□ Basic Measurements in epidemiology

Epidemiology basically focuses on measurement of mortality and morbidity in human population. The 1st requirement is therefore definition of what is to be measured and establishment of criteria or standards by which it can be measured. This is not only a prerequisite of epidemiological studies, but also one of its goals.

The clinician may not require a precise definition of disease (eg migraine) for immediate patient-care, but the epidemiologist needs a definition that is acceptable and applicable to its use in large populations, and that is precise and valid to enable him to identify those who have the disease from those who do not.

Clear definitions help to minimise errors in classification of data standardised methods of observation and recording are therefore essential before commencing any epidemiological study.

The scope of measurements in epidemiology is very broad and unlimited and includes the following:

- Measurement of mortality
- Measurement of morbidity
- Measurement of disability
- Measurement of natality

- Measurement of the presence, absence or distribution of the characteristic or attributes of the disease, measurement of medical needs, health care facilities, utilization of health services and other health-related events, measurement of the presence, absence or distribution of the environmental and other factors suspected of causing the disease, measurment of demographic variables.

- The basic requirements of measurements are validity, reliability, accuracy, sensitivity and specificity But, measurement errors are unavoidable, no

matter where and by whom measurements are taken. The purpose of quality control in measurement is, therefore, not to eliminate errors, but to reduce them as much as possible or at least to an acceptable level.

• In the above connection, the following terminology needs explanation:

□ Variate: Any piece of information referring to the patient or his disease is called a variate.
A variate can be discrete i.e. it can be present or absent e.g. lung cancer, broken leg, or rash in measles or it can be continuously distributed e.g. blood pressure, serum cholesterol, height etc.

□ Circumstance: Any factor in the environment that might be suspected of causing a disease e.g. air pollution, polluted water etc.

• The frequency of a discrete variable or circumstance can be expressed as a rate in relation to population. The frequency of continuously

distributed variables or circumstances is expressed in the form of a frequency distribution using the summarising indices of mean, centiles, standard deviation etc.

□ Tools of measurement:

The epidemiologist usually expresses disease magnitude as a rate, ratio or proportion. A clear understanding of the term is required for interpretation of epidemiological data. The basic tools of measurement in epidemiology are:

- Rates
- Ratios and
- Proportions

□ Rate measures the occurence of some particular event (development of disease or the occurrence of death) in a population during a given time period.

- It is a statement of risk of developing a

condition. It indicates the change in some event that takes place in a population over a period of time.

An example of a typical rate is the death rate.

-Death rate:

A rate comprises the following elements-numerator, denominator, time specification and multiplier. The time dimension is usually a clander year, The rate is expressed per 1000 or some other round figure (10,000, 100,000) selected according to convenience or convention to avoid fractions.

Cirule rates:

These are the actual observed rates such as birth and death rates.

Specific rates: these are the actual observed rates due to specific causes (e.g. tuberculosis); or occuring in specific groups (e.g. age, sex groups) or

during specific time periods (e.g. annual, monthly or weekly rates).

- Standardized rates: these are obtained by direct or indirect method of standardization or adjustment e.g. age and sex standardized rates.

- Ratio:

Another measure of disease frequency is a ratio. It expresses a relation in size between two random quantities. The numerator is not a component of the denominator. The numerator and the denominator may involve an interval of time or may be instantaneous in time.

Broadly, ratio is the result of dividing one quantity by another, it is expressed in the form of.

x: y or x/y.

Example 1:

The ratio of white blood cells relative to red cells is 1: 600 or 1/600, meaning that for each white cell, there are 600 red cells.

Example 2:

$$\frac{\text{The number of children with scabies at a certain time}}{\text{The number of children with malnutrition at a certain time}}$$

Other examples include: sex-ratio, doctor-population ratio, child-woman ratio, etc.

Proportion

A proportion is a ratio which indicates the relation in magnitude of a part of the whole. The numerator is always included in the denominator. A proportion is usually expressed as a percentage.

Example:

$$\frac{\text{The number of children with scabies at a certain time}}{\text{The total number of children in the village at the same time}} \times 100$$

-Proportion: the number or amount of a group or part of something when compared to the whole.

Measurement of mortality

Traditionally and universally, most epidemiological studies begin with mortality data. Mortality data are relatively easy to obtain and, in many countries reasonably accurate. Many countries have routine systems for collecting mortality data. Each year, information on deaths is analysed and the resulting tabulations are made available by each government. Mortality data provide the starting point for many epidemiological studies. In fact, they are the major resource for the epidemiologist. The basis mortality data is the death certificate. So we 1st look at the death certificate for ascertaining the frequency of disease in a population.

Limitations:

Mortality data are not without limitations. Problems posed are posed by:

- The incomplete reporting of the deaths.
- Lack of accuracy.
- Lack of uniformity.
- Choosing a single cause of death.
- Changing coding systems and changing diagnosis may affect the validity.
- Diseases with low fatality (e.g. mental diseases, arthritis).

Uses:

Statistics on causes of death are important and widely used for a number of purposes. They may be employed in explaining trends and differentials in overall mortality, indicating priorities for health action and allocation of resources, in designing intervention programmes- moreover, they give important clues for epidemiological research.

Mortality rates and ratio:

Mortality rates and ratios are widely used for a number of purposes. They may be employed in explaining trends and differentials in overall mortality, in deciding priorities for health action and the allocation of

resources, in designing intervention programmes and in the assessment and monitoring of public health problems and programmes. Moreover, they give important clues for epidemiological research.

Crude death rate:

The simplest measurement of mortality is the crude death rate. It is defined as "the number of deaths (from all cases) per 1000 estimated mid-year population in one year, in a given place". It measures the rate at which deaths are occurring from various cause in a given population, during a specified period. The crude death rate is calculated from the formula:

$$\frac{\text{Total number of death}}{\text{total population}} \times 100{,}00$$

It is important to recognize that the crude death rate summarises the effect of two factors:

1) Population composition
2) Age-specific death rates (which reflect the probability of dying).

Specific death rate:

When analysis is planned to throw light on aetiology, it is essential to use specific death rates. The specific death rates may be :

- Cause or disease specific- e.g. tuberculosis, cancer, accident
- Related to specific groups- .g. age-specific, sex-specific, age and sex specific, etc.
- Rates can also be made specific for other variables such as income, religion, race, housing, etc. Specific death rates can help us identify particular groups "at risk", for preventive action. They permit comparisons between causes within the same population.

Case fatality rate (ratio):

Case fatality represents the killing power of a disease. It is simply the ratio of deaths to cases. The time interval is not specified. Case fatality rate is typically used in acute infectious diseases (e.g. food poisoning, cholera, measles). Its usefulness for chronic disease is limited, because the period from onset to death is long and variable. The case fatality rate for the same disease may vary in different epidemics because of changes in the agent, host and environment factors.

Proportional mortality rate:

It is sometimes useful to know what proportion of total deaths are du to a particular cause (e.g. cancer or what proportion of deaths are occurring in a particular age group (e.g. above the age of 50yrs). Proportional mortality rate expresses the "number of deaths due to a particular cause (or in a specific age group) per 100 (or 1000) total deaths". Thus we have:

- Proportional mortality from a specific disease
- Under – 5 proportionate mortality rate
- Proportional mortality rate for aged 50 years and above

Proportional mortality rate is computed usually for a broad disease group (such as communicable diseases as a whole) and for a specific disease of major public health importance, such as cancer or coronary heart disease in industrialized countries.

Survival rate:

It is the proportion of survivors in a group, (e.g. of patients) studied and followed over a period (e.g. a 5- yr period). It is a method of describing prognosis in certain disease conditions. The survival period is usually reckoned from the date of diagnosis or start of the treatment. Survival rates have received special attention in cancer studies.

Measurement of morbidity

Morbidity has been defined as "any departure, subjective or objective, from a state of physiological well-being". The term is used equivalent to such terms as sickness, illness, disability etc. The WHO Expert Committee on Health Statistics noted in its 6th report that morbidity could be measured in terms of 3 units –

- Persons who were ill.
- The illness (periods or spells of illness) that these persons experienced.
- The duration (days, weeks, etc) of these illnesses.

These aspects of morbidity are commonly measured by morbidity rates or morbidity ratios, namely frequency, duration and severity. Disease frequency is measured by incidence and prevalence rates. The average duration per case or the disability rate, which is the average number of days of disability per person, may serve as a measure of the duration of illnesses. The case fatality rate may be used as an index of severity. This section focuses on incidence an prevalence rates, which are widely used to describe disease occurrence in a community.

The value of morbidity data

They describe the extent and nature of the disease load in the community, and thus assist the establishment of priorities.

They usually provide more comprehensive, an more accurate and clinically relevant information on patient characteristics than can b obtained from mortality data and are therefore essential for basic research.

They serve as starting point for aetiological studies, and thus play a crucial role in disease prevention.

They are needed for monitoring and evaluation of disease control activities.

Prevalence

The term prevalence refers to measure of "status quo" of people affected by a disease or exposed to a drug in a population at a fixed point of time or during specific period.

⇒ The prevalence of a disease is a measurement of how common the disease is

→ Specifically, it is the number of existing cases (new and old) of disease in a defined population at a given point of time or over a defined time period.

- The broader definition is:

$$\text{Prevalence} = \frac{\text{the total number of all individuals who have a disease at a particular time}}{\text{the population at risk of having the disease at this point in time or midway through period}}$$

Prevalence is of two types:

1. Point prevalence
2. Period prevalence

1.Point prevalence of a disease is defined as the number of all current cases (old and new) of a disease at one point in time in relation to a defined population.

The point in point prevalence may for all practical purposes consist of a day, several days or even a few weeks depending on the time it takes to examine the population sample.

$$\frac{\text{number of all cases(old\& new) of specified disese exisiting at a given point in time}}{\text{estimated population at risk at the same time}}$$

- Where the term prevalence rate is used, without any further Qualification, it is taken to mean point prevalence.
Point prevalence has been made specific for age, sex and other relevant factors or attributes.

2.Period prevalence

A less commonly used measure of prevalence is period prevalence .it measures the frequency of all current cases(old & new)existing during a defined period of the time expressed in relation to defined population.it includes cases arising before but existing into or through to the yrs. as well as those cases arising during the year. Period prevalence is given by the following formula:

$$\frac{\text{number of existing cases(old \& new) of a specified disease during a given period of time interval}}{\text{estimated mid-interval population at risk}} \times 100$$

⇒ Prevalence helps to estimate the magnitude of health/disease problems in the community, and it identifies the potential high risk population

⇒ Prevalence rates are especially useful for administrative and planning purposes, e.g hospital beds, man power needs, rehabilitation facilities etc.

Incidence

- Incidence rate is defined as the number of new cases occurring in a defined population during a specified period of time it is given by the following formula:

$$\frac{\text{number of new cases of specified disease during a given period of time}}{\text{population at risk during that period}} \times 1000$$

- For example if there has been 500new cases of an illness in a population of 30,000 in a year. The incidence rate would be:
- 500/30,000x1000per year
- Note: incidence rate must include the unit of time used in the final expression, if u wrote 16.7per 1000 this would be inadequate the correct is 16.7 per 1000per year.

- It will be seen from the above definition that incidence rate refers:
- Only the new cases
- During a given period of time(usually one year).
- In a specified population, of population at risk, unless other denominator are chosen.
- It can also refer new spells or episodes of disease arising in a given period of time, per 1000 population .for example, a person may suffer from a common cold more than once a year. If he had suffered twice he would contribute 2 spells of sickness in that year. The formula in that case is:

- Incidence rate=$\frac{\text{number of spells of sickness in defined period of time}}{\text{mean number of persons exposed to risk in that period}} \times 1000$

- Incidence measure the rate at which new cases are occurring in population.it is not influenced by duration of disease. The use of incidence is generally restricted to acute conditions

- Examples include attack rate (case rate), secondary attack rate, hospital admission rate, etc.
- **Attack rate:**

  Attack rate is defined as an incidence rate (usually expressed as a percent) used only when the population is exposed to risk for a limited period of time such as during an endemic, it relates the number of cases in population at risk and reflects the extent of epidemic. Attach rate is given by:

$$\frac{\text{number of cases of specified disease during a specifies time intervals}}{\text{total population at risk during the same intervals}} \times 100$$

- **Secondary attack rate:**
- It is defined as the number of exposed persons developing the disease within the range of incubation period following exposure to a primary case.

Uses of incidence rate

The incidence rate as a health status indicator is useful for taking action:

- To control disease and
- For research into aetiology and pathogenesis, distribution of disease and efficacy of preventive and therapeutic measures.

For instance if the incidence rate is increasing, it might indicate failure of effectiveness of the current control programs.

Rising incidence rates might suggest the need for a new disease control or preventive program or the reporting practice had improved

→ A change or fluctuation in the incidence of disease may also mean a change in the aetiology of the disease, example change in the agent, host and environmental characteristics. Analysis of differences in incidence rates reported from various socio-economic group and geographical areas may provide a useful insights into the effectiveness of the health service provided.

Relationship between incidence and prevalence

- Prevalence depend on 2 factor (incidence and duration of illness) Given the assumption that is stable, the incidence and prevalence can be expressed as:
- P=I x D)
- =incidence x mean duration
- Examples for stable condition
- Incidence=10 cases per 1000 population per year.
- Mean duration of disease:5 years
- Prevalence=10 x 5=50per 1000 population
- Incidence=P/D
- Duration= P/I

The above equation(P=I x D) shows that the longer the duration of the disease ,the greater the pevalence,for example,tuberclosis keep cropping up throughout the year, the old cases of TB may persist for months years together.

On the other hand if the disease is acute and short duration either because of rapid recovery or death, the prevalence rate will be relatively low compared with the incidence rate.th some disease(e.g food poisoning),the disease is so short lived that there are no old cases.

→ Therefore a decrease in prevalence may take place not only from a decrease in incidence but also from a decrease of duration of illness through either more rapid recovery or more rapid death.

Incidence Vs. Prevalence:

1- Incidence conveys the information about the risk of contracting the disease, whereas Prevalence indicates how widespread the disease is.

2. Incidence is usually more useful than prevalence in studying the disease

etiology for eg if the incidence rate of a disease in a population increases, then there is a risk factor that promotes the incidence. for eg. consider a disease that takes a long time to cure and was widespread in 2002 but dissipated in 2003. This disease will have both high incidence and high prevalence in 2002, but in 2003 it will have a low incidence (because it takes a long time to cure, so the fraction of individuals that are affected remain high). In contrast, a disease that has a short duration may have a low prevalence and a high incidence.

$$\text{Prevalence} \approx \text{incidence} \times \text{Average duration of disease}$$

The importance of this equation is in the relation between prevalence and incidence, for ex, when the incidence increases, then the prevalence must also increase.

Odds ratio

- it is the measure of the strength of the association between the risk factor and outcomes. Odds ratio is closely related to the relative risk.it is a cross product.
- It is presented by following equation:

- $$\frac{\text{odds of exposure to the diseased group}}{\text{odds of exposed in non diseased(control) group}}$$

- OR is used in case control studies RCTS &COHORT STUDIES
- OR is the estimate of RR when the disease under study is relatively rare.

• odds ratio:

• The odds ratio is the ratio of odds of an event occuring in one group to the odds of it occuring in another group.

	Outcome	No outcome
Exposed	A	B
Not exposed	C	D

OR = AD/BC

Measuring The Drug Use: Units of Use

- Drug uses usually expressed as a proportion.
- Numerator - utilization units
- Denominator - variety of units are employed, like monetary units, prescription, number of drug dispensed.
- To overcome various problems with traditional units of measurement, WHO developed the concept of DDD.

Defined Daily Dose (DDD):

- The DDD is the assumed average maintenance dose per day for a drug used for its indication in adults.
- A DDD will only be assigned for drugs that already have an ATC (Anatomical Therapeutic Chemical) code.
- It should be emphasized that the defined daily dose is a unit of measurement and does not necessarily reflect the recommended or Prescribed Daily Dose.
- Doses for individual patients and patient groups will often differ from the DDD and will necessarily

have to be based on individual characteristics (e.g age and weight and pharmacokinetic considerations.

- The formula for calculating DDD is as follows:

$$\text{Drug usage (DDDs)} = \frac{\text{Items Issued} \times \text{Amount of Drug per Item}}{\text{WHO DDD Measure}}$$

For ex: Paracetamol has a DDD of 3g, which means that an average patient who takes paracetamol for pain relief uses 3g per day.

This is equivalent to six standard (500mg) tablets. If a patient consumes twenty four (500mg) tablets (i.e 12g of paracetamol in total) over the space of six days, he can have said to consumed four DDDs of this drug.

(12g i.e, total amount of drug)/3g (i.e amount of drug in a DDD) = 4 number of DDDs

□ Advantages:

- More meaningful than simple comparisons of grams

- Can be applied to a large no of drugs.
- We can compare utilization between regions/ countries and over time.

□ Disadvantages:

- DDD may present a dose that is seldom used
- Not meaningful when used with paediatric drug use data
- No provision for alteration in patients with reduced renal function.

General principle of DDD

- The basic principle is to assign only one DDD per route of administration within an ATC code.
- DDDs for plain substances are normally based on monotherapy
- A DDD will normally not be assigned for a substance before a product is approved and marketed in at least one country.
- For substances indicated for rare disorders with

individual dosing, the working group could decide not to assign a DDD.

- DDDs are not established for topical products (e.g. dermatological), sera, vaccines, antineoplastic agents, allergen extracts, general and local anaesthetics and contrast media.
- The DDD is sometimes a dose that is rarely ever prescribed, because it is an average of two or more commonly used dose sizes.

□ Uses:

1. Drug utilization:

- The DDD system can be used for collection of drug utilization statistics in a variety of settings and from a variety of sources.

Ex are:

- Sales data such as whole data at a national, regional or local level.
- Dispensing data either comprehensive or sampled.
- Patient encounter based data. This is usually collected

by specially designed sampling studies such as those carried out by market research organisations.

- Patient survey data. Collection of data at the patient level can provide information about actual drug consumption and takes into account compliance in filling prescriptions and taking medications as prescribed.
- Health facility data. Data on medication use at all the above levels is often available in health care settings such as hospitals and health centres at regional, district or village level

2. Improving Drug use:

- Examples of ways in which drug utilization statistics based on ATC and DDDs have been and can be used to improve drug use include the following:
- National publications, which provide clinicians, pharmacists and other with a profile of drug consumption in the country (with or without comparisons between countries or between areas within the country)

• Publications providing feedback within health services to individual health facilities, groups of health care providers, or individual health providers.
• Use of drug utilization statistics by national health systems, universities, drug information centers and others to identify possible over use, under use or misuse of individual drugs or therapeutic groups.

3. Drug Safety Assessment:

• Estimates of frequency trends in spontaneously reported cases of suspected adverse reactions for certain population groups may be linked to trends in drug consumption, using the DDD system.

4. Double Medication And Pseudo-Double Medication:

• The ATC classification can be used as a tool for screening of "double"- and "pseudo-double medication"
• "Double medication" can be defined as using two identical drugs simultaneously (e.g. two different diazepam preparations) whereas "pseudo-double

medication" can be defined as using two chemical different substances but with similar Pharmacodynamics properties simultaneously (e.g. a diazepam preparation plus an oxazepam preparation).

- The objective of checking these situations, by using physician or pharmacy, patient computer records, is to prevent unnecessary medication, which may increase the risk of side effects.

5. Drug Catalogues:

- ATC codes are included in some international drug catalogues (e.g the Index Nominal) and in several national drug catalogues.

Prescribed Daily Dose (PDD):

- The PDD will give the average daily amount of a drug that is actually prescribed.
- When there is a substantial discrepancy between the PDD and the defined daily dose DDD, it is important to take this into consideration when

evaluating and interpreting drug consumption figures.

- For drugs where the recommended dosage differs from one indication to another (e.g the antipsychotics) it is important that diagnosis is linked to the prescribed daily dose given.

- Pharmacoepidemiological information (e.g sex, age and mono/combined therapy) is important in order to interpret a PDD.

- The PDD can vary according to both the illness treated and national therapy traditions. For the anti-infective, for instance, PDDs vary according to the severity of the infection.

- There are also substantial differences between PDDs in various countries, which can be up to four to five fold range. PDDs in Asian populations are often lower than in Caucasian populations.

- The fact that PDDs may differ from one country to another should always be considered when making international comparisons.

- It should be noted that the prescribed daily dose does not necessarily reflect actual dose consumed.

Definition:

- Medication adherence is defined as the extent to which a patient's medication taking behaviour coincides with the intention of health advice he or she is given.
- Medication adherence is one of the most important factors that determine therapeutic outcomes especially in patient suffering from chronic illness.
- Adherence to treatment is the key link between treatment and outcome in medical care.
- Low medication adherence has assumed importance as it seriously determines the benefit of current medical care and imposes a significant financial burden on individual.
- There are several methods available for assessment of adherence, accurate measurement continues to difficult at present there is no generally accepted 'Gold Standard' for measuring adherence.

1. Biological Assay:

- Biological assays measure the concentration of a drug, its metabolites or tracer compounds in the blood or urine of a patient.
- These measures are intrusive and often costly to administer.
- Patients who know that they will be tested may consciously take medication that they had been skipping so the tests will not detect individuals who have been non-adherent.

Drugs or food interactions, physiological differences, dosing schedules and the half-life of the drugs may influence the results.

2. PILL Count:

Counting the number of pills remaining in the patient's supply and calculating the number of pills that the patient has taken since filling the prescription is the easiest method for calculating patient's medication adherence.

Some data indicate that this technique may underestimate adherence in older population. Patterns of non-adherence are often difficult to be determined. With the simple count of pills on a certain date weeks to months after the prescription was filled.

Because pill count are often based upon the date prescription is filled patient who get prescriptions refilled prior to their first one running out and then combining pills into a single (and possibly non-original) bottle presents complications.

-Loss of data is common among many studies

3. Weight of Topical Medications:

Here the weight of the topical medication, remaining in a tube as a measure of adherence.

When compared with the patient log books of daily medication use, weight estimates of

adherence were considerably lower than patient log estimate.

- They recommend that clinical trials involving topical applications incorporate medication weights as the primary measure of adherence.

In comparison of methods to measure adherence, the estimates calculated from medication logs and medication weights were consistently higher than those of electronic monitors.

4. Electronic Monitoring:

The medication event monitoring system (MEMS) manufactured by Hardex corporation allows the assessment of the number of pills missed during a period as well as adherence to a dosing schedule.

- It is a system with an electronic umbilical cord that records the dates and times of bottle caps opening as a means of ensuring adherence to therapeutic regimens.

- The system electronically monitors when the

pill bottle is opened, and the research can periodically download the information to a computer

- The availability and the cost of this system could limit the feasibility of its use.
- The MEMS monitors are drug packages with integral electronic micro circuitry designed to compile the dosing histories of ambulatory patient's prescribed medications.
- Each monitor consists of a conventional medicine bottle filled with the special closure that records the time and date of each opening and closing of the container through integrated micro circuitry.
- Monitors are designed to be used by one patient with one drug.
- A reader transfers the dosing history data from the MEMS monitor to a MS-windos based computer.

5. Pharmacy Records And Prescription claims:

This method can be used primarily for medications that are taken for chronic illnesses such as hypertension.

- Concerns regarding the completeness and reliability of these records have been expressed. These records provide only indirect measure of drugs consumed.
- Patterns of over and under consumption for periods less than that between refills cannot be assumed.

6. Patient interviews:

Interviewing patients to assess their knowledge of the medication they have been prescribed and the dosing schedule provide little information as to whether the patient is adherent with the actual dosing schedule.

- Subjective assessments by interviewes can bias adherence estimates.

This method is rarely used in the medical research to assess adherence.

7. Patient Estimates of Adherence:

Direct questioning of patients to assess adherence can be an effective method.

Patients who admit to non-adherence are generally accurate in their assessment.

However, patients who claim adherence may be underreporting their non-adherence to avoid caregiver disapproval. Other methods may need to be employed to detect these patients.

8. SCALED QUESTIONAIRES:

- ***Morisky et al.*** (1986) developed a 4-item scaled questionnaire to assess adherence with antihypertensive treatment. Their scale demonstrated acceptable psychometric properties.
- ***Li et al.*** (2005) developed four instruments to measure antihypertensive medication adherence in a population of Chinese immigrants in the US. Their measures are culturally sensitive and demonstrate good reliability.
- ***The Hill-Bone compliance to High Blood Pressure Therapy Scale***
  Include 14 items, 8 of which are directed at assessing medication taking behaviour in hypertensive patients.
  - Not only is this method relatively simple economically feasible to use. But it has the added advantage of soliciting information regarding situational factors that interfere with the medication adherence.
  - E.g. forgetfulness remembering to bring medications along when out of town.

- ***The Compliance-Questionnaire-Rheumatology (CQR):***
  Is a 19-item questionnaire that has been favourably compared with electronic medication event monitoring. This instrument has good validity and reliability.
- ***QUESTIONAIRE:***
  You indicated that you are taking medication for your identified health concern such as "high blood pressure" individuals have identified several issues regarding their medication-taking behaviour and we are interested in your experiences. There is no right or wrong answer.

Please answer such question based on your personal experience with your (health concern) medication.

Interviews may self-identify regarding difficulties they may experience concerning medication-taking behaviour.

Please circle the correct number	No=0	Yes=1
1. Do you sometimes forget to take your pills?		
2. Were there any days you did not take you medicine?		
3.When you travel or leave home do you Sometimes forget to bring along your pills?		
4. Did you take your medicine yesterday?		
5. When you feel like your health concern is under control, do you sometimes stop taking your medicine?		
6. Taking medicine every day is a real inconvenience for some people(do you ever feel hassled about sicking to your blood pressure treatment?		

7. How often do you have difficulty remembering to take all your medications?(please circle the correct number)

Never/Rarely.....0
Once in a while.....1
Sometimes.....2
Usually.....3
All the time.....4

9. MEDICATION ADHERENCE SELF-EFFICIENCY SCALE:

The purpose of MASE scale is so clinicians and researchers can identify situation in which patients has low-self efficacy in adhering to prescribed medications.