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Name:

Applied Human Biology

Y12-Y13 SIL

Unit 3: A1 Understand health issues and associated initiatives and research

Support Resources:

- https://qualifications.pearson.com/content/dam/pdf/BTEC-Nationals/applied-human-biology/2018/specification-and-sample-assessments/9781446958599-btecnat-l3-extcert-apphumbio-spec-ppv2-070618upd.pdf
- https://qualifications.pearson.com/content/dam/pdf/BTEC-Nationals/Applied-Human-Biology/2018/Support-resources/Student%20resource%20-%20Unit%203%20Human%20Biology%20and%20Health%20Issues.pdf

Complete the Sections, then mark (mark scheme at the end of the document)

Getting to know Unit 3

Unit 3 Specification Overview

A1 Understand health issues and associated initiatives and research

Learners will select and apply knowledge of fundamental human biology, such as cells and tissues, human body systems and functions, immune response and genetics from Unit 1: Principles of Applied Human Biology and microorganisms and infectious diseases from Unit 2: Practical Microbiology and Infectious Diseases. They will then develop an understanding of health issues, associated initiatives and research, and potential areas for further research and development:

Covered in this booklet:

- Infections:
  - reducing the transmission of infectious diseases
  - controlling the spread of antibiotic resistance in bacteria
  - antibiotic- and antimicrobial-resistant infections
  - role of vaccination programmes in controlling disease.
- Health and lifestyle initiatives related to:
  - cardiovascular diseases
  - respiratory diseases
  - ageing population
  - obesity
  - smoking, alcohol and substance misuse
  - sexually transmitted infections (STIs).

Expect to learn about these in class in September:

- Genetic initiatives:
  - genetic screening
  - genetic diseases
  - pre-implantation genetic diagnosis.
- Medical prevention and treatments:
  - cancer screening
  - medical imaging
  - stem-cell therapy, epigenetic modification and reprogramming
  - developing new drugs
  - hormone therapies.

Assessment

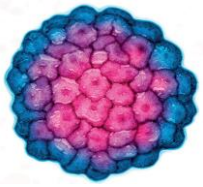
- You will be assessed through a 3-hour supervised task (EXAM) worth 60 marks, which is set and marked by Pearson.

Key terms used in Unit 3: Write the correct term next to each definition

Term	Definition
	The capacity or power to have an effect on the development, actions, behaviours or opinions in healthcare
	Issue or problem, related to health, that has been identified, which is open ended and has multiple potential solutions
	Data in numerical form, which can be categorised and used to construct graphs, or tables of raw data, such as data drawn from the results of experiments
	Inclination or prejudice in a way considered to be unfair
	Related to the best use of limited, or scare, resources (financial)
	May be used on its own to describe the subject that the article is describing e.g. obesity
	Acknowledgement of sources of information used within an article
	Consider in detail, the different aspects of an issue, situation, problem or argument and how they interrelate.
	Effects or consequences of an action or decision that may happen although not explicitly stated
	Published research reports and data, likely to be based on analysis of primary research
	The extent to which an experiment, test or measuring procedure yields the same results on repeated trials
	Ethically related aspects that may have affected how research was carried out
	Research compiled directly from the original source, which may not have been compiled before
	Refers to how the research described in the article was carried out, for example through quantitative methods such as analysis of numerical data or qualitative- based observations
	Specific terminology directly relating to the subject matter presented in the article
	An issue that influences and is opposed by a considerable number of individuals in society
	Strategy/plan identified in the article and related to the impact it has in the health issue
	A specific group at which an article is aimed
	The means of mass communication through reporting medium
	Use your knowledge to propose a likely solution to a problem
	Descriptive data, such a data drawn from open-ended questions
	Requires identification of a point and linked justification / exemplification of that point. The answer must contain some linked reasoning in questionnaire

Section 1: Infectious Diseases

Many diseases are caused by infecting agents or microorganisms, such as viruses, bacteria, protoctists, fungi or larger parasites such as worms and insects (lice and fleas). Infecting agents live in or on the body, and if they cause disease, they are described as pathogens.



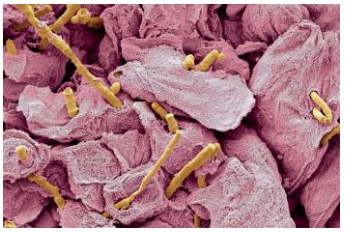
Viruses occur in all types of ecosystem and can affect all living organisms.

Give some examples of infectious diseases caused by viruses:

Some viruses cause cancer, such as cervical cancer which is caused by the human papilloma virus (HPV).

Bacteria are single celled prokaryotic organisms. Many inhabit the intestines of animals, including human intestines. Many types of bacteria are essential to us, however some types of bacteria are pathogenic.

Give some examples of infectious diseases caused by bacteria:



Fungi are eukaryotic organisms. While some fungi support ecosystems by breaking down dead matter to recycle nutrients, some fungi act as parasites and infect other organisms. Yeast is one such type of fungi that can infect humans,
Give some example of infectious diseases caused by yeast:

Protoctista are species that do not fit into the other categories of microorganisms. All members of this species kingdom are eukaryotic and include:

- protozoa – infecting agents that cause malaria, sleeping sickness and amoebic dysentery
- slime mould and water moulds.

Infectious diseases are also called communicable diseases as they can spread from person to person, or from animals to people, and, in some cases, people to animals. However, all microorganisms require certain conditions for their cell numbers to grow by replicating. **What are the five conditions?**

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Complete the table below to show some examples of communicable diseases and their method of transmission (how they enter a host)

Method of transmission	Infectious disease
Direct or social contact –fomites are objects or substances that can carry infecting agents and transfer them from one person to another. Examples include shaking hands, physical touching, and sharing of items such as towels, bedding and money.	
Airborne – the infecting disease is carried in droplets and released via breathing, coughing and sneezing; the droplets are breathed in by another person.	
	Typhoid, salmonella, campylobacter, hepatitis A, Ebola and cholera
	HIV, AIDS, syphilis, hepatitis B and the human papilloma virus (HPV) (which causes cancer of the cervix)
Insects and tick bites.	

For many of the identified infectious diseases across the world, how they are spread and how they are cured using medicines such as antibiotics is known, and ultimately how they are prevented using vaccinations and other health-related policies and procedures. However, there are important public health issues in the prevention and control of infection, that influence the level of infectious disease in a community and can lead to outbreaks of a previously unknown, or previously contained, infectious disease.

Describe some public health issues that can impact the prevention and control of infection:

Epidemiology

What is epidemiology?

What type of data do epidemiologists gather and how is this used?

Complete the following key definitions, with an example for each

Key term	Definition	Example of disease (s)
Endemic		
Epidemic		
Pandemic		

In Britain, local health authorities must report any outbreak of a disease in the area they are responsible for. This data is generated from GP reports, private health agencies and health-related charities. This data is then passed on to the Department of Health and Social Care (DoHSC) to review over a period of time. If they detect a serious outbreak of a disease, this is reported to the World Health Organisation (WHO) who track the data further and decide if medical assistance or resources are needed to prevent a serious epidemic.

Reducing the transmission of infectious disease

Infectious diseases still cause millions of deaths around the world every year – from malaria and schistosomiasis in tropical areas, to influenza and norovirus outbreaks in the more temperate regions of the world. They affect all age groups, from new-born babies to the elderly and cannot always be stopped from spreading from one person to another.

Where possible, health professionals take preventative measures against infections that are common in particular age groups, or those that occur on a seasonal basis. For example, people vulnerable to infectious disease, such as the elderly, or those with underlying health conditions such as diabetes or respiratory issues, are offered a flu vaccination on a yearly basis. Babies and infants are immunised against communicable diseases such as measles, mumps and rubella to prevent them spreading.

Antibiotics and vaccination programmes are only a small part of how governments and healthcare workers help to reduce the burden of infectious disease on individuals and on society. The following case studies look at some different ways of reducing the transmission of a particularly deadly infectious disease.

Controlling the spread of antibiotic resistance

Bacteria can quickly develop resistance to antibiotics. In fact, bacteria have been developing antibiotic resistance for millions of years as a defence mechanism against naturally occurring antimicrobials, and against antibiotics secreted by other bacteria.

Why has antibiotic resistance increased over the last century?

The WHO has previously stated that "antibiotic resistance is one of the biggest threats to global health, food security, and development today".

One way of getting around antibiotic resistance is, of course, to develop new antibiotics. Why is this far more difficult than it sounds?

New antibiotics cannot currently be developed quickly enough to deal with the problem of antibiotic resistance, and so doctors and scientists have been forced to look for other methods of reducing resistance. One of the most important of these is through what is known as "antibiotic stewardship". **Explain how this works.**

As modern medicine discovered more antibiotics through the second half of the 20th century, some older antibiotics were replaced with more modern ones. Another approach to reducing antibiotic resistance has been to "rotate" the prescription of antibiotics. **Explain how this works.**

There are some other possibilities being examined by scientists as ways of combating antibiotic resistance.

Bacteriophages –

Bacteriocins –

Immunotherapies –

Vaccination programmes and disease prevention

Vaccination is another way to help reduce the overuse of antibiotics. **What is a vaccination?**

Vaccination involves active immunity where the immune system is activated to make its own antibodies.

- **Active immunity is;**

- **Passive immunity is:**

- **Why does active immunity last a long time, but passive immunity is fairly short lived?**

- In order for vaccination programmes to be successful and to protect the greatest number of individuals possible, large proportions of the population must be vaccinated. **Explain why:**

Children in countries with established vaccination schedules rarely suffer from potentially serious diseases such as polio, measles, meningococcal meningitis.

In the UK there is a vaccination schedule that:

- offers all children vaccination against specific diseases at appropriate ages, such as whooping cough, mumps, measles and rubella
- offers vaccinations through the NHS against influenza and pneumonia to all people over 50, who have certain health conditions, are pregnant, frontline health and social care workers, or who care for or live with someone at significant risk of contracting influenza. However, because influenza has a high mutation rate, each year the vaccine is adjusted to the three types predicted to most likely infect people in that specific period.

In addition to planned schedules, people travelling abroad can request and pay for certain vaccinations, and people with specific health conditions can ask for vaccines against hepatitis B, TB and chickenpox.

Different infectious diseases have different levels at which herd immunity is said to have been achieved. This is based not only on how effective the vaccine is at immunising each individual, but also how infectious the disease is.

Research the minimum percentage of the population that must be vaccinated to guarantee herd immunity for measles:

Research the minimum percentage of the population that must be vaccinated to guarantee herd immunity for polio:

Why is the minimum percentage higher for measles than for polio?

Complete the table below to consider the advantages and disadvantages of vaccination

Reasons for / advantages of vaccinations	Reasons against / disadvantages of vaccinations

Section 2: Health and lifestyle initiatives

Cardiovascular disease (CVD)

Cardiovascular disease (CVD) includes all the diseases of the heart and circulation such as:

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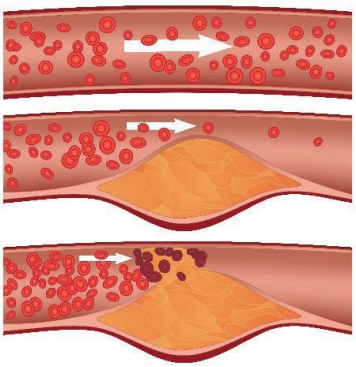
Diseases of the cardiovascular system are some of the biggest killers globally, causing an estimated 31% of deaths worldwide – most of which are from heart attacks and strokes. It is estimated that over 1 billion people around the world suffer with hypertension, which puts them at a greater risk of having heart attacks and strokes.

Describe some of the consequences of hypertension.

As an individual ages, they have an increased risk of CVD due to narrowing of the arteries and other blood vessels as a result of fats being deposited in the walls of the blood vessels. This process of the arteries being 'clogged up' is called atherosclerosis.



Describe some of the consequences of atherosclerosis

Modern medicine, combined with public health approaches, has to implement a wide range of approaches to reduce the effects of cardiovascular disease on an individual and on society.

Primary prevention

Primary prevention involves trying to prevent medical emergencies such as heart attacks and strokes before they occur. This involves looking at populations who might be at risk of these conditions, such as people with high blood pressure, high cholesterol, or other pre-existing medical conditions. Primary prevention often involves both lifestyle changes and medical intervention, although this depends on why an individual is at risk of cardiovascular disease.

Describe the methods involved in primary prevention of CVD:

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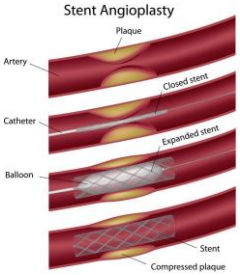
Intervention



However effective primary prevention may be, some people are still going to be unfortunate enough to suffer from a cardiovascular event – whether that is a heart attack, a stroke, or sudden damage to a blood vessel from a blood clot. If this happens then immediate treatment is needed. Without rapid intervention these conditions can be fatal or lead to lasting disabilities. Interventions in cardiovascular disease may involve:

- **thrombolysis –**
- **angioplasty –**
- **Bypass surgery –**

Secondary prevention

Where primary intervention involves prevention, and interventional management involves treatment, secondary prevention focuses on trying to reduce the likelihood of a health problem recurring.

In cardiovascular disease, this involves looking at people who have already suffered from a heart attack, stroke or other cardiovascular condition, and trying to reduce the risk of this happening again. Like primary prevention, this often takes multiple approaches.

Describe the health and general lifestyle measures involved in secondary prevention of CVD:

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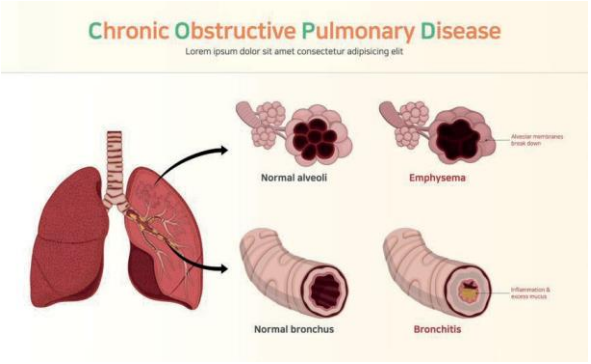
Respiratory diseases



Whilst not causing as many deaths worldwide as cardiovascular disease, respiratory diseases still affect many millions of people every year.

The most common respiratory diseases are asthma, COPD and lung cancer, although there are many others in addition to these.

Complete the table below on the treatments for the most common respiratory diseases

Respiratory disease	Asthma	COPD	Lung cancer
Lifestyle measures			
Medications			

An ageing population

Thanks to modern medicine and other significant social changes, the population of the world is gradually getting older. The WHO estimates that by 2050 the proportion of the world's population over the age of 60 will have doubled to 22% – almost 2 billion people.

With the average life expectancy in the UK at more than 80 years of age, as the population ages, new challenges arise for individuals and society. As a result of living longer, people are now affected by a wider range of diseases, particularly those that are slow to develop.

State some diseases that are more prevalent in older age:

Additionally, as people age, they tend to depend more on others for care and support as their independence and quality of life declines. **What impact might this have on their families and the health and social care services?**

It takes years to develop new health and social care services that met meet the demands of the population and this often requires years ahead of the new services being needed so that sufficient time is given to develop new drugs and build new hospitals, for example. Gathering data regularly on the population to monitor the incidence of different diseases and disorders is the only way for the government and health and social care providers to predict the needs of society in the future.

One of the ways in which society can try to reduce the impact of an ageing population is by encouraging people to look after their bodies throughout their life, to reduce the number of people suffering from multiple comorbidities in older age. Health services need to understand the health needs of the older population and understand what separates those who remain active and maintain good health, from those are who physically less active and may experience more health problems.

Consider the different ways that local authorities, charities and other health and social care groups promote health and wellbeing by providing resources:

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Obesity

Define a healthy diet:

What is malnutrition?

What is obesity?

The WHO reports that globally there are more people who are obese than underweight in most regions, and that obesity is linked to more deaths globally than being underweight.

Obesity is currently a significant concern to health services globally. The prevalence of being overweight and obesity among children and adolescents aged 5-19 has risen dramatically from 4% in 1975, to just over 18% in 2016 globally. For adults, the figure is estimated that around 13% (650 million) of the global population is obese, and 39% (1.9 billion) is overweight.

State some examples of serious health problems that obesity can cause:

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Explain why tackling obesity is difficult for healthcare professionals and governments:

Discuss the advantages and disadvantages of the different strategies used to tackle obesity in the table below:

Strategy	Advantages	Disadvantages
Public Health Campaigns		
Medication		
Gastric band operation		

Smoking, alcohol and substance misuse

Tobacco and alcohol are both legal drugs in the UK but are responsible for causing significant amounts of harm. They are both physically and psychologically addictive, are strongly related to higher rates of cancer, liver and lung disease – but are still seen as socially acceptable drugs.

Smoking

It was only after the Second World War that scientists began to make the link between smoking and disease, and longer still before governments worldwide started to take action to reduce smoking- related harm and deaths. The ONS report the number of people in the UK who smoke has fallen continually – in 2015, only 17.2% of adults smoked, compared to 46% in 1974.

Smoking is a risk factor for many diseases throughout the body – **name some of these diseases below:**

Explain why smoking-related diseases and deaths is challenging.

In the UK, how have healthcare workers and governments tried to stop people smoking or never start in the first place?

Alcohol

It is possible to drink alcohol at a "harmless" level, which is not associated with any particularly increased risk of disease. Over sustained periods of time, **name some health issues caused by alcohol misuse:**

Describe how alcohol misuse can also lead to social problems:

In the UK, how have different organisations tried to reduce alcohol misuse?

Substance misuse

Explain what is meant by substance misuse

Describe some of the potential consequences of substance misuse (consider behavioural, physical, social and economic issues)

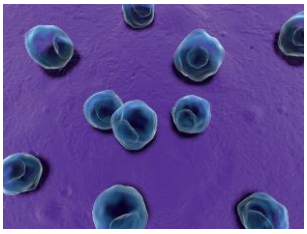
Complete the table of health risks commonly associated with illegal substances

Misused drug	Method of use	Possible health risks
Cannabis		
LSD		
Heroin		
Ecstasy		
Cocaine		
Amphetamine		

Describe some of the long-term damage of addiction and overreliance on drugs

How does the UK government deal with tackling the problem of illicit drug use?

Sexually transmitted infections (STIs)



Sexually transmitted infections may be caused by a huge variety of pathogens – viral, bacterial and fungal. They cause many different symptoms – from itchiness or soreness in the genital region, right through to suppression of the immune system, and even death. Many sexually transmitted infections are treatable with modern medicine – but not all of them can be eliminated entirely.

<u>Research</u> some common STI's in the UK in the table below:

Long-term effects of the disease				
Potential issues of treatments				
Treatment				
Symptoms				
Cause (pathogen)				
	Chlamydia	Gonorrhoea	Herpes	HIV

If an STI cannot be treated, then preventing people from contracting the infection in the first place becomes tremendously important. **Research strategies that have been used by different UK organisations to reduce the spread of STI's.**

In addition to disease prevention campaigns, vaccination campaigns can be an effective way of treating some STIs. In the UK there is now a national vaccination campaign for Human Papilloma Virus (HPV)

Who is this campaign targeted at and why?

Explain the importance of this vaccination programme in the UK.

Mark Scheme

Key terms used in Unit 3: Write the correct term next to each definition

Term	Definition
Influence	The capacity or power to have an effect on the development, actions, behaviours or opinions in healthcare
Health issue	Issue or problem, related to health, that has been identified, which is open ended and has multiple potential solutions
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Reliability	The extent to which an experiment, test or measuring procedure yields the same results on repeated trials
Ethical issue	Ethically related aspects that may have affected how research was carried out
Primary research	Research compiled directly from the original source, which may not have been compiled before
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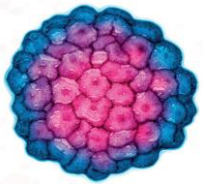
Technical language	Specific terminology directly relating to the subject matter presented in the article
Social issue	An issue that influences and is opposed by a considerable number of individuals in society
Health initiative	Strategy/plan identified in the article and related to the impact it has in the health issue
Target audience	A specific group at which an article is aimed
Media	The means of mass communication through reporting medium
Suggest	Use your knowledge to propose a likely solution to a problem
Qualitative data	Descriptive data, such a data drawn from open-ended questions

Explain	Requires identification of a point and linked justification / exemplification of that point. The answer must contain some linked reasoning in questionnaire

Infectious Diseases

Many diseases are caused by infecting agents or microorganisms, such as viruses, bacteria, protoctists, fungi or larger parasites such as worms and insects (lice and fleas). Infecting agents live in or on the body, and if they cause disease, they are described as pathogens.



Viruses occur in all types of ecosystem and can affect all living organisms.

Give some examples of infectious diseases caused by viruses:

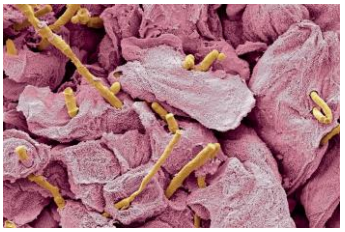
HIV/AIDS, measles, mumps, influenza, herpes and Ebola

Some viruses cause cancer, such as cervical cancer which is caused by the human papilloma virus (HPV).

Bacteria are single celled prokaryotic organisms. Many inhabit the intestines of animals, including human intestines. Many types of bacteria are essential to us, however some types of bacteria are pathogenic.

Give some examples of infectious diseases caused by bacteria:

cholera, bacterial pneumonia, meningococcal meningitis and whooping cough



Fungi are eukaryotic organisms. While some fungi support ecosystems by breaking down dead matter to recycle nutrients, some fungi act as parasites and infect other organisms. Yeast is one such type of fungi that can infect humans, Give some example of infectious diseases caused by yeast:

Candidiasis (thrush), ringworm, athlete's foot, farmer's lung (aspergillosis)

Protoctista are species that do not fit into the other categories of microorganisms. All members of this species kingdom are eukaryotic and include:

- protozoa – infecting agents that cause malaria, sleeping sickness and amoebic dysentery
- slime mould and water moulds.

Infectious diseases are also called communicable diseases as they can spread from person to person, or from animals to people, and, in some cases, people to animals. However, all microorganisms require certain conditions for their cell numbers to grow by replicating. What are the five conditions?

- A source of energy
- nutrients
- Suitable temperature
- Host organism
- Suitable oxygen concentrations

Complete the table below to show some examples of communicable diseases and their method of transmission (how they enter a host)

Method of transmission	Infectious disease
Direct or social contact –fomites are objects or substances that can carry infecting agents and transfer them from one person to another. Examples include shaking hands, physical touching, and sharing of items such as towels, bedding and money.	Athlete's foot, influenza, colds, measles, mumps, MRSA and hospital acquired infections, norovirus and chicken pox
Airborne – the infecting disease is carried in droplets and released via breathing, coughing and sneezing; the droplets are breathed in by another person.	Measles, colds, influenza
Contaminated food and water	Typhoid, salmonella, campylobacter, hepatitis A, Ebola and cholera
Bodily fluids, for example blood to blood, or via sexual intercourse	HIV, AIDS, syphilis, hepatitis B and the human papilloma virus (HPV) (which causes cancer of the cervix)
Insects and tick bites.	Malaria, dengue fever, lyme disease and sleeping sickness

For many of the identified infectious diseases across the world, how they are spread and how they are cured using medicines such as antibiotics is known, and ultimately how they are prevented using vaccinations and other health-related policies and procedures. However, there are important public health issues in the prevention and control of infection, that influence the level of infectious disease in a community and can lead to outbreaks of a previously unknown, or previously contained, infectious disease.

Describe some public health issues that can impact the prevention and control of infection:

the general health of the public

living conditions

sanitisation and cleanliness

housing

water supply

Epidemiology

What is epidemiology?

The study of the distribution and determinants of diseases and health problems, and the factors that affect their spread in specific populations (groups of people in rural or urban areas for example)

What type of data do epidemiologists gather and how is this used?

Epidemiologists gather information about the distribution of specific diseases throughout the population, and, using the evidence they gather, identify the risk factors for the disease. This evidence helps to shape public policies that try to reduce or eradicate the infectious diseases.

Epidemiologists gather data on how many people fall ill and how many people die as a result of the infectious disease. They then use data to look at the incidence (number of new cases in the population) and prevalence (number of people with the disease in a population at any given time). They use this data to make comparisons across days, weeks, months or years.

This data informs the preventative and treatment regimens that any nation may need implement to control an infectious disease.

Complete the following key definitions, with an example for each

Key term	Definition	Example of disease (s)
Endemic	An infectious disease that is always present in a particular area or population	Chicken Pox
Epidemic	A sudden outbreak of an infectious disease, affecting many people in an area or population group	Influenza Measles
Pandemic	If an epidemic spreads across a very large area, such as a continent or the whole world,	Covid-19

In Britain, local health authorities must report any outbreak of a disease in the area they are responsible for. This data is generated from GP reports, private health agencies and health-related charities. This data is then passed on to the Department of Health and Social Care (DoHSC) to review over a period of time. If they detect a serious outbreak of a disease, this is reported to the World Health Organisation (WHO) who track the data further and decide if medical assistance or resources are needed to prevent a serious epidemic.

Controlling the spread of antibiotic resistance

Bacteria can quickly develop resistance to antibiotics. In fact, bacteria have been developing antibiotic resistance for millions of years as a defence mechanism against naturally occurring antimicrobials, and against antibiotics secreted by other bacteria.

Why has antibiotic resistance increased over the last century?

Overuse of antibiotics in medicine, veterinary care and agriculture

The WHO has previously stated that "antibiotic resistance is one of the biggest threats to global health, food security, and development today".

One way of getting around antibiotic resistance is, of course, to develop new antibiotics. Why is this far more difficult than it sounds?

It can take many years of research to identify a chemical with antimicrobial properties, and many years more to determine whether or not it can be made into a drug which is safe and effective in humans

New antibiotics cannot currently be developed quickly enough to deal with the problem of antibiotic resistance, and so doctors and scientists have been forced to look for other methods of reducing resistance. One of the most important of these is through what is known as "antibiotic stewardship". Explain how this works.

"Antibiotic stewardship" is only prescribing antibiotics for proven bacterial infections, and then only using them for as long as they are needed. Educating both doctors and patients about this concept is hugely important to reduce the long-term over-prescribing of antibiotics that can be seen throughout the world today

As modern medicine discovered more antibiotics through the second half of the 20th century, some older antibiotics were replaced with more modern ones. Another approach to reducing antibiotic resistance has been to "rotate" the prescription of antibiotics. Explain how this works.

Using different antibiotics in sequence over months or years. If an antibiotic is not used for a long period of time, then bacterial resistance to it is likely to diminish, in favour of resistance to drugs currently being used. (Even this measure, however, isn't likely to be enough to combat the antibiotic resistance crisis).

There are some other possibilities being examined by scientists as ways of combating antibiotic resistance.

Bacteriophages – viruses specifically designed to infect and destroy particular bacterial strains

Bacteriocins – antimicrobial peptides produced by strains of certain species of microorganisms that are active against other strains of the same or related species

Immunotherapies – a type of therapy that uses substances to stimulate or suppress the immune system to help the body fight cancer, infection, and other diseases.

Vaccination programmes and disease prevention

Vaccination is another way to help reduce the overuse of antibiotics. What is a vaccination?

The deliberate exposure of a person to a specific type of pathogen that has been killed or treated to make it harmless, or to its antigens, to stimulate an immune response.

As a result, the person's body makes memory cells that remain, giving long-term immunity.

Vaccination involves active immunity where the immune system is activated to make its own antibodies.

- Active immunity is; the body's immune response in which it makes antibodies to a specific antigen. It may be natural, as in having the disease, or artificial, following a vaccination.

- Passive immunity is: where you are given ready-made antibodies. This happens naturally when antibodies pass from mother to foetus before birth, or after birth in the first breast milk (colostrum). It may be artificial when antibodies are injected into a person, for example an anti- tetanus injection

- Why does active immunity last a long time, but passive immunity is fairly short lived?

- In order for vaccination programmes to be successful and to protect the greatest number of individuals possible, large proportions of the population must be vaccinated. Explain why:

This helps to prevent the disease from spreading easily amongst those who either haven't received adequate protection from the vaccine or who cannot be vaccinated. This concept is called herd immunity

Children in countries with established vaccination schedules rarely suffer from potentially serious diseases such as polio, measles, meningococcal meningitis.

In the UK there is a vaccination schedule that:

- offers all children vaccination against specific diseases at appropriate ages, such as whooping cough, mumps, measles and rubella

- offers vaccinations through the NHS against influenza and pneumonia to all people over 50, who have certain health conditions, are pregnant, frontline health and social care workers, or who care for or live with someone at significant risk of contracting influenza. However, because influenza has a high mutation rate, each year the vaccine is adjusted to the three types predicted to most likely infect people in that specific period.

In addition to planned schedules, people travelling abroad can request and pay for certain vaccinations, and people with specific health conditions can ask for vaccines against hepatitis B, TB and chickenpox.

Different infectious diseases have different levels at which herd immunity is said to have been achieved. This is based not only on how effective the vaccine is at immunising each individual, but also how infectious the disease is.

Research the minimum percentage of the population that must be vaccinated to guarantee herd immunity for measles:

Measles is extremely infectious – and so herd immunity cannot be guaranteed unless at least 90-95% of the population has been vaccinated

Research the minimum percentage of the population that must be vaccinated to guarantee herd immunity for polio:

Polio is harder to spread, and only requires 80-85% of the population to be vaccinated before herd immunity is deemed to have been achieved

Why is the minimum percentage higher for measles than for polio?

Measles is far more infectious than polio.

Complete the table below to consider the advantages and disadvantages of vaccination

Reasons for / advantages of vaccinations	**Reasons against / disadvantages of vaccinations**
Protects against many (childhood) illnesses such as: MMR, polio, diptheria, along with other potentially fatal diseases, such as COVID-19, influenza. protect other people in your community – by helping to stop diseases spreading to people who cannot have vaccines reduce or even get rid of some diseases – if enough people are vaccinated (undergo rigorous safety testing before being introduced – they're also constantly monitored for side effects after being introduced)	sometimes cause mild side effects that will not last long – you may feel a bit unwell (headache, fatigue) and have a sore arm for 2 or 3 days Rare cases of seizures or an allergic reaction vaccines are not suitable for: - people who've had a serious allergic reaction (anaphylaxis) to a previous dose of the vaccine - people who've had a serious allergic reaction to ingredients in the vaccine. - people with weakened immune systems (for example, because of cancer treatment or a health condition).

Health and lifestyle initiatives

Cardiovascular disease (CVD)

Cardiovascular disease (CVD) includes all the diseases of the heart and circulation such as:

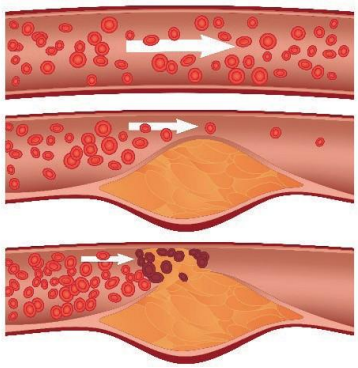
- coronary heart disease
- angina
- heart attack
- congenital heart disease
- stroke

Diseases of the cardiovascular system are some of the biggest killers globally, causing an estimated 31% of deaths worldwide – most of which are from heart attacks and strokes. It is estimated that over 1 billion people around the world suffer with hypertension, which puts them at a greater risk of having heart attacks and strokes.

Describe some of the consequences of hypertension.

Hypertension increases the risk of conditions such as peripheral vascular disease – (damage to the blood vessels usually caused by a combination of hypertension, smoking, and high cholesterol) which can result in chronic kidney damage, and the loss of limbs or eyesight due to damage to the tiny blood vessels in these parts of the body.

As an individual ages, they have an increased risk of CVD due to narrowing of the arteries and other blood vessels as a result of fats being deposited in the walls of the blood vessels. This process of the arteries being 'clogged up' is called atherosclerosis.



Describe some of the consequences of atherosclerosis

Atherosclerosis can result in higher blood pressure putting the person at risk of stroke and heart attacks.

It can also result in the heart having to work harder to pump blood around the body, which raises blood pressure, and deposits can break away from the blood vessels and block an artery.

If this happens, a person may experience chest pains and breathlessness, potentially leading to angina, or if there is a significant blockage, this is experienced as a heart attack

Modern medicine, combined with public health approaches, has to implement a wide range of approaches to reduce the effects of cardiovascular disease on an individual and on society.

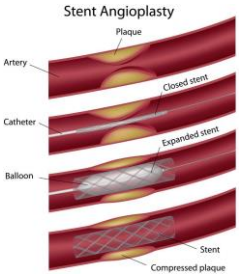
Primary prevention

Primary prevention involves trying to prevent medical emergencies such as heart attacks and strokes before they occur. This involves looking at populations who might be at risk of these conditions, such as people with high blood pressure, high cholesterol, or other pre-existing medical conditions. Primary prevention often involves both lifestyle changes and medical intervention, although this depends on why an individual is at risk of cardiovascular disease.

Describe the methods involved in primary prevention of CVD:

- reducing high blood pressure by exercising more, reducing dietary salt intake and reducing stress levels
- reducing high cholesterol levels by changing diet and reducing alcohol intake
- improving diet by reducing ready-made meals and processed convenience foods which are typically high in sugar, salt and saturated fats, resulting in higher calorie intake
- stopping smoking (to reduce high cholesterol levels, high blood pressure, and to reduce the risk of other diseases as well)
- using medication such as statins or antihypertensives to reduce high cholesterol or high blood pressure

Intervention



However effective primary prevention may be, some people are still going to be unfortunate enough to suffer from a cardiovascular event – whether that is a heart attack, a stroke, or sudden damage to a blood vessel from a blood clot. If this happens then immediate treatment is needed. Without rapid intervention these conditions can be fatal or lead to lasting disabilities. Interventions in cardiovascular disease may involve:

- thrombolysis – using medication (usually delivered through a vein) to break up a blood clot and restore blood flow to an area of the body. This intervention may be used in strokes, heart attacks, or peripheral vascular disease
- angioplasty – a wire is inserted into the affected blood vessel under X-ray guidance, and dye is squirted into the blood vessel so the location of the thrombus can be identified. It may then be possible to break up the thrombus, or to place a stent to open up the blockage.
- Bypass surgery – If the blood vessel is too diseased for thrombolysis or an angioplasty to be effective, then bypass surgery may be required. This involves taking a healthy blood vessel from another area of the body (usually the leg) and using it to bypass the area of blockage or narrowing. Alternatively, artificial material is sometimes used to construct the bypass if no suitable blood vessels can be found.

Secondary prevention

Where primary intervention involves prevention, and interventional management involves treatment, secondary prevention focuses on trying to reduce the likelihood of a health problem recurring.

In cardiovascular disease, this involves looking at people who have already suffered from a heart attack, stroke or other cardiovascular condition, and trying to reduce the risk of this happening again. Like primary prevention, this often takes multiple approaches.

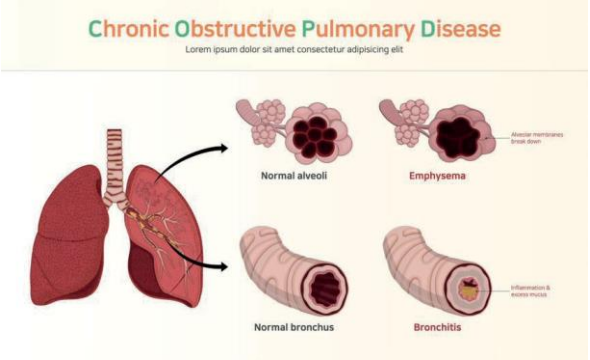
Describe the health and general lifestyle measures involved in secondary prevention of CVD:

- stopping smoking – this is probably one of the most important lifestyle changes that people can make after a heart attack or stroke
- improving diet to help reduce salt and cholesterol, and to include healthier fats
- increasing levels of exercise to help to reduce high blood pressure and improve cardiovascular fitness. This may need to be as part of a rehabilitation programme following a stroke or heart attack
- taking medication to lower blood pressure, reduce cholesterol, and reduce platelet activity to lower the risk of a further thrombosis. Other medication may also help to preserve the function of the heart muscle after a heart attack.

Respiratory diseases

Whilst not causing as many deaths worldwide as cardiovascular disease, respiratory diseases still affect many millions of people every year.

The most common respiratory diseases are asthma, COPD and lung cancer, although there are many others in addition to these.



Complete the table below on the treatments for the most common respiratory diseases

Respiratory disease	Lifestyle measures	Medications
Asthma	Exercise remains very important and can significantly improve symptoms in some asthma sufferers by increasing their respiratory fitness	Inhaled medication to help keep the airways open and reduce symptoms such as coughing and breathlessness (medication is delivered directly to the lungs and works quicker than oral medication).
COPD	Exercise Pulmonary rehabilitation classes are held to help people exercise safely, within the limits of their conditions. Physiotherapy can be helpful for sufferers to learn how to breathe more effectively, to loosen and cough up sticky secretions from their lungs. To stop smoking can help to slow any deterioration in the disease.	Oral medication to reduce the thickness and stickiness of mucous secretions in COPD sufferers. Surgery (in very severe cases) to remove sections of diseased lung Lung transplant
Lung cancer	Exercise Pulmonary rehabilitation classes are held to help people exercise safely, within the limits of their conditions. To stop smoking can help to slow any deterioration in the disease.	Surgery (in very severe cases) to remove sections of cancerous lung Lung transplant

An ageing population

Thanks to modern medicine and other significant social changes, the population of the world is gradually getting older. The WHO estimates that by 2050 the proportion of the world's population over the age of 60 will have doubled to 22% – almost 2 billion people.

With the average life expectancy in the UK at more than 80 years of age, as the population ages, new challenges arise for individuals and society. As a result of living longer, people are now affected by a wider range of diseases, particularly those that are slow to develop.

State some diseases that are more prevalent in older age:

Dementia, cancer, COPD, CHD

Additionally, as people age, they tend to depend more on others for care and support as their independence and quality of life declines. What impact might this have on their families and the health and social care services?

Informal support can be difficult to obtain as people are tending to have fewer children, and their families are often scattered – meaning that traditional family support networks cannot always look after a relative as they become older and frailer.

This means that many older people depend more on health and social care services to provide them with carers, or an environment where they can be cared for (such as a residential or nursing home).

It takes years to develop new health and social care services that met meet the demands of the population and this often requires years ahead of the new services being needed so that sufficient time is given to develop new drugs and build new hospitals, for example. Gathering data regularly on the population to monitor the incidence of different diseases and disorders is the only way for the government and health and social care providers to predict the needs of society in the future.

One of the ways in which society can try to reduce the impact of an ageing population is by encouraging people to look after their bodies throughout their life, to reduce the number of people suffering from multiple comorbidities in older age. Health services need to understand the health needs of the older population and understand what separates those who remain active and maintain good health, from those are who physically less active and may experience more health problems.

Consider the different ways that local authorities, charities and other health and social care groups promote health and wellbeing by providing resources:

- leisure centres having free or reduced cost membership for the over 60s
- fitness clubs in community centres offering free exercise activities
- promotion of walking and cycling activities as well as running
- providing exercise classes with adapted and inclusive workouts for those who are physically less able.

Obesity

Define a healthy diet:

The balance of nutrients to be right. This requires eating the right amounts, or portions, of food stuffs.

What is malnutrition?

Eating less than the amount of nutrients they need to be healthy

What is obesity?

Repeatedly eating excessive amounts of the nutrients they need. Obesity can also be caused by a lack of physical exercise, or a combination of poor diet and lack of physical exercise.

The WHO reports that globally there are more people who are obese than underweight in most regions, and that obesity is linked to more deaths globally than being underweight.

Obesity is currently a significant concern to health services globally. The prevalence of being overweight and obesity among children and adolescents aged 5-19 has risen dramatically from 4% in 1975, to just over 18% in 2016 globally. For adults, the figure is estimated that around 13% (650 million) of the global population is obese, and 39% (1.9 billion) is overweight.

State some examples of serious health problems that obesity can cause:

- diabetes
- osteoarthritis
- coronary heart disease
- some cancers, including breast and bowel
- diseases of the liver, gallbladder and bowels
- stroke.

Explain why tackling obesity is difficult for healthcare professionals and governments:

Healthcare professionals and governments cannot control how much people choose to eat, and how much exercise they choose to do. Fast food is cheaper and more readily available than ever before, and many people lead busy lives that do not leave much time for cooking or exercising.

Sometimes encouragement from a healthcare professional is enough for people to make the lifestyle changes needed to reduce their weight – but often the habits and patterns that have led to someone being overweight in the first place are quite complex, and resistant to change.

Discuss the advantages and disadvantages of the different strategies used to tackle obesity in the table below:

Strategy	Advantages	Disadvantages
Public Health Campaigns	Public health campaigns encourage people to make diet and lifestyle changes, and initiatives like the sugar tax imposed on sugary soft drinks in the UK aim to guide people towards healthier choices	Other methods maybe required in cases of sever obesity / other health issues caused by obesity
Medication	Used for people who are severely obese and who have tried dieting and exercise without success, medication is sometimes used to help with weight loss	In order for someone to remain on this medication, they must demonstrate that they are continuing to lose weight on a regular basis
Gastric band operation	In exceptional circumstances, surgery may be offered to reduce the size of the stomach – either by placing a removable band around the stomach, or by physically bypassing most of the stomach. After the operation, only very small portions can be eaten, and people usually lose significant amounts of weight.	This operation is only performed as a last resort, and people need support from a specialist dietician and weight loss team to ensure that they get the appropriate nutrients from their more limited diet, and that their weight loss is carefully managed

Smoking, alcohol and substance misuse

Tobacco and alcohol are both legal drugs in the UK but are responsible for causing significant amounts of harm. They are both physically and psychologically addictive, are strongly related to higher rates of cancer, liver and lung disease – but are still seen as socially acceptable drugs.

Smoking

It was only after the Second World War that scientists began to make the link between smoking and disease, and longer still before governments worldwide started to take action to reduce smoking- related harm and deaths. The ONS report the number of people in the UK who smoke has fallen continually – in 2015, only 17.2% of adults smoked, compared to 46% in 1974.

Smoking is a risk factor for many diseases throughout the body – name some of these diseases below:

Throat, lung and stomach cancer, heart attacks, strokes, peripheral vascular disease, erectile dysfunction, lung diseases such as COPD, and even dementia

Explain why smoking-related diseases and deaths is challenging.

Often, by the time somebody realises that smoking has damaged their body, it is too late to reverse the disease process.

This means that healthcare workers and governments have to tackle the act of smoking – either by convincing people to stop smoking or ensure that they never start in the first place

In the UK, how have healthcare workers and governments tried to stop people smoking or never start in the first place?

In the 1960s, cigarette advertising on television was banned.

In the 1980s, this was followed by heavier taxation on cigarettes and tobacco products.

In the early 2000s, health awareness campaigns detailing the harm caused by smoking and the establishment of "help to quit" services began

In 2003, there was the banning of billboard and magazine advertising for cigarettes.

Smoking in all enclosed workplaces became illegal in 2007.

In recent years all cigarettes and tobacco products are sold in unbranded packaging. Shops have stopped displaying tobacco products, instead keeping them hidden from sight behind the counter.

Alcohol

It is possible to drink alcohol at a "harmless" level, which is not associated with any particularly increased risk of disease. Over sustained periods of time, name some health issues caused by alcohol misuse:

heart disease, stroke, liver disease, liver cancer, mouth cancer, pancreatic cancer.

Describe how alcohol misuse can also lead to social problems:

Alcohol misuse can also lead to social problems, such as unemployment, divorce, serious crime and prison sentences, and homelessness. Alcohol addiction has been linked to road deaths, domestic abuse, violent assault and physical and emotional problems in children living with parents with alcohol problems. Even low levels of alcohol intake by a pregnant woman can damage her developing foetus.

In the UK, how have different organisations tried to reduce alcohol misuse?

This is usually in the form of public health campaigns and education. By educating people about harmful levels of alcohol abuse, governments hope to encourage people to cut down on levels of harmful drinking.

Doctors and nurses are encouraged to ask people about their levels of alcohol consumption, and offer patients help to reduce their drinking, or even stop entirely.

Organisations such as Alcohol Concern (in England and Wales) and Alcoholics Anonymous (UK) aim to offer non-judgemental counselling, support, and assistance for people who are addicted to alcohol, and who want to stop excessive use.

Substance misuse

Explain what is meant by substance misuse

Substance misuse isn't limited to the use of illegal, or illicit, drugs, such as cocaine, cannabis, and heroin. Antibiotics, or similar drugs, have been misused as a means to combat infections, leading to antibiotic resistance in many cases, and the creation of so called 'superbugs' as a result. It can also include sleeping pills, tranquillisers, and other drugs that have been prescribed, sometimes over prescribed, long term.

Describe some of the potential consequences of substance misuse (consider behavioural, physical, social and economic issues)

Any substance can be addictive, while they may make a person feel relaxed initially, they can quickly lead to people feeling sick, sleepy, paranoid or to panic attacks. This is in addition to the potential issues of debt and even possibly crime to finance ongoing substance misuse.

Illegal or controlled drugs, sometimes called recreational drugs, are taken to alter behaviour and mood. Taken once, they can be extremely dangerous, and if taken regularly they can quickly become addictive, often leading to long-term physical and mental health problems.

Addiction and overreliance on drugs, of any kind, causes long-term damage to the body, in particular the liver and kidneys. The liver clears the blood of drugs by breaking up the chemicals, and the kidneys excrete the waste in urine. Over time, these organs are vulnerable to damage. All drugs have side effects associated with them, these can include rashes, digestive issues, and blood disorders.

Complete the table of health risks commonly associated with illegal substances

Misused drug	Method of use	Possible health risks
Cannabis	Usually smoked but can be eaten.	Mental illness, raised blood pressure, memory loss
LSD	Eaten in various forms.	Disorientation, depression and anxiety.
Heroin	Injected, sniffed, or smoked.	Heart and lung disorders, HIV/AIDS, vein thrombosis, septicaemia (blood infection).
Ecstasy	Swallowed.	Heat stroke, collapse, cramps
Cocaine	Sniffed or injected.	HIV/AIDS, vein thrombosis, septicaemia (blood infection).
Amphetamine	Swallowed, sniffed or injected	HIV/AIDS, vein thrombosis, septicaemia (blood infection).

Describe some of the long-term damage of addiction and overreliance on drugs

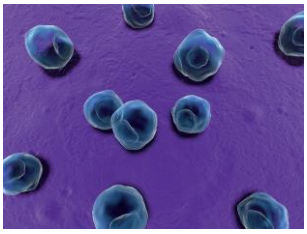
The harm from these substances can occur in several ways, depending on which drug is used and how it is taken. Smoking substances like cannabis or crack cocaine, for example, can cause similar health problems to smoking tobacco – damage to the lungs and airways.

Snorting drugs such as cocaine can cause damage to the nose, and the delicate tissues in the nasal passages. Injecting drugs such as heroin can cause long-term damage to blood vessels, and lead to severe infections throughout the body. In addition, the drugs themselves may cause psychological issues amongst users. If somebody overdoses on a drug, it can even kill them.

How does the UK government deal with tackling the problem of illicit drug use?

Different governments take different approaches to dealing with illicit drugs. Some ban them entirely, and impose harsh sentences for anybody found carrying drugs, whether for their own use or for supplying to others. In the UK, drugs are classified as class A, B, or C, according to their perceived level of risk. Class A drugs are most likely to cause harm – and being caught whilst carrying these carries a much greater likelihood of prosecution and prison than class C drugs. In the UK, educational campaigns aim to make people are of the possible risks behind drug abuse, as well as the potential legal consequences. (Other countries, such as Portugal, have decriminalised all previously illegal drugs. This means that, instead of arresting drug users, they are offered help to manage their addiction, or to stop taking drugs entirely).

Sexually transmitted infections (STIs)



Sexually transmitted infections may be caused by a huge variety of pathogens – viral, bacterial and fungal. They cause many different symptoms – from itchiness or soreness in the genital region, right through to suppression of the immune system, and even death. Many sexually transmitted infections are treatable with modern medicine – but not all of them can be eliminated entirely.

Research some common STI's in the UK in the table below:

	Cause (pathogen)	Symptoms	Treatment	Potential issues of treatments	Long-term effects of the disease
Chlamydia	bacterium *Chlamydia trachomatis*	as discomfort on urinating and genital soreness – or it may not cause any symptoms at all	oral antibiotics		If left untreated, it can go on to cause serious womb or testicular infections and can even cause infertility in both men and women
Gonorrhoea	bacteria		antibiotics	Rise if strains of gonorrhea that are very resistant to antibiotics	
Herpes	virus	The herpes virus may lie dormant for long periods of time, before flaring up and causing painful blistering of the genitals	Antivirals may reduce the severity of the attack	Antivirals will not eradicate the virus from the body – and so sufferers may continue to have outbreaks of herpes for the rest of their lives.	
HIV	virus			No actual cure but can now be effectively controlled in most cases using a range of different drugs, preventing it from developing into the much more severe Acquired Immunodeficiency Syndrome (AIDS)	

If an STI cannot be treated, then preventing people from contracting the infection in the first place becomes tremendously important. Research strategies that have been used by different UK organisations to reduce the spread of STI's.

Public health campaigns encourage people to get tested regularly and remain aware of the risks of transmission. Encouraging people to use condoms and to test regularly can help to reduce the spread of untreatable infections.

In addition to disease prevention campaigns, vaccination campaigns can be an effective way of treating some STIs. In the UK there is now a national vaccination campaign for Human Papilloma Virus (HPV)

Who is this campaign targeted at and why?

In the UK all girls and women from age 12 to age 18 are vaccinated against HPV, with plans to extend this vaccination programme to men and boys soon.

This is because HPV is an STI with many different viral subtypes, some of which are responsible for cervical cancer in females, penile cancer in males, and anal cancers.

Other subtypes of HPV are also responsible for genital warts – and some of the vaccines developed for HPV are effective against both the cancer-causing strains of HPV and the wart-causing strains.

Explain the importance of this vaccination programme in the UK.

It is hoped that this vaccination campaign will help to eradicate cancers caused by HPV, as well as significantly reduce the rate of genital wart infection.