**Assignments number three.**

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**Question 1**. **Distinguish between descriptive epidemiology and analytical epidemiology**.

First and foremost, Epidemiology is defined as the study of the determinants, distribution and frequency of disease **(Bohning, 2011, p 2).**

According to **Bohning (2011, p 7)** there are two broad types of epidemiology.

1. **Descriptive Epidemiology**.

This is examining the distribution of disease in a population and observing the basic feature of its distribution.

1. **Analytic Epidemiology**.

Analytic epidemiology is investigating a hypothesis about the cause of disease by studying how exposures relate to disease.

The **key difference** between Descriptive and Analytic Epidemiology is the approach taken to address the particular health issue**. Descriptive Epidemiology generates hypotheses whereas Analytic Epidemiology tests for hypotheses to deduce conclusions (Difference between Descriptive and Analytic Epidemiology, 2018).**

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| **Descriptive Vs Analytic Epidemiology** | |
| 1. Descriptive Epidemiology refers to the studies that generate hypotheses and answer the questions who, what, when and where of the disease or infection. | 1. Analytic Epidemiology refers to the studies that are conducted to test for hypotheses and to generate conclusions on the particular disease. |
| **Hypothesis.** | |
| 1. Descriptive epidemiology is able to generate a hypothesis. | 1. Analytic epidemiology is able to conduct a test for the hypothesis. |
| **Interventions.** | |
| 1. Intervention studies are not performed in descriptive epidemiology. | 1. Interventions are analyzed in analytic epidemiology. |

**Question. 2 Write down and explain the mathematical expression of the following.**

1. **Incidence.**

Incidence refers to the occurrence of new cases of disease/injury in a population over a specified period of time. According to “**Epidemiology”, (2019, P 158)** other epidemiologist use incidence to mean the number of new cases per unit of population.

Incidence =

**Types of incidence.**

There are two types of incidence namely 1**. Incidence proportion 2.Incidence rate or person-time rate.**

1. **Incidence proportion/risk.**

This is the proportion of an initially disease-free population that develops disease, become injured or dies during a specified period of time. As a measure of incidence it includes only new cases of disease in the numerator and its denominator is the number of persons in the population at the start of observation period. Moreover the denominator of incidence proportion is limited to the population at risk for developing disease. For example if the numerator new cases represent cancer of ovaries, the denominator should be restricted to women because men have no ovaries **(Epidemiology, 2019, P 160).**

**The mathematical expression of incidence proportion;**

Incidence proportion ═

1. **Incidence Rate/person-time rate.**

Incidence person-time rate is a measure of incidence that incorporates time directly into the denominator. It is generally calculated from a long-term cohort follow-up study where enrollees are followed over time and the occurrences of new case of disease is documented. Each person is observed from an established starting time until one of four ended points is reached (**onset of disease, death, migration out of study area and end of study)**.Like incidence proportion, the numerator of incidence rate is the number of new cases identified during the period of observation. And unlike incidence proportion, the denominator of incidence rate/person-time rate is the sum of time each person was observed, totaled for all persons. The denominator represent the total time the population was at risk and being watch for disease. Incidence rate is the ratio of the number of cases to the total time the population is at risk of disease **(epidemiology, 2019, P 161).**

**The mathematical expression of incidence rate;**

Incidence Rate ═

1. **Prevalence.**

Prevalence rate is the proportion of persons in population who have a particular disease or attribute at a specified point of time or over a specified period of time.

Prevalence include all cases, both new and preexisting in the population at the specified time, meanwhile incidence is limited to new cases only. Prevalence may be reported as a percentage (5% or 5 people out of 100) or as the number of cases per 10,000 or 100,000 people. The way prevalence reported depend on how common the characteristic is in the population **(National Institute of Mental Health, 2017**).

Prevalence =

**Types of Prevalence.**

There areseveral ways to measure and report prevalence depending on the timeframe of the estimate.

1. **Point Prevalence.**

This refers to the prevalence measured at a particular point in time. It is the proportion of persons with a particular disease or attribute on a particular date.

Prevalence of attribute =

1. **Period prevalence.**

Period prevalence refers to prevalence measured over an interval of time. It is the proportion of persons with a particular disease or attribute at any time during the interval.

1. **Lifetime prevalence**.

It is the proportion of a population who at some point in life has ever had the characteristic

**Question. 3** **Apart from Randomized trials, describe four (4) other epidemiological research designs.**

Epidemiological research/studies generally fall into four broad categories (Coggon

et al., 2003).

1. Cross-sectional study

2. Case-control study

3. Cohort study

4. Case-crossover study.

Each of these is addressed in turn the sections that follow.

1. **Cross-sectional study.**

Cross-sectional studies measure the prevalence of conditions or characteristics of people in a population at a point in time or over a short period **(Epidemiology\_ an introduction, 2018, P 26).** In cross-sectional studies, it is not always necessary to investigate the whole population; a sample is usually sufficient, provide that the individual in the sample are representative of the total group under consideration.

1. **Case-control study.**

These focus on determining disease causation **(Epidemiology \_ an introduction, 2018, P 26)**. The ‘case’ is a person who has a particular symptom or medical condition. The focus is on a group of cases which is then compared with the control group consisting of people not having the symptom or the medical condition. Also investigations are carried out into the previous exposure of two groups to particular factors that are suspected of causing the symptom or condition. If the two groups differ regarding their exposure to such factors, a causal link between the symptom/condition and the factor is referred.

1. **Cohort study.**

These focus on groups of people who show certain attributes or characteristics (e.g. with

respect to their health behavior). The groups are then observed over a period of time in

order to discover what happens to their individual members and to check whether there

are any associations between behavior and the development of disease **(Millennium**

**Cohort Study, 2006).**

1. **Case-crossover studies.**

According to **Thisted (2006)** case-crossover study design is a relatively new analytical epidemiological approach, and is unique in that the case serves as his/her own control and is used to investigate the transient effects of an intermittent exposure on the onset of acute outcomes.

The case-crossover studystarts with identifying cases and only cases are used (it is a case-only study. We record whether the exposure was present shortly before the onset of the disease and in a pre-specified reference time period.

**Question.4 Data from hospital records are one of the most important sources of information in epidemiologic studies.**

1. **Outline the limitations of using hospital data.**

Base on the work of “**Alfonso, Masi, Dr.P.H, F.A., P.H” *– Potential uses and limitations of Hospital data in Epidemiologic research,* (1965, P 662)** the limitation of using hospital data are as follows.

1. Hospital detected cases are not inclusive and are selected according to,
2. Personal characteristics for example age, race, sex, socioeconomic status.
3. Severity of disease with a tendency to advanced cases.
4. Associated condition.
5. Administrative admission policy.
6. Difficulty of finding adequate control groups.
7. Hospital records are not primarily designed for research, because of
8. Incomplete and unstandardized information.
9. Diagnostic variability among hospitals.
10. The community population at risk cannot be precisely defined**.**
11. Duplicate admission raise problems in determining incidence and prevalence rate.

**b) Describe the possible sources of error in interview surveys.**

According to ‘***The Qualtics Handbook of Question Design”, (2010-2019),*** designing a research project takes time, skill and knowledge. If you don’t go into the process with a clear goal and methods, you’ll likely come out with skewed data or an inaccurate picture of what you were trying to accomplish.

The possible sources of error in interview surveys are as follows;

**1. Population Specification Errors.**

Population specification errors occur when the researcher does not understand who they should survey. This can be tricky because there are multiple people who might consume the product, but only one who purchases it, or they may miss a segment looking to purchase in the future. **For instance:** Packaged goods manufacturers often conduct surveys of housewives, because they are easier to contact, and it is assumed they decide what is to be purchased and also do the actual purchasing. In this situation there often is population specification error. The husband may purchase a significant share of the packaged goods, and have significant direct and indirect influence over what is bought. For this reason, excluding husbands from samples may yield results targeted to the wrong audience **(*The Qualtrics Handbook of Question Design, 2010-2019).***

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**2. Sampling and Sample Frame Errors.**

Survey sampling and sample frame errors occur when the wrong subpopulation is used to select a sample, or because of variation in the number or representativeness of the sample that responds, but the resulting sample is not representative of the population concern.

Unfortunately, some element of sampling error is unavoidable, but sometimes, it can be predicted. For instance, in the 1936 presidential election between Roosevelt and Landon, the sample frame was from car registrations and telephone directories. The researchers failed to realize that the majority of people that owned cars and telephones were Republicans, and wrongly predicted a Republican victory. **For example:** Suppose that we collected a random sample of 500 people from the general U.S. adult population to gauge their entertainment preferences. Then, upon analysis, found it to be composed of 70% females. This sample would not be representative of the general adult population and would influence the data. The entertainment preferences of females would hold more weight, preventing accurate extrapolation to the US general adult population. Sampling error is affected by the homogeneity of the population being studied and sampled from and by the size of the sample **(*The Qualtrics Handbook of Question Design, 2010-2019).***

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**3. Selection errors.**

Selection error is for a sample selected by a non-probability method. When respondents choose to self-participate in a study and only those interested respond, you can end up with selection error because there may already be an inherent bias. This can also occur when respondents who are not relevant to the study participate, or when there’s a bias in the way participants are put into groups.For example**:** Interviewers conducting a mall intercept study have a natural tendency to select those respondents who are the most accessible and agreeable whenever there is latitude to do so. Such samples often comprise friends and associates who bear some degree of resemblance in characteristics to those of the desired population **(*The Qualtrics Handbook of Question Design, 2010-2019).***

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**4. Non-responsive errors**.

Non-response error can exist when an obtained sample differs from the original selected sample.

This may occur because either the potential respondent was not contacted or they refused to respond. The key factor is the absence of data rather than inaccurate data. **Example:** In telephone surveys, some respondents are inaccessible because they are not at home for the initial call or call-backs. Others have moved or are away from home for the period of the survey. Not-at-home respondents are typically younger with no small children, and have a much higher proportion of working wives than households with someone at home. People who have moved or are away for the survey period have a higher geographic mobility than the average of the population. Thus, most surveys can anticipate errors from non-contact of respondents. Online surveys seek to avoid this error through e-mail distribution, thus eliminating not-at-home respondents **(*The Qualtrics Handbook of Question Design, 2010-2019).***

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**5. Measurement errors.**

Measurement error is generated by the measurement process itself, and represents the difference between the information generated and the information wanted by the researcher. Generally, there is always some small level of measurement error due to uncontrollable factors. **Example:** A retail store would like to assess customer feedback from at-the-counter purchases. The survey is developed but fails to target those who purchase in the store. Instead, the results are skewed by customers who bought items online **(*The Qualtrics Handbook of Question Design, 2010-2019).***

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**Question 5. Explain the main determinants of health**.

Many factors combine together to affect the health of individuals and communities. Whether people are healthy or not, is determined by their circumstances and environment. To a large extent, factors such as where we live, the state of our environment, genetics, our income and education level, and our relationships with friends and family all have considerable impacts on health, whereas the more commonly considered factors such as access and use of health care services often have less of an impact **(WHO , 2019).**

However the main determinants of health are as follows;

**1. Social determinants of health (SDOH).**

As defined by the World Health Organization **(WHO**), social determinants of health are the conditions in which people are born, grow, live, work and age. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels”. The social determinants of health also determine access and quality of medical care sometimes referred to as medical social determinants of health.

Factors in the social environment that are important to health generally include those related to safety, violence, and social disorder. Moreover factors related to the type, quality, and stability of social connections, such as social participation, social cohesion, social capital, and the collective efficacy of the neighborhood or working environment**.**  Social participation and integration in the immediate social environment like school, working place and neighborhood appear to be important to both mental and physical health**.** What also seems important is the stability of social connections, such as the composition and stability of householdsand the existence of stable and supportive local social environments or neighborhoods in which to live and work (WHO 2019).

**2. Physical environment factors (physical determinant).**

The factors in the physical environment that are important to health include harmful substances, such as air pollution or proximity to toxic sites, access to various health-related resources **for example** healthy or unhealthy foods, recreational resources, medical care and as well as community design and the built environment like land use mix, street connectivity and transportation systems.

The environment can affect health through physical exposures, such as air pollution. A large body of work has documented the effects of exposure to particulate matter (solid particles and liquid droplets found in the air) on cardiovascular and respiratory mortality and morbidity (WHO 2019).

**3**. **Health services**

Access and use of services that promote health and prevent disease influence health. Simple measures, such as protecting water supplies, often have the greatest impact on overall health. Examining high-use populations in terms of health care utilization can be an effective way to target interventions tailored to specific groups such as those with multiple co-morbidities **(Amit, 2019).**

4. **Gender.**

Gender refers to the societal characteristics that society ascribes to the two sexes. According to **Amit, 2019**, “gendered norms influence the health system's practices and priorities. Gender inequities do not only result from income disparities; gender is also linked to differential access to health services, to unequal obligations to provide unpaid family care duties, and to disparities in nutrition”.

5. **Culture.**

The customs, traditions, and the beliefs of the family and community all affect health. A person’s cultural background has an influence on their beliefs, behaviors, perceptions, emotions, language, diet, body image, and attitudes to illness, pain, and misfortune. All of these factors can influence health and the use of healthcare services **(Amit, 2019**).

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