consumption habits (rated on a scale from 0-5, with 5 being the highest level of excess sugar consumption). The following table of raw data was prepared.

Rec.No.	Age	Sex	Weight	Sugar
1	6	M	31	3
2	14	M	60	5
3	8	F	36	1
4	5	F	27	2
5	10	M	42	4
6	11	F	44	3
7	13	M	50	3
8	7	M	34	5
9	7	F	35	2
10	9	F	37	0
11	6	M	32	2
12	7	M	35	3
13	11	M	44	5
14	10	F	40	2
15	12	F	47	2
16	6	F	32	1
17	10	M	40	4
18	9	M	39	2
19	8	M	36	3
20	11	F	44	1
21	7	F	35	1
22	9	F	38	0
23	6	M	29	5
24	8	F	34	4
25	10	F	41	3

Rec.No.	Age	Sex	Weight	Sugar
26	9	M	36	5
27	9	F	38	2
28	6	M	32	4
29	10	M	42	4
30	7	F	30	3
31	11	M	43	3
32	8	F	36	2
33	12	F	46	0
34	12	M	48	4
35	7	M	33	3
36	6	F	30	2
37	9	M	37	1
38	12	M	48	3
39	11	F	45	2
40	11	M	46	3
41	7	F	34	2
42	10	F	40	2
43	12	M	50	4
44	8	M	36	5
45	8	F	37	1
46	13	F	51	3
47	9	F	37	2
48	11	F	41	0
49	8	M	35	4
50	7	M	33	4

FEEDBACK

There are no absolute answers to this question.

There are 50 children, and this could be mentioned in the *text*. Half of them are girls. You could also state in the text that 50% of the sample is male. A *pie chart* is good for illustrating what proportions of the whole are made up by individual groups, but it would be unnecessary to illustrate this simple proportion.

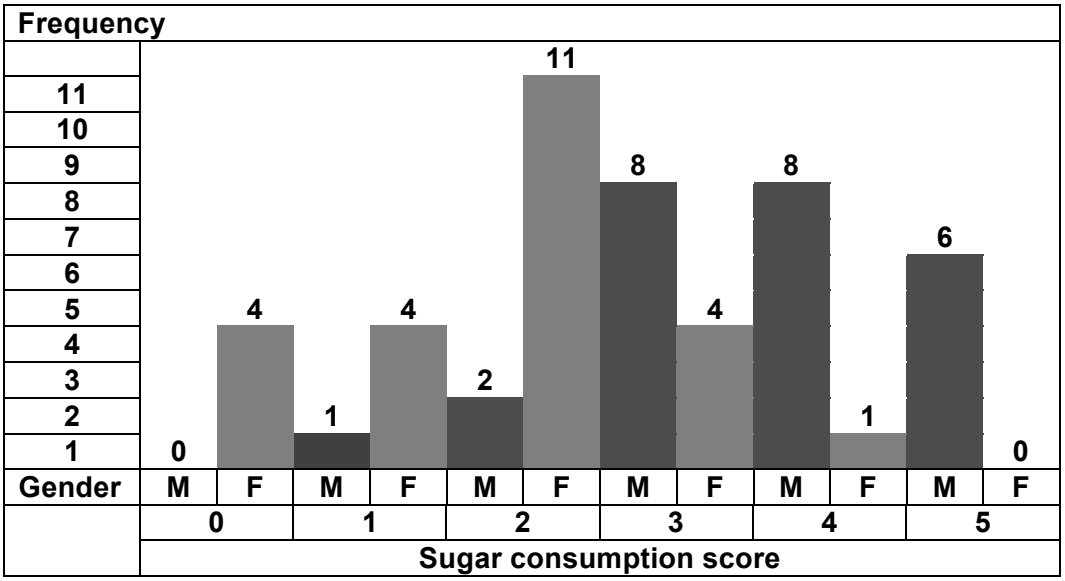
A *frequency distribution table* could be prepared to illustrate the age composition:

Age	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Number	1	6	7	7	7	6	7	5	2	1

This could also be represented on a *histogram*, although this would not really add to the clarity of the data and there is nothing particularly important about age distribution that you would want to emphasise at this stage. A variation on this table would be to extend it to include the breakdown of the sample by gender and age as in the example in Vaughan & Morrow (1989) page 106.

The sugar consumption data could be rather neatly illustrated with a *histogram*. Here too you have the opportunity to split the data by gender.

Histogram of sugar consumption levels by gender



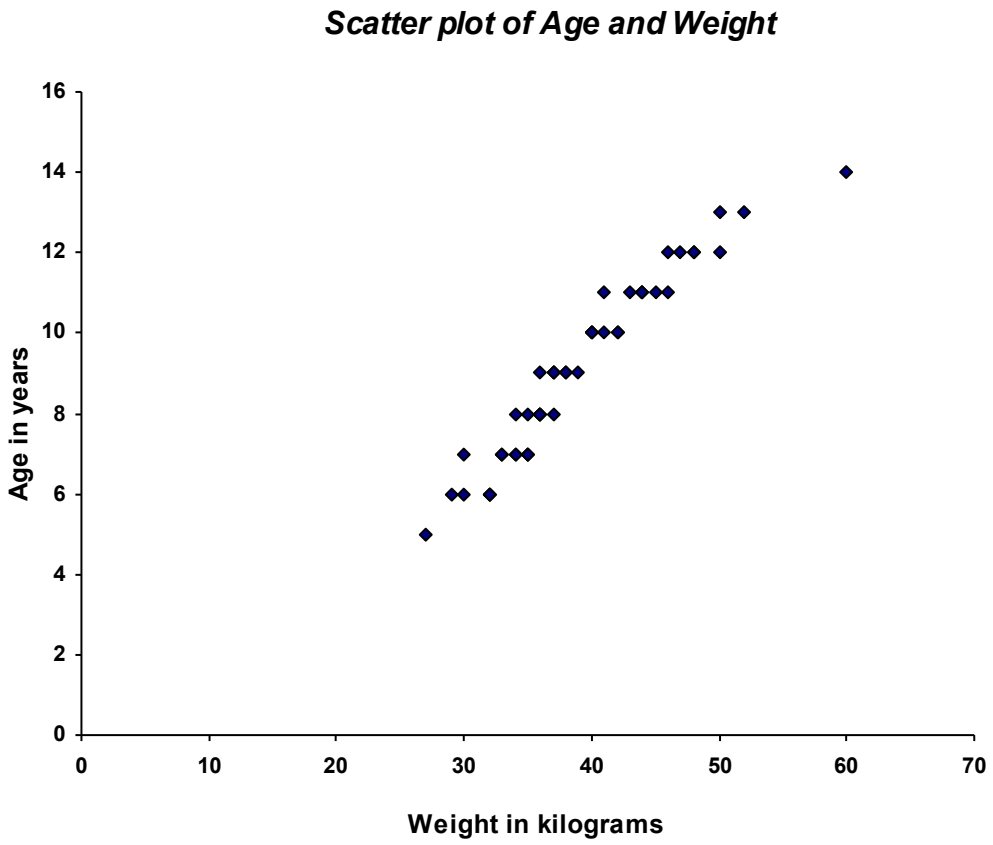
The *frequency distribution table* would look like this:

Gender	Sugar consumption score						
	0	**1**	**2**	**3**	**4**	**5**	**Total**
Male	0	1	2	8	8	6	25
Female	4	5	11	4	1	0	25
Total	4	6	13	12	9	6	50

Since both age and weight are continuous variables, you could calculate the range,

median and mean for each of them and report these in the text of your report.

For the same reason you could prepare *a scatter plot* (X-Y plot) using the weight and age variables to see if this illustrates some kind of association between them.



4 SESSION SUMMARY

In this session, you have considered a range of methods of representing datasets including tables, graphs, diagrams and descriptions through text. Not every variable requires such representation; it is therefore important to be selective when making graphical representations of data. It has also been noted that graphical representations can make a substantial impact. In the next session, we discuss reporting an epidemiological event.

Unit 3 – Study Session 4
Report on an Epidemiological Event

Introduction

Even the most perfect technical description and analysis of a health or illness event may amount to nothing unless it is effectively communicated to those who have the responsibility to do something about it. The point is that they need to have all the necessary information communicated to them in a way that is not just accurate, but also clear, short, simple and very persuasive. After all, your main objective should be to generate an effective response to the health problem described by your epidemiological investigation. For this reason the preparation of a well-constructed report is an essential part of the epidemiological process. It is also an essential part of your assignment so refresh your memory on the requirements.

This study session looks at a generic format to assist you in preparing a report on an epidemiological event.

Contents

Timing of this session

This session contains two readings and four tasks. It could take you up to three hours to complete.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session you should be able to:	
Health Measurement Outcomes	***Academic Learning Outcomes***
▪ Establish guidelines for effective epidemiological report writing.	▪ Summarise information. ▪ Use simple graphical techniques. ▪ Critically review a report.

2 READINGS

There are two readings in this session.

Author/s	**Publication Details**
Vaughan, J. P. & Morrow, R. H.	(1989). Ch 12 - Communicating Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 125 - 129.
Community Agency for Social Enquiry (CASE).	(1999). Introduction & Health Status. In *The Second Kaiser Family Foundation Survey of Health Care in South Africa*. Johannesburg: CASE: 1 - 7.

3 REVIEW GUIDELINES FOR REPORT WRITING

Before you construct a report or a research article, it would be useful to identify the main components, or sections of such a report and the function that each part of the report is to serve. The tasks in this session help you to do this.

READING: Vaughan, J.P. & Morrow, R.H. (1989). Ch 12-Communicating Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 125 - 129.

Note that you have previously looked at this chapter, and have considered the structure of a report in previous units. Now, in the final stages of preparing for your report, you will examine these components more closely and from the perspective of the whole report, not just selected parts.

TASK 1 - IDENTIFY THE MAIN COMPONENTS OF A HEALTH REPORT OR RESEARCH ARTICLE

a) *The above reading lists five points to consider when writing a report. Do you agree with these suggestions or would you alter them in some way?*

b) Scan four to five health reports published in any journal. Identify the main components of these articles by writing down the headings or subheadings used. Identify the purpose of each component.

You may use Moodley, Pick, Bradshaw & Cooper (1996) or Chapter 2 of Katzenellenbogen, Joubert & Abdool Karim (1997) if you wish.

FEEDBACK

Guidelines for preparing your health report or scientific article:

Most of the scientific articles, research reports or theses you will encounter are fairly rigidly structured around the following subheadings, each subheading representing a major section of the document:

Title, Author, etc.	Abstract	Introduction/purpose
Literature review	Aims	Objectives
Methods	Results	Discussion
Conclusion	Recommendations	

Each of these sections serves a particular purpose with respect to the overall task of the article or report, which is to communicate the nature of the research and its outcomes. In reports where research is not the primary focus of the report, the literature review may be limited or even fall away. See also Vaughan & Morrow (1989) pages 126 - 128.

Now consider the objective of each section in more detail.

TASK 2 - IDENTIFY THE MAIN OBJECTIVE OF EACH PART OF A SCIENTIFIC ARTICLE

Write down the specific objective that each individual section of the report must achieve:

Title, Author etc. *.....…*

Abstract *.....*

Introduction *.....*

Literature review *.....*

Aims *.....*

Objectives *.....*

Methods *.....*

Results *.....*

Discussion *.....*

Conclusion *.....*

Recommendation .....

FEEDBACK

Article component	Objectives that each component of the report must achieve
Title, Author etc.	A succinct statement indicating what the study is about, utilising a few key words to catch the reader's attention.
Abstract	A representative summary of all the main components of the thesis/report. A line or two per chapter heading and possibly one or two more for the results or major conclusion.
Introduction	What is the broad purpose for doing the research? How does it fit into the social, political, economic or health care setting/context in which it will eventually be applied?
Literature review	What is already known about the research problem? What is not known? What methods have been used to research it?
Aims	Based on what is already known/unknown in the literature, what is the specific research question that you will therefore try to answer through your study? Be very specific about what you will try to prove.
Objectives	Each objective must identify a step you will take to obtain each main piece of evidence you need to answer the main research question.
Methods	For each step, there needs to be a method you will use to get the information/evidence you require. This is described in the Methods section of the report. It must include sample size, sample selection method, data collection process, questionnaire design and testing, record verification, examiner variability, how you will analyse the data etc.
Results	This section describes the main features of the data after you have summarised and analysed it, e.g.: What is high? What is low? What is unusual? What is statistically significant? What is associated with what? Use a few tables and graphs to illustrate this but make all the important statements in the text.
Discussion	What does the data mean? This is where you interpret your results and establish what they actually mean. You might compare them with results in the literature. It should include: statement of principal findings; Strengths and weaknesses of your study; strengths and weaknesses in relation to other studies, particularly differences in results; meaning of study mechanisms and implications for policy makers and others involved in setting out protocols or guidelines of some kind; unanswered questions and future research.
Conclusion	What is the final answer to the original research question based on what you discovered through your study?
Recommendations	If there is a practical suggestion that arises directly out of your research findings, this can be stated here.

The length and composition of your report can be critical in determining whether your report actually gets read. It is therefore important to think strategically about which parts of your report need to be given greater prominence and more space, and conversely, which parts should be trimmed down to occupy less space. Remember that in most cases, your readers are pressed for time and want to be able to read the important parts quickly and easily.

TASK 3 - ESTIMATE APPROXIMATE LENGTH OF REPORT SECTIONS

Since most people struggle to find the time and energy to read lengthy reports in detail, it is important to keep them short and to the point.

Review the components of a report outline in the table above and suggest an appropriate length for each section.

FEEDBACK

Compare your proposed lengths with those in the reading below, page 129.

READING: Vaughan, J. P. & Morrow, R. H. (1989). Ch 12 - Communicating Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 125 -129.

Now that you have a clear framework for health reports and articles, try your hand at evaluating a report. In other words, put yourself in the position of the person who will mark your health report!

4 CRITIQUE A SAMPLE REPORT

Without saying whether we think this is a good, bad or indifferent report, here is a recent summary report from the Community Agency for Social Enquiry (CASE).

READING: Community Agency for Social Enquiry (CASE). (1999). Introduction & Health Status. In *The Second Kaiser Family Foundation Survey of Health Care in South Africa*. Johannesburg: CASE: 1 – 7.

TASK 4 - READ AND CRITIQUE A HEALTH SURVEY

Write a short critique of the health report contained in the above reading. Address all the main characteristics including the format, composition, structure, writing style, length, language, etc. If this was sent to you as part of your preparation for a meeting, would you make the time to read it? Would you be impressed and/or persuaded by its presentation and message?

FEEDBACK

The criteria in Vaughan & Morrow, page 126 should have been useful in evaluating this report.

5 SESSION SUMMARY

In this session, you have reviewed some of the critical elements (sections or components) of health reports and scientific articles. You have considered desirable standards to meet, identified the purpose and a suitable length for each section. You have also critiqued an article using the criteria drawn up by Vaughan and Morrow. All these skills are very important in preparing for your assignment and other academic tasks that you may undertake in the future.

The next (and final) session in this unit addresses the preparation of your written assignment. It is firmly based on the guidelines discussed in this study session.

Unit 3 - Study Session 5
Final Report (Assignment 2)

Introduction

This last study session guides you through your final task for the Module Assignment, which is to write an epidemiological report on the assignment dataset. Remember that it is contained in Section 3.6 of the Module Introduction. This is your opportunity to combine your literature review with your analysis, interpretation and summary of the data you have completed in the course of this unit. You should now have your lecturer's comments on Assignment 1 and these suggestions must be incorporated in your final report.

The report should reflect your grasp of the epidemiological concepts and processes you have encountered during all the preceding study sessions of the module. The structure of the report should particularly take into account the guidelines for report writing and communication discussed in the previous study session in this unit.

Finally, recognise that your report needs to convince others in the health system that you have an important and valid point to make. They need to be persuaded to take you seriously and act upon your suggestions. This is the real challenge you face as you prepare your report, and one of the criteria whereby it will be evaluated.

Contents

Timing of the session

The session contains ten tasks – all designed to help you prepare the final version of your assignment.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this study session you should be able to:
▪ Prepare a reader-friendly and convincing epidemiological report.

2 READINGS

Refer to the readings suggested in the previous study sessions on Report Writing.

3 ASSIGNMENT 2: FINAL REPORT

Prepare a descriptive summary of the dataset. Identify what statistical tools you wish to use. Determine what associations you will test and carry out, and any other analyses that you consider appropriate. Record and illustrate the results with graphs or other kinds of diagrams where appropriate.

Write the final report, complete with summary, references, graphs, tables, etc. The report must provide a reader-friendly and convincing response to the original problem identified in the dataset. It should provide the basis for a health authority to address the Public Health issues reflected by the data.

A typed report of 6 - 8 pages, and definitely not more than 10, is required.

4 ANALYSE AND INTERPRET THE DATA

For this task, your work from Unit 2, Session 5, **Task 3**, could provide the starting point. In that task, you set out a strategy for analysing your data. Before you start, review your study questions and bear them in mind while you do your analysis.

In **Task 1** you will test for any associations that may exist between the variables in the assignment dataset. You will need to apply some of the statistical tools introduced earlier in this unit to this dataset. You will also test any of the assertions made in the literature you reviewed earlier; in other words, whether this study

confirms or contradicts what the literature says about the same issues.

TASK 1 - IDENTIFY THE MAIN FINDINGS

There is a lot of information in the dataset but not all of it may tell you something that is essential to know.
In this task:

a) Determine which information is the most important.

b) Determine the main message or result(s) emerging from your analysis of the material.

FEEDBACK

The main findings are those that are best able to give you an answer to your questions. Remember that your main task is to determine how to address the health problem described. Refer back to the original set of questions you selected during Study Session 5 of Unit 2.

Note that the main finding could also tell you that you have asked the wrong question, in which case you may need to ask another question. The end result should provide you with information that helps you understand and/or respond to the health problem more effectively.

Large tables of data similar to the data presented in the assignment dataset are generally difficult to read and interpret. Therefore you will want to break down the data and present sections of it using smaller tables and/or various types of graphs.

TASK 2 – USING TABLES OR GRAPHS, DESCRIBE THE MAIN FINDINGS

Develop a set of tables and graphs you would use to represent the health information in your assignment dataset.

Refer to your answers in **Task 1**. Remember also that Unit 3, Session 3 guided you in this process.

FEEDBACK

Revisit Session 3 of this Unit – *Representing Health Information* for assistance with this task.

TASK 3 - DETERMINE TO WHAT EXTENT THIS IS A PUBLIC HEALTH CONCERN

Clearly the most important part of your job is to make sense of the information that has been given to you. You have already carried out a simple statistical analysis of the data and identified its main features (**Task 1**), and have summarised the main points in easy to read tables or graphs (**Task 2**). The next step is to determine what this information means.

a) What do the results of your analysis tell you about the health problem(s) that the data describes?

b) What are the Public Health implications of this health problem? To what extent is this a Public Health problem?

FEEDBACK

This task has taken you through the process of data interpretation. When interpreting data, the trick is to choose the right questions to ask and to search the material for the answers. A better understanding of the health problem can guide your recommendations or decisions on what action to take.

By now you should have a clear idea of the nature of the health problem and of its most important characteristics. Not every health problem in the community can be considered a Public Health concern. It would probably be helpful to refer back to your definitions of this concept from the very first study sessions of this module. Use this working definition of Public Health to help you decide if the health problem in this study has Public Health implications.

In your report, you will need to persuade your manager that it is important for him/her to take some kind of action, if this is the case. If you have sound, demonstrable reasons for deciding that this is a Public Health concern, your report will be more persuasive. Your manager will only do this if they are convinced that the problem is a Public Health concern, and that there is a Public Health intervention that they can use to address it. You will therefore have to provide a convincing explanation of what this means.

Very few health problems are unique: they have probably occurred somewhere before. It is very likely that similar information has been reported in other places or at another time. Perhaps you can learn from those experiences.

TASK 4 - COMPARE THE FINDINGS TO OTHER EXPERIENCES OR STUDIES

Locate and compare your information with similar information reported elsewhere.

FEEDBACK

In previous sessions you located examples of many different health indicators from a variety of sources. Use the same range of sources and compare your findings with that information. Existing databases of health indicators such as those of the WHO and UNICEF allow us to compare the rates of particular health problems in countries around the world, or even to compare a district or region with another nearby. These different sources provide a measure of how large or small your own health problem is, when compared to others.

5 DISCUSS THE IMPLICATIONS FOR DISTRICT HEALTH PLANNING

This is the final stage in preparing the draft material upon which your final assignment report will be based. This task encourages you to sift through the various points that have emerged from your preceding analysis and interpretation of the findings. It invites you to select the finding that seems to be the most important to you and consider what the health system could do in response to this research conclusion. This is the kind of recommendation that you will need to persuade your supervisor to act upon.

TASK 5 - EVALUATE POTENTIAL PUBLIC HEALTH RESPONSES TO THE FINDINGS

a) Prepare a short list of possible actions to take.

b) Prioritise the most appropriate responses.

Present recommendations based on the information in your report.

FEEDBACK

The Conclusion and Recommendations sections of your report are the critical sections focused on Public Health *action*. The Conclusion section provides summary short answers to the study objectives/questions, highlighting for the manager the main findings of your report.

These findings should then link directly with your Recommendations. These recommendations should be practical, *do-able*, and should include a list of the necessary resources (money, personnel, transport, training, collaboration) to actually achieve your aims. Remember here that you are asking for resources to be spent to address the Public Health problems you have highlighted in your report, and so you need to justify the expenditure.

TASK 6 – EVALUATE TWO SETS OF RECOMMENDATIONS

Consider how you would respond if you were a manager, and you received the following recommendations for action – the first from your TB coordinator and the second from your MCWH coordinator. Which coordinator is going to get your attention, and which is more likely to get the resources they need in the coming year?

Recommendation 1 from the TB Coordinator: This year we need to improve our TB Cure Rates by providing more education and treatment.

Recommendation 2 from the MCWH Coordinator: In the coming year we need to increase our immunisation coverage in children under 5 years old by 20%. To do this we recommend that the following be implemented:

a) We need to purchase and provide for running costs of 2 new 4X4 vehicles to

increase outreach to remote villages.

b) We need to hire a nursing sister, nursing assistant and driver for each vehicle.
c) We should contract the local School of Public Health to develop and test culturally appropriate community education and awareness materials on childhood immunisation.
d) A pharmacist should be assigned to complete a review of the procurement and transport of vaccines, to identify why vaccines are out of stock or expired in remote sites.

FEEDBACK

You will undoubtedly have chosen Recommendation 2 from the MCWH Coordinator, because it is explicit, reasoned and specifies exactly how the recommendations should be carried out.

Note that sometimes, as with Recommendation 2, your recommendations may include the need for further, or specific, studies. Especially when you are dealing with summary data, the reason for the problems you identify may not be available in the data. You may, in fact, have identified a problem but you may not know the cause of the problem, hence the need for further study.

6 PREPARE YOUR REPORT

By this stage you will have examined the information and come to some conclusions about it concerning, for example, what it implies, the quality of the dataset and how useable it is, as well as what Public Health issues may need to be addressed. You have summarised and illustrated some of the most prominent features of the data and made some recommendations on how the issue/s should be addressed.

This information needs to be effectively reported to your manager and others involved in the decision-making process of your health authority. The main message you wish to communicate must be clearly laid out and supported by good illustrations and a persuasive argument.

TASK 7 - FINALISE AN OUTLINE STRUCTURE FOR YOUR FINAL REPORT

In Unit 2, Study Session 5, **Task 2**, you developed a rough outline for your report. Now you should refine that outline. Remember that you have to catch and hold the attention of your manager (and others) long enough to communicate the most important information, and persuade him or her to act upon it. For this reason, the report should be clearly and appropriately structured *and not too long!*

Select an appropriate structure for your report: use the guidelines introduced in the previous study session and in Vaughan and Morrow (1989), Chapters 11 and 12.

FEEDBACK

You may wish to use the following steps as a guide in constructing your report.

Select a title and subheadings

Think of these as road signs that tell the reader where different parts of your report are located. They are short, clear indicators of what issues you are addressing at each point in the report, and also give an indication of the most important issues you will be addressing.

Determine the order in which the issues (sections) will appear

The sequence suggested by Vaughan and Morrow in Chapter 12 might suit your needs, but you should not feel bound by this format. You may wish to add different subheadings and exclude others. Whatever you decide, ensure that the report moves quickly from a brief introduction in which the problem is identified and described, towards a discussion that presents your interpretation and supports your conclusions.

Select tables, graphs and other illustrations to include

Tables and graphs carry quite a lot of information, and can be very confusing because of this. Not everything has to be presented in a table or graph. Some facts are easier to report in the text. Carefully select the information that will benefit most from a graphical illustration. You should also not assume that the graph or table speaks on its own. Your text must state clearly what is illustrated in the graph or table. Point out the highlights of the data in this way.

The guidelines in Vaughan & Morrow (1989), Chapters 11 and 12, may also be useful in this process.

Having finalised the structure and order of your report, it is time to complete the writing and compile your report. You should have already developed in rough draft form most of the sections of your report. Now you should put them all together.

As you write and review the report section by section, keep in mind the main study objectives of the report and the main findings of the analysis you carried out on the dataset. These should guide you in ensuring that all the sections deal adequately with the objectives and that you do not stray from the key issues. Be selective when drafting your report.

TASK 8 - COMPILE ALL THE INFORMATION INTO A REPORT

Compile a draft version of each section of the report.

FEEDBACK

It is useful to begin by writing the parts that you are confident about; this builds confidence and focuses your mind for the more difficult sections. Do not assume that your reader knows everything you do. Use short, clear sentences where possible.

7 PROOF-READ AND EDIT THE FINAL VERSION

The purpose of this final task is to ensure that you submit a product of the highest possible quality. Your supervisors in the work context should not be expected to read a report which has not been proof-read and checked for accuracy, and does not contain proper referencing. A report that looks attractive and is reader-friendly may mean the difference between success and failure, i.e. whether it gets read and taken seriously or not.

TASK 9 - CHECK FOR CORRECTNESS, LOGICAL STRUCTURE, REFERENCING

Check the report for clarity, correct spelling, grammar, accuracy, coherence and any other aspects you consider important.

FEEDBACK

It can help to get a colleague or friend to read your report as a test of how easy it is to read and how persuasive it is. They may also pick up minor typing errors you missed. Show your report to someone else (not necessarily a health professional) and ask them to give their opinion of your report and what impression it makes upon them. They may offer some surprising suggestions.

TASK 9 - FINALISE AND SUBMIT YOUR REPORT

Read the report once more and ensure that it meets your main objectives. Check it for accuracy, conceptual soundness and fix any typographical errors that may have crept in. Check your references using the guidelines in the *SOPH Academic Handbook*.
Once complete to your satisfaction, send it to your lecturer in accordance with the guidelines contained in the Module Introduction and the *SOPH Academic Handbook*.
Be sure to keep a duplicate copy of what you submit. Keep a computer file copy on a separate backup disk and a spare printed version.

FEEDBACK

Your lecturer will provide you with feedback, and you will then be able to revise your assignment for final submission.

8 SESSION SUMMARY

Hopefully you have completed your assignment and more importantly, gained some insight and experience of interpreting epidemiological data.

Before putting your module away, please take the time to give us some feedback on your experience of the module and the assignment. It will help us to iron out any confusing aspects of the module, and to improve it as a learning tool. The evaluation form will be sent to you soon. Thank you for your contribution!

Postgraduate Diploma in Public Health

Measuring Health and Disease I: Introduction to Epidemiology

Readings

School of Public Health
University of the Western Cape

MEASURING HEALTH & DISEASE I - INDEX FOR READER

The following text is required for this module in addition to the Module Readings, and can be found online in pdf format:

- Vaughan, J. P. & Morrow, R. H. (1989). *Manual of Epidemiology for District Health Management.* Geneva: WHO. [ISBN 92 4 154404 X] [Online], Available: http://whqlibdoc.who.int/publications/924154404x.pdf [Downloaded 20/08/2010].

Prescribed Texts:

- Katzenellenbogen, J. M., Joubert, G., Abdool Karim, S. S. (1997). *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press. [ISBN: 019 571308 7]

- Beaglehole, R., Bonita, R., & Kjellstrom, T. (1993). *Basic Epidemiology.* Geneva: WHO. [ISBN 92 4 154446 5]

Author/s	**Reference Details**
Beaglehole, R., Bonita, R., & Kjellstrom, T.	(1993). Ch 1 - What is Epidemiology? In *Basic Epidemiology.* Geneva: WHO: 1 - 11.
Beaglehole, R., Bonita, R., & Kjellstrom, T.	(1993). Ch 6 - Epidemiology and Prevention. In *Basic Epidemiology.* Geneva: WHO: 93 - 96.
Beaglehole, R., Bonita, R., & Kjellstrom, T.	(1993). Ch 7- Communicable Disease Epidemiology. In *Basic Epidemiology.* Geneva: WHO: 97 - 102.
Beaglehole, R., Bonita, R., & Kjellstrom, T.	(1993). Ch 10 - Epidemiology, Health Services and Health Policy. In *Basic Epidemiology.* Geneva: WHO: 131 - 141.
Community Agency for Social Enquiry (CASE).	(1999). Introduction & Health Status. *The Second **Kaiser Family Foundation Survey of Health Care** in South Africa.* Johannesburg: CASE: 1 - 7.
Depoy, E. & Gitlin, L.	(1994). Ch 5 - Developing a Knowledge Base Through Review of the Literature. In *Introduction to Research.* St Louis: Mosby: 61 - 66.
Katzenellenbogen, J. M., Joubert, G., Abdool Karim, S. S.	(1997). Ch 1 - Introduction. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 3 - 9.
Katzenellenbogen, J. M., Joubert, G., Abdool Karim, S.	(1997). Ch 2 - Key Concepts in Epidemiology.In *Epidemiology: A Manual for South Africa.* Cape Town:

S.	Oxford University Press: 15 - 24.
Katzenellenbogen, J. M., Joubert, G., Abdool Karim, S. S.	(1997). Ch 11 - An Introduction to Data Presentation, Analysis, and Interpretation. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press Press: 101 - 111.
Katzenellenbogen, J. M., Joubert, G., Abdool Karim, S. S.	(1997). Ch 13 - The Use of Routinely Available Data in Epidemiological Studies. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 133 - 139.
Katzenellenbogen, J. M., Joubert, G., Abdool Karim, S. S.	(1997). Ch 14 – Disease Surveillance. In *Epidemiology: A Manual for South Africa.* Cape Town: Oxford University Press: 140 - 146.
Health Systems Trust.	(1998). *How to Conduct a Situation Analysis: A Guide for Health Districts in South Africa*. Durban: Health Systems Trust: 1 - 8 & 50 - 53.
London, L.	(1996). Use of Rapid Appraisal Techniques to Evaluate Contact Tracing Activities at a Local Authority TB Clinic in the Western Cape. *South African Journal of Epidemiology and Infection,* 11(3): 77 - 81.
Moodley, J., Pick, W., Bradshaw, D. & Cooper, D.	(1996). The Infant and Under Five Mortality Rates for Children Born to Mothers in Griffiths Mxenge, Khayelitsha: A Community-Based Survey. *South African Journal of Epidemiology and Infection,* 11(3): 82 - 84.
Mouton, J.	(2001). Ch 6 - The Literature Review. In *How to Succeed in Your Master's and Doctoral Studies: A South African Guide and Resource Book*. Pretoria: Van Schaik: 86 - 97.
Sackett, D. L.	(March 1981). How to Read Clinical Journals: 1. Why to read them and how to start reading them critically. *CMA Journal,* 124: 555 - 558.
UNICEF.	(1998). Basic Indicators. In *The State of the World's Children 1998.* Geneva: UNICEF: 92 - 97 & 102 - 105.
Vaughan, J. P. & Morrow, R. H.	(1989). *Manual of Epidemiology for District* Health Management. Geneva: WHO. [Online], Available: http://whqlibdoc.who.int/publications/924154404x.pdf [Downloaded 20/08/2010].

CONTENTS LIST

Vaughan, J. P. & Morrow, R. H. (1989). Ch 4 - Epidemiological Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 39-42.

UNIT 2 SESSION 3 - EPIDEMIOLOGICAL HEALTH INFORMATION

Vaughan, J. P. & Morrow, R. H. (1989). Ch 4 – Epidemiological Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 33-44.

Vaughan, J. P. & Morrow, R. H. (1989). Ch 7 – Epidemiological Surveys. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 81-84.

UNIT 2 SESSION 4 - INFECTIOUS DISEASES AND OUTBREAKS

Vaughan, J. P. & Morrow, R. H. (1989). Ch 6 - Controlling an Epidemic. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 59-70.

UNIT 2 SESSION 5 - SYSTEMATICALLY INTERPRET THE INFORMATION

No readings.

UNIT 3 – HEALTH SYSTEM APPLICATIONS

UNIT 3 SESSION 1 - SCREENING AND SURVEILLANCE

Vaughan, J. P. & Morrow, R. H. (1989). Ch 5 – Reporting and Surveillance Systems. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 45-58.

UNIT 3 SESSION 2 - MAKING SENSE OF THE DATA

Vaughan, J. P. & Morrow, R. H. (1989). Ch 10 – Data Processing and Analysis. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 99-112.

UNIT 3 SESSION 3 - REPRESENTATION OF HEALTH INFORMATION

Vaughan, J. P. & Morrow, R. H. (1989). Ch 11 – Presenting Health Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 113-124.

UNIT 3 SESSION 4 – REPORT ON AN EPIDEMIOLOGICAL EVENT

Vaughan, J. P. & Morrow, R. H. (1989). Ch 12 – Communicating Health

Information. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 125- 129.

UNIT 3 SESSION 5 – DATA ANALYSIS, INTERPRETATION AND FINAL REPORT

Vaughan, J. P. & Morrow, R. H. (1989). Ch 11-13. In *Manual of Epidemiology for District Health Management.* Geneva: WHO: 113-154.

MEASURING HEALTH AND DISEASE – EVALUATION QUESTIONS
SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF THE WESTERN CAPE

Please give us some feedback on this module. Thank you.

1. In general, how do you feel about the module?
2. Did any aspects of the module challenge you to think more deeply about how we measure health and disease?
3. Are there any sections of the module which could be better explained? Be as specific as possible.
4. Were there any sections or sessions that you felt were unnecessary?
5. Were there any topics that you felt should have been included in the module?
6. Are there any improvements you could suggest to the assignment?
7. Are there any interesting readings which you feel should be added to the module?
8. Do you have any intention to use or adapt any part of the module?

Date:
Place:
Do you play a role in the field of Public Health? If so what?
Your name: [optional]:

Please paste your response into an email to: Ms L Alexander, SOPH, UWC
lalexander@uwc.ac.za