

BTEC Applied Science Example Assignment

During the BTEC course you will be presented assignments that you will have to use to research information and then present evidence towards the assessment criteria.

This assignment is about diseases and infections.

Scenario

The study of microbiology and the diseases that can be caused by these tiny organisms is an interesting and ever increasing important part of science.

Epidemiology is the study of the patterns, causes, and effects of health and disease conditions in defined populations. It is the cornerstone of public health, and informs policy decisions and evidence-based medicine by identifying risk factors for disease and targets for preventive medicine. Epidemiologists help with study design, collection and statistical analysis of data, and interpretation and dissemination of results.

Epidemiology has helped develop methodology used in clinical research, public health studies and, to a lesser extent, basic research in the biological sciences. Major areas of epidemiological study include disease etymology, outbreak investigation, disease surveillance and screening, bio-monitoring, and comparisons of treatment effects such as in clinical trials.

Epidemiologists rely on other scientific disciplines like biology to better understand disease processes, statistics to make efficient use of the data and draw appropriate conclusions, social sciences to better understand proximate and distal causes, and engineering for exposure assessment.

You are working as an Epidemiologist working for the Department of Health doing various tasks within this assignment.

Your first task is to produce a research folder about each piece of information in the learning list that follows.

Unit Content Covered – to be researched.

1 Know the different types of diseases and infections

- *Infectious diseases*: protozoal eg malaria, giardia; metazoal (Schistosomes, trypanosomes) eg Bilharzia; arthropod infestation eg scabies, lice, ticks; helminthic eg tapeworms, hookworms; pathogenic bacterial eg staphylococci, gonorrhoea, meningitis; viral eg HIV, chicken pox; subcutaneous mycoses eg sporotrichosis, chromomycosis; systemic or deep mycoses eg respiratory and disseminated types
- *Diseases with environmental causes and links*: nutritional deficiency diseases, eg rickets, anaemia; chronic dietary disease eg cardiovascular disease, obesity, diabetes; diseases caused by pollution eg asbestosis/mesothelioma; diseases caused by chemical poisoning eg minamata; cancers eg those linked to radiation poisoning, those caused by exposure to UV A and B radiation (such as melanoma); lupus; immune diseases; allergies; asthma
- *Degenerative diseases*: disease due to ageing and degenerative body function or where the causes are less clear, eg Alzheimer's, osteoporosis

2 Understand the factors that can influence the development of diseases and infections

- *Pathogens*: parasital, pathogenic bacterial, fungal, viral (nature of, thriving conditions, lifecycle, likelihood of developing within humans)
- *Environmental causes*: nutritional deficiency diseases (relationship between deficiency of particular vitamins, minerals or proteins and the development of disease, progressive nature of the deficiency disease, its potential for being reversed); chronic dietary disease (links between particular dietary habits and the development of disease, the psychiatric nature of some diseases); diseases due to environmental factors (direct impacts of some pollutants and their effects, relationship between cancers and radiation or exposure to UV A and B radiation, relationship between environmental conditions and disease)
- *Where the cause is uncertain*: body degeneration, eg Alzheimer's, osteoporosis (where causes are complex, multiple, or are unclear)

3 Be able to investigate the spread of diseases and infections

- *Direct contact*: person-to-person eg direct transfer of bacteria, viruses; animal to person, infected animal bites or handling animal waste; mother to unborn child eg through the placenta (HIV or toxoplasmosis), during delivery (group B streptococcus)
- *Indirect contact*: surfaces eg bacteria; endemic organisms eg fungal (histoplasmosis) and bacterial infections (anthrax)
- *Spread through the air*: droplet transmission eg from coughing; particle transmission eg airborne virus, bacterium such as tuberculosis, pollution particulates and possible links to asthma

Spread through vectors: bites and stings transferring infection eg mosquitoes, fleas, lice or ticks

Food and water contamination: contaminated food and water eg Escherichia coli (E. coli)

4 Know some of the impacts that diseases can have upon people, society and the environment

Symptoms: change over time eg speed of onset, chronic, relapsing or remitting; symptomatic; asymptomatic; specific symptoms eg direct pain, relating to an organ or location; general symptoms affecting the entire body or being, eg fever, weight loss, depression; presenting symptom (as described to a doctor); cardinal symptom (evidence leading to a specific diagnosis)

Impacts upon: individuals eg debilitation, ability to work; populations eg the impacts of HIV on a community, city, region or country; economy eg costs of drug treatment, debilitation and its effects on economic growth

5 Understand ways in which diseases can be treated, cured or eradicated

General types of treatment: treatment of protozoal infections eg using amoebicides; antibiotics (chemotherapeutic agent against micro-organisms); why viruses are difficult to treat; the use of antivirals

Treatments for particular diseases and their effectiveness: links to the stage of development of the disease or infection; alternative strategies; how different treatments may have different impacts; availability of treatment and finance for drug treatments; the effectiveness of treatments against killer disease; their side effects; cure, remission, containment, delay

Progression in treatment over time: how treatments have changed for particular infections and diseases over time; how recent developments may have altered treatments eg new drug treatments or therapies; impacts of treatments upon patient care and survival rates; how some infections become drug resistant eg malarial treatments

Programmes designed to reduce and/or eradicate disease and their effectiveness: global aid programmes eg UNICEF programmes for reducing infant mortality and its causes; the impact of education and healthcare programmes eg diarrhoeal treatment and oral rehydration therapy; targeted aid programmes eg HIV antiretroviral funding; eradication programmes eg the Roll Back

Assessment and grading criteria – this is what you will be Judged on (Just like in the real thing...)

<u>Pass</u>	<u>Merit</u>	<u>Distinction</u>
P1 describe the main types of diseases and infections	M1 explain the differences between the main types of infections and diseases	D1 assess the basis for the classification of different infections and diseases
P2 explain some of the human and physical conditions that lead to the development of diseases and infections	M2 explain how and why these infections and diseases develop in the way that they do	D2 assess the importance of human and/or physical environmental conditions in explaining the development of these diseases and infections
P3 carry out an investigation into the spread of diseases and infections	M3 explain how and why these infections and diseases spread in the way that they do	D3 assess the factors which explain the spread of these diseases and infections
P4 describe the impact that diseases and infections can have upon people, society and the environment	M4 explain the links between the diseases selected and the impact that these may have	D4 assess the impact that these infections and diseases may have, both on individuals and on communities at different scales
P5 describe how diseases and infections can be treated, cured or eradicated.	M5 explain the reasons for treatments to cure or eradicate diseases and infections.	D5 assess the effectiveness of treatments given for these infections and diseases.

You will then be asked to complete a series of tasks. Do these and add these to your folder.

Task 1 – Diseases and infections

As an Epidemiologist working for the Department for Health, you are producing public health information pages for their webpage. You need to make sure that the information is factual, yet easy for the public to read. Ensure that you are aware of your target audience and compliment your information with clear diagrams. Show off your new webpage as to your boss for approval.

Develop an information page for the website showing at least three for each type of micro-organism that causes a disease within the human body. (Fungi, Protozoa, Viral, Bacterial, parasitic macro-organisms such as arthropod infestation)

- Indicate the type of organism
- The life cycle of the organism
- How it can be spread
- Conditions that can lead to infection
- Life styles, physical or environmental conditions that help the disease spread.
- Symptoms
- Treatment

P1

Include a page on the different classifications of disease. Explain how they are divided into sub groups and the main characteristics of that group.

M1

Using the information you found about classification of disease, assess how useful these are for use in the medical profession.

- Provide a balanced argument of how beneficial and arguments for how limited the system is in practise.
- Provide examples where diseases have been hard to classify.
- For each example explain the problems associated that made it hard to classify and the impact this had on treatment.

D1

Your evidence could include:

Presentations, microscopic images of pathogens, flow diagrams, research material, posters, webpage documents, statistical data of infection rates.

Task 2 Factors that influence diseases and infections

As part of your job you have also been asked to look at the difference between infection and disease. Some diseases are not caused by a pathogen but by environmental factors.

- Pick at least three examples of different environmentally caused disease.
- For each explain how humans can contract that disease.
- How these diseases differ from pathogenic disease.
- Symptoms.
- Treatment

P2

Using your knowledge from P1 and P2 explain the difference between the different infections, linking into the way they are spread, the organism that causes them and type of disease they cause.

- Pick three killer infections and diseases.
- For each of your examples also explains how and why these diseases develop in the way they do.
- Explain the link between their development and human and/or physical conditions they thrive in.
- In order to help you later to do this you need to produce examples of disease that have spread and changed as they spread globally.
- You could include maps showing infection demographics.
- Types of strains of disease.
- Changes in the disease pathology or pathogen itself as it spread.

M2 & D2

Your evidence could include:

Presentations, flow diagrams, research material, posters, webpage documents, statistical data of infection rates, labelled maps, video footage from the news.

Task 3 – Investigating the spread of disease

You have been asked to investigate how a selection of infection and diseases spread and the factors that influence. You should focus on the epidemiological ways in which they can spread. To present this information have been asked to make a webpage. The webpage should consist of a main summary page indicating the main methods of pathogen transference and then three separate pages for your examples.

To achieve P3, you should carry out your investigations and present your findings on how ***four examples of killer diseases*** are spread. Include factors that affect their spread, you might want to look at historical records as to how and when the disease spread more rapidly.

Examples could be:

- Spanish Flu
- Swine Flu
- Bird Flu
- The Bubonic Plague
- Malaria
- Leprosy
- TB
- CJD

Your investigation should include different examples of transference methods; such as droplet, vector and direct contact. And you should also look at different disease agents, such as viral, bacterial and fungal if possible.

P3

Expand your webpages to include information for each of your examples that explain how and why these diseases spread and the impact they have. Include answers to:

- What conditions to they favour?
- Which countries to does each example spread more quickly in, and why?
- What are the links between the method of transfer and the conditions in the communities they are found in?

M3

Create a new page to your website that looks at the importance of factors of infection. In this section you must compare two different infections; one that has been slowly and one that has spread quickly. Examples could be recent or historical in nature.

In both cases you must assess how important knowing the methods of how the disease can spread is. Explain how in both cases the disease spread at the rate it did and how difficult it was/would be to contain it.

D3

Your evidence could include:

Presentations, case files, research notes, disease spreading maps or models, infection data, diagrams

Task 4 The impact of disease on people and the environment

Your boss has been impressed with your work so far on the website and has asked you to research some more information that might be of use to the public. This time you are focusing your research on the impact of diseases on people, communities and globally. You could look at personal diaries of sufferers, media articles and interviews with people to gather your information.

Keeping with **your four chosen killer diseases** from Task 3, create a section on their webpages to look at the impact of each on society.

- Describe how each affects the person who suffers.
- What symptoms do they get? Short term and long term.
- How are they treated by the people around them?
- How does the community deal with people when they get infected?
- How does the larger country deal with the infection if it is pandemic or epidemic?

P4

Expand your webpage even further to include an explanation for each of your examples of the links between the disease and the impacts it has on the communities.

- You might look at restriction on movement and why?
- How devastating it has been on the population as a whole and why?
- Are people shunned or ostracised by their communities and why?
- Are their religious or lack of resource issues?
- Lack of medical care that influences the spread of the disease?

M4

Assess for each example how important the impact of these diseases/infections have on:

- a. The individual (personally)
- b. The local community
- c. The country
- d. Globally
- e. Wider organisations that have had to intervene.

D4

Deadline: _____

Your evidence could include:

Presentations, data, diary entries, video footage, case notes, historical case notes, diagrams, graphical work..

Note: Confidential information must be blanked out on any evidence that enables anybody to identify a person if personal details form part of your evidence.

Task 5 How effective is treatment?

Your last piece of work is to produce leaflets and a presentation for people who are at risk of contracting killer diseases, such as holiday goers, people who take drugs, people who might have unprotected sex and people who have young children. The leaflets are to focus on the different ways they can be treated. You could include diagrams or photos to accompany your text.

Choose four diseases or infections (they could be any four from your current research) to produce your leaflets. Make sure the design or your leaflet is appropriate for the target audience. **Include descriptions** of:

- Briefly how each disease/infection can be identified
- How the symptoms can be treated
- What the short and long term treatments are to cure the disease
- If it can't be cured what long term treatments might be required
- How treatment regimens can lead to reduced infection rates and possible eradication.

P5

Produce a presentation that will explain the reasons for your treatments chosen above. This will be shown nearby the leaflets to help raise awareness and encourage people to pick up the leaflets with the information about treatments on.

- What programs exist to reduce these diseases?
- Why is it important to address these killer diseases?
- Why is it important to study and understand these examples of treatments?
- Why does science still strive to eradicate these diseases?

Additional help: If you are struggling look at these two examples: 'Roll Back Malaria' and 'Upgrading the provision of fresh water as a means of reducing infection'

M5

Lastly to finalise all your work, add to your presentation your assessment of how effective treatments for your examples above are. You must be critical and evaluate each example.

- How effective are they at stopping the spread of disease?
- How good are they at helping the individual who is suffering?
- How can you judge how effective they have been? What criteria do they use? E.g. survival rates?
- Compare how well they have worked in the past compared to today if infection rates have increased or decreased.
- Give your own opinion for each evaluating how effective they have been and why.

D5

Your evidence could include:

Presentations, essays, data, reference to examples evaluations