Supervised written assessment: Disease

This sample is intended to inform the design of assessment instruments in the senior phase of learning. It highlights the qualities of student work and the match to the syllabus standards.

Dimensions assessed

- Knowledge and conceptual understanding (KCU)
- Investigative processes (IP)
- Issues and impacts (I&I)

Assessment instrument

The response presented in this sample is in response to an assessment task.

Question 1: KCU

Select one of the infectious diseases you have studied this term. Explain and compare how the structure and function of the pathogen improves its ability to infect the host and subsequently reproduce.

Question 2: I&I

From the diseases you have studied this term select one that has increased in its occurrence over recent decades. Explain how human populations and behaviours (in particular those involving humans moving in on natural habitats) have increased the occurrence of the disease.

Question 3: I&I

Below is an extract from "The Australian health management plan for pandemic influenza",

“The strategy… is based on containment. This means that all efforts will be made to delay the entry of the virus into Australia, and contain any outbreaks that do occur. This will allow time to produce a vaccine.”

Explain whether this strategy would be effective in containing a future outbreak of H5N1 (bird flu), as well as whether it would have been effective in preventing the spread of HIV in Australia. These positions are to be based on conclusions and comparisons about the structure, function and behaviour of the pathogens and their hosts, for example:

- Speed and mode of transmission.
- Role of vectors.
- Effectiveness of vaccination.
- Length of the incubation and infectious periods of the pathogens.
Question 4: KCU

Some pathogens are not presently controllable by vaccine. Explain how a pathogen is able to break or avoid the usual information pathways that allow the body to make antibodies against the disease without there being symptoms of the disease present.

Question 5: I&I

During this inquiry, you analysed media reports about the recent outbreaks of Hendra virus in Queensland. Attached is a selection of those articles from “The Courier Mail”. Use the information in the articles to:

- Identify and explain the problems/issues that have contributed to lack of knowledge about the Hendra virus
- Evaluate the impact of each issue on finding a treatment for Hendra virus

Question 6: IP

This question uses the Disease data summary sheets for the eight diseases. These are the only resource that can be taken into the exam and are to be attached to the exam after completion of this section.

Complete the following table using data and estimates from your data sheets. The range of scores for each category are given in the table:

<table>
<thead>
<tr>
<th>Disease</th>
<th>Vaccine available?</th>
<th>Morbidity (with treatment)</th>
<th>Range of transmission</th>
<th>Reservoir of pathogen in environment</th>
<th>Ability of pathogen to mutate</th>
<th>Total score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No = 3</td>
<td>Nil = 0</td>
<td>Body fluids = 1</td>
<td>Widespread</td>
<td>Nil or low = 0</td>
<td>(add rows)</td>
</tr>
<tr>
<td></td>
<td>Yes = 0</td>
<td>&lt;1% = 1</td>
<td>Contact = 2 Vector or aerosol</td>
<td>=3</td>
<td>Yes (&lt;5 years) =3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>1-10% = 2</td>
<td></td>
<td>Localised = 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;10% = 3</td>
<td></td>
<td>No = 0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Smallpox

Bubonic plague

Cholera

Malaria

HIV

Ebola

Hendra

H5N1

The total score, in the right hand column, is a measure of the seriousness of the disease. Use the data provided and total score to identify trends, patterns or anomalies, in regard to the prevalence and seriousness of the disease in the world at present.
## Instrument-specific criteria and standards

Student responses have been matched to instrument-specific criteria and standards; those which best describe the student work in this sample are shown below. For more information about the syllabus dimensions and standards descriptors, see [www.qsa.qld.edu.au/11362.html](http://www.qsa.qld.edu.au/11362.html).

<table>
<thead>
<tr>
<th>Knowledge and conceptual understanding (KCU)</th>
<th>Standard A</th>
<th>Standard C</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student work has the following characteristics:</td>
<td></td>
<td>The student work has the following characteristics:</td>
</tr>
<tr>
<td>• <strong>description</strong> and <strong>explanation</strong> of <strong>complex information</strong> about information pathways between pathogens and the host’s immune response</td>
<td></td>
<td>• <strong>description</strong> of the information pathways between pathogens and immune response</td>
</tr>
<tr>
<td>• <strong>comparison</strong> and <strong>explanation</strong> of <strong>complex</strong> interrelationships between the host, and the structure and function of the pathogen that improves its ability to infect the host and subsequently reproduce itself</td>
<td></td>
<td>• <strong>description</strong> of <strong>interrelationships</strong> between the host, and the structure and function of the pathogen that allows to infect the host and reproduce</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Investigative processes (IP)</th>
<th>Standard A</th>
<th>Standard C</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student work has the following characteristics:</td>
<td></td>
<td>The student work has the following characteristics:</td>
</tr>
<tr>
<td>• <strong>systematic analysis and interpretation</strong> of disease information using <strong>appropriate quantitative and qualitative techniques</strong> to identify trends, relationships and anomalies</td>
<td></td>
<td>• <strong>analysis</strong> of disease information using <strong>appropriate quantitative and qualitative techniques</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Issues and impacts (I&amp;I)</th>
<th>Standard A</th>
<th>Standard C</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student work has the following characteristics:</td>
<td></td>
<td>The student work has the following characteristics:</td>
</tr>
<tr>
<td>• <strong>identification</strong> and <strong>explanation</strong> of issues and <strong>evaluation</strong> of scientific impacts <strong>relevant</strong> to the Hendra virus problem, and the effect of human behaviours on the spread of disease</td>
<td></td>
<td>• <strong>identification and description</strong> of issues and scientific impacts <strong>related</strong> to the Hendra virus problem and the effect of human behaviours on the spread of disease</td>
</tr>
<tr>
<td>• <strong>synthesis</strong> of data to draw <strong>well-reasoned</strong> conclusions and express <strong>justified</strong> positions about the management of pandemics</td>
<td></td>
<td>• <strong>use</strong> of data and information to <strong>express plausible</strong> conclusions and positions about the management of pandemics</td>
</tr>
</tbody>
</table>

Note: Colour highlights have been used in the table to emphasise the qualities that discriminate between the standards.

**Key:**
- Qualitative differences across the standards
- Cognitive processes demonstrated in the response
Indicative response — Standard A

The annotations show the match to the instrument-specific standards.

<table>
<thead>
<tr>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparison against other modes of transmission to demonstrate the improvement in ability to infect the host</td>
</tr>
<tr>
<td>Explanation about the complex interrelationship between the host's immune response and the parasite</td>
</tr>
<tr>
<td>Explanation of the complex interrelationship between the host's defences, parasite activity and potential for further spread of the disease</td>
</tr>
<tr>
<td>Comparison of effectiveness of vaccines/drugs in targeting pathogens</td>
</tr>
<tr>
<td>Interrelationship between pathogen and host</td>
</tr>
<tr>
<td>Comparison of protozoa to another pathogen to highlight the impact of the pathogen-host interrelationship</td>
</tr>
</tbody>
</table>

**Question 1**

The protozoan parasite (Plasmodium) that causes malaria has evolved an ability to infect the salivary glands of the Anopheles mosquito, and transfer of the disease between humans and other hosts is via this vector. The high density of mosquitoes in malarial areas (if they are not controlled) means that the majority of susceptible humans are infected, even if densities of human populations are low. This wouldn’t be as likely if transmission relied on other methods such as aerosols or contact.

Once humans are infected, the parasite has a number of ways to combat the host’s immune responses. Firstly, it has the ability to produce a variety of antigens, so the antibodies that are produced by the body to attach to a particular antigen won’t be effective as the parasite population keeps changing antigens. Parasites can also disguise their antigens by taking on proteins from blood cells on their surface.

Most of the time, the parasites are inside red blood cells so they can’t be attacked by the immune system, only breaking out to infect other red blood cells. These breakouts are timed for particular short periods of the day, so large numbers of protozoa are exposed to antibody attack for short periods only. Breakout times are often at dawn and especially dusk (they can be identified by alternating chills and fevers). These are times of maximum mosquito activity, to increase the chances of transfer to new hosts and vectors. Vaccines and drugs are not very effective against the malaria parasites because of this (even though they work well on other pathogens).

Most strains of Plasmodium do not cause symptoms with a high death rate, but cause reoccurring bouts of severe illness without fatal symptoms, allowing the infected person to maintain active parasite populations for decades, and act as a long-term reservoir for transferring the parasite to other vectors and hosts. Pathogens, such as Ebola virus, that kill their host quickly, limit their ability to reinfect other hosts and therefore reproduce. The complex and adaptive structures and behaviours of Plasmodium make it one of the biggest challenges for modern medical technology and research.

**Question 2**

Human Immunodeficiency Virus (HIV) is a mutation from SIV, which is found in high levels in primate populations across central Africa but doesn’t cause any symptoms in primates. No-one knows when the mutation took place, but increasing numbers and migration of human populations in these areas has helped the mutation and spread of HIV.

Increasing populations have led to increasing amounts of primate habitat being cleared for farmland. Primates are forced to live closer to humans, often being forced to scavenge for food around human settlements and generally travel longer distances. A higher density in their populations means that different virus strains that might have been found only in some small populations, are spreading more widely.
<table>
<thead>
<tr>
<th>Issue evaluated</th>
<th>Shortages of protein has led to an increasing trade and consumption of &quot;bush meat&quot;, with primates now being caged at high densities in houses and markets, and butchered under unsanitary conditions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue explained</td>
<td>HIV can’t survive more than a few minutes outside the body, and 30 or 40 years ago, humans would rarely come into close proximity to a primate to pick up a mutated virus. Now it is almost inevitable. If a mutated HIV was picked up by a human in the past, most people didn’t move far from their home village, so the infection would die out there, without spreading to the general population. This has been the case with Ebola outbreaks, as the chances of moving to another area after picking up the infection are low (you die very quickly).</td>
</tr>
<tr>
<td>Issue identified</td>
<td>HIV differs from Ebola virus in that it has a long latency period and with the large increase in road and air transport and personal mobility that has led to the current pandemic.</td>
</tr>
<tr>
<td>Issue explained</td>
<td>The third factor in the interaction that determines how fast a disease will spread is its method of transmission. HIV, which is spread by contact with body fluids, is much harder to transmit compared to diseases with an aerosol, vector or contact transmission, and education has been an effective control measure. This would be much less effective with a disease like H5N1 avian flu, which starts by mutation from birds in similar social conditions but is transmitted by aerosols.</td>
</tr>
<tr>
<td>Issue evaluated by making a comparison</td>
<td>Justified position expressed</td>
</tr>
</tbody>
</table>

**Question 3**

A containment strategy relies on keeping infected hosts far enough away from uninfected hosts that the pathogen cannot infect hosts outside the containment area. In the case of H5N1, any persons within about a 10 metre radius of the infected person over the infectious period (2 – 3 days) are then potentially infected, and the transmission then increases exponentially. Given that the initial case would arrive at an airport, or be working at a chicken farm that has been infected from a wild carrier bird, and may not have symptoms or have symptoms that may be taken for common 'flu, it would take authorities days to realize an outbreak has taken place. The containment area would be very large, and would require severe restrictions to enforce quarantine and avoid mass panic. This is similar to the recent equine influenza outbreak, where whole states that were infected were quarantined. Because of the fast speed of transmission, and potential for the wild bird population to act as vectors or reservoirs of infection my opinion would be that the majority of the country would be quickly infected, with isolated uninfected “islands” such as Western Australia, Alice Springs etc., being required to produce the vaccine and provide assistance. The production of vaccine would only be of benefit to the uninfected hosts, who may only be in the majority if luck and the established strategies are operating quickly and at a high level.

Containment would not have been an effective strategy in Australia for HIV, because HIV has a very long latency period, with people remaining infectious but without symptoms for years. Testing for HIV antibodies is only effective a number of months after the initial infection, so even if all arrivals to Australia were tested, some infectious hosts would still not be detected. Placing restrictions on HIV positive people can cause them to be stigmatized, so HIV positive people are less likely to cooperate with authorities. Because the HIV virus attacks the way that the body makes its immune response to the virus, an effective vaccine is long-term and risky.

HIV is only transmitted by exchange of body fluids, which means the speed and radius of its transmission is much smaller than H5N1, and so slow acting strategies such as education and providing free condoms and syringes has proven effective in limiting HIV infection in countries where the resources exist for using these strategies widely.

| Data synthesised to draw reasoned conclusions | Justified position expressed |

Queensland Studies Authority  April 2011  | 5
Question 4

The human immune system identifies a foreign organism by testing proteins or long-chain sugars (polysaccharides) called antigens on its surface. Once the immune system identifies one of these does not belong to the body, it passes information to the immune system to start creating more of the antibody molecules that have a complementary shape to the antigen (lock and key), and these are able to bind to the antigen and either disable the invader or make it more susceptible to the effects of the white blood cells which then destroy it. Initially, this process takes a few days, but once the immune system has learned the information to make a particular type of antibody, it can create large numbers of these quickly and prevent pathogens taking hold at an early stage, so no symptoms are experienced.

Vaccines are made by removing or disabling the infectious part of the pathogen while still preserving the antigen, which can then act as the basis for the immune system response without the risk of symptoms.

The usual information pathway is avoided by the influenza viruses, which can change their protein coats so that a virus with a similar DNA (or RNA) can produce a different outside appearance (antigen) to the immune system, which then must start from scratch to begin the process of making large numbers of antibodies to combat the virus.

Viruses like influenza have greater ability to mutate easily in the parts of their DNA that contain the information for the protein coat. A change in just one base pair in that part of the DNA changes the information for one part of the protein molecule, which causes the protein coat to be a different shape to the original. The immune system receives its information in the form of the shape rather than the chemical composition of the antigen, so a small change can make the antigen unrecognizable to the immune system. Vaccines and drugs against particular pathogens should focus on those areas of the pathogens surface that it cannot change without becoming ineffective, e.g. the part of the coat that recognizes and locks on to the target cell.

Question 5

Many of the cases identified in the articles were due to the delay in recognising that the horses were infected with Hendra virus. This was due to the horses presenting to the clinic with neurological symptoms rather than the typical respiratory symptoms. Because of this, correct quarantine and infection barriers were not in place, and the vets and government officials didn’t act fast enough considering the seriousness of the pathogen.

An issue is that the disease is rare enough that a rapid serological test does not exist for Hendra virus, and this is a matter of priority for control of the virus. A vet should be able to isolate a horse with suspicious symptoms, and have a definite test result back within a few hours to prove or disprove the hypothesis of Hendra infection, with treatment then proceeding according to this outcome.

The method of transmission from bats to horses, and horses to people is not fully understood. It is known that bats contain the virus and that it can be found in their urine and placental waste but how it gets passed on to the horses is unknown. Even though a large proportion of bats carry the virus, relatively few cases of Hendra virus have come to light. The virus can be artificially introduced into other species (zoonotic) but it does not happen naturally. Until we know what the method of transmission is in natural cases it is difficult to plan a strategy to prevent new cases.
Horses and people that are infected have very high mortality rates, yet it does not seem to pass from horse to horse, person to person or bats to people.

A vaccine needs to be developed but companies are not willing to spend up to hundreds of thousands of dollars to develop a vaccine for a relatively small market. Even though bat colonies occur all along the coast, the only cases of Hendra virus have occurred in Queensland so many people with horses in other states would not be interested in buying the vaccine.

The biggest hurdle is finding out the mode of transmission. If this is known people can prevent their horses catching the disease in the first place. Simple measures such as isolation (horses from bats, or infected animals from other animals) could be cost effective and prevent the spread of the disease if the disease is found to be transmitted from direct contact only. If the disease is spread by droplet infection or can be passed on through drinking water contaminated by bat waste then action can be taken to eliminate this risk. At the moment it is not known how the virus passes from the bats to horses so the prevention strategies can be hit or miss.

Education to better recognise the range of symptoms could ensure that people better protect themselves from catching Hendra virus from infected animals. There seems to be evidence that using protective measures (protective clothing, washing) can prevent the spread from horses to carers.

Solving these problems can have a major impact on stopping the spread of Hendra virus until other measures such as a vaccine can be developed.

### Question 6

<table>
<thead>
<tr>
<th>Disease</th>
<th>Vaccine available?</th>
<th>Morbidity (with treatment)?</th>
<th>Range of Transmission?</th>
<th>Reservoir of pathogen in environment?</th>
<th>Ability of pathogen to mutate?</th>
<th>Total score (add rows)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No = 3, Yes = 0, Yes (within 2-3 months) = 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Smallpox**: 0 1 2 0 0 3
- **Bubonic plague**: 0 0 3 2 0 5
- **Cholera**: 1 1 2 3 0 7
- **Malaria**: 3 2 3 3 3 14
- **HIV**: 3 3 1 2 0 9
- **Ebola**: 3 3 1 2 0 9
- **Hendra**: 3 3 1 2 3 12
- **H5N1**: 1 3 3 2 3 12

The severity score seems to give a reasonable assessment of the importance of the diseases in the present day.

- Smallpox and plague have basically been conquered by vaccination and public health (rat control), they don’t mutate easily, and their levels have been reduced now to the point where susceptible hosts are unlikely to contact the pathogen, which explains the small total score.

- Malaria has the highest score, and it is the disease that causes the greatest mortality and economic loss out of all the ones listed. It does not receive the attention it deserves because it has a low morbidity, and occurs in areas where facilities for the level of research required to tackle the complex pathogen are less available.
### Interpretation of Information to Identify Trends and Relationships

- Cholera is a severe disease only where adequate sanitation doesn’t exist, and is easily treated by rehydration therapy. Its moderate score reflects this, but also the fact that some parts of the world still lack the resources to provide those two requirements.

- Ebola and HIV have a moderately high score, which would be higher if the way they spread didn’t need fluid contact. HIV transmits slowly and there is a long latency period, while Ebola has a transmission rate so fast that it kills people before they can move to infect new hosts. They remain localised diseases at present.

- H5N1 and Hendra have the highest priority according to the scores. H5N1 is the disease of most concern to authorities, and has attracted the most money and resources due to its high morbidity and rapid transmission potential. The high score for Hendra is misleading: it has a high morbidity, but its vectors are not widespread and transmission between vectors and hosts is slow and localised, so it is not as big a threat as HIV, H5N1 and malaria.

### Interpretation of Information to Identify Anomalies

Identifies relationships

The rating system worked reasonably well, but needs changes to reduce the weighting given to severe but localised diseases like Hendra.
Indicative response — Standard C

The annotations show the match to the instrument-specific standards.

**Question 1**

The Ebola virus is a long chain virus that interferes with the interior surface of blood vessels and the body's ability to coagulate blood (clot). When the blood vessel becomes damaged and platelets can’t make clots, patients go into shock and die. Spread of Ebola is by contact with an infected person or their body fluids like blood or other secretions that leak from their body (vomiting, diarrhea, blood). Ebola can get into the body through small cuts in the skin, or the mouth and other body openings.

Incubation for Ebola is usually 5–15 days. When the virus enters the body they attach to body cells and inject their RNA. They use the host cell to produce hundreds of copies of themselves. When the host cell becomes full of the Ebola virus it bursts open and the Ebola viruses can infect other cells. The Ebola virus also makes a protein that sticks the virus to the interior surface of blood vessels and stops it being recognised by neutrophils and helps stop the neutrophils from encouraging other white blood cells to attack the Ebola.

**Question 2**

HIV has been increasing over the last 4 decades since the 1970s. It first was found in isolated villages in Africa but has now spread to all countries. HIV (started as a virus in monkeys in Africa. As people began to eat monkeys due to famines they started to catch the disease. Because monkeys with HIV don’t show symptoms of disease people were not able to know if the monkeys were infected to avoid eating infected monkeys. When people had to travel further to find food, or because of war or other reasons they spread the disease further from their villages into the general population. Also because they didn’t have protection like condoms or education they could spread the disease to other people who then infected more people. As infected people moved further away (like refugees) they spread the disease to other countries. HIV can take many years before symptoms occur so people could spread the disease to many others who did not know they had it, and they could pass it on. People with HIV develop AIDS (Acquired Immune Deficiency Syndrome) which can produce a lot of different and rare diseases so people didn’t recognise it was AIDS or HIV. Not every person who has HIV develops AIDS so this made it harder for it to be recognised and so people could spread HIV without knowing they were infected.

**Question 3**

H5N1 or bird flu is spread very quickly because people can be infected if they come within 10m of an infected person when they are most contagious. For containment to work you would need to identify the infected people very quickly before they can pass on the infection to others through their droplet spray or other fluids. Many people would not have symptoms yet or there symptoms would be weak while they are infectious so detection would be difficult. Using heat scanners at the airport to find infected people may be helpful but if someone was infected before they got on the plane there could be a lot of people who were infected during the plane ride when they are trapped with the sick person and they would not have symptoms yet so the scanners will not be effective. Because of this containment will not be as effective as it could be with less contagious diseases. By the time a vaccine has been developed the pandemic will probably be over since the illness is over pretty quickly and people won’t catch the same disease again because of their immune system. H5N1 would spread quickly in Australia but be over in a few months. A vaccine would take longer than that to...
Position
Expresses a position
Uses information to express plausible conclusions
Describes scientific information
Identifies and describes issues
Identifies impacts
Analysis and interpretation of information using appropriate qualitative and quantitative techniques

develop. If most people have caught it the vaccine would be a waste of time.
HIV takes longer to develop and spread so a vaccine would be more useful. If people use protection during sex and don’t share needles it is slower to spread. Containment probably wouldn’t have worked because most people infected with HIV would not have symptoms unless they had the disease a long time and some people never get symptoms but can still spread the disease. Because people live with the disease for a long time they would have to be contained for a very long time, this would be expensive for the government and would be unpopular for the infected people and their families to be kept apart.

Question 4
The common flu has many different strains because it mutates often. A vaccine exists for some of these strains but new ones keep emerging so that it is not possible to create a vaccine that protects against all influenza strains.
A vaccine is made by taking a virus and treating it with heat or chemicals so that it can’t infect cells with its DNA. The virus is then injected into the patient and their body builds up immunity. The immune system makes antibodies that attach themselves to foreign bodies like viruses or bacteria and disable them. Phagocytes can then consume the virus. When a foreign body is recognised the human body can make up to 2000 antibodies per second. Antibodies only attach to one type of antigen like a lock and key. The surface of the virus has the antigens that antibodies attach to. When viruses mutate the antigen changes and antibodies won’t work and you have to make a different antibody for the new antigen.

Question 5
No-one knows how Hendra virus gets passed on from bats to horses. The bats carry the virus in their urine and placenta waste but it is a mystery how it is passed on to the horses. Also only some horses get the virus from the bats even though there are other horses nearby that don’t get affected and the disease does not seem to be passed on from one horse to another.
If people can work out the method of transmission then strategies can be made to stop the spread. This will not only protect horse but people who can also catch the virus. People who own horses and veterinarians are in danger of catching Hendra from infected horses and it can be fatal to people.

Question 6

<table>
<thead>
<tr>
<th>Disease</th>
<th>Vaccine available?</th>
<th>Morbidity (with treatment)?</th>
<th>Range of Transmission?</th>
<th>Reservoir of pathogen</th>
<th>Total score (add rows)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No = 3, Yes = 0,</td>
<td>Nil = 0 1% = 1</td>
<td>Body fluids = 1 Contact = 2 Vector or aerosol = 3 Localised = 2 Widespread =3</td>
<td>Nil or low ≤ 0 Yes (&lt;5 years) =3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(within 2-3 months)</td>
<td>&lt;10% = 2 &gt;10% = 3</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Smallpox</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Bubonic plague</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Cholera</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Malaria</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>HIV</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Ebola</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Hendra</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>H5N1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>11</td>
</tr>
</tbody>
</table>
| Interpretation of information using qualitative techniques | **Smallpox** has a small total score because it can be treated with a vaccine and needs contact to spread the disease.

Bubonic plague also has a score of only 3. It is easier to spread than smallpox because of the aerosol transmission but it also has a vaccine and it can be successfully treated and doesn't cause death anymore like it used to.

Cholera is higher but still in the low range. It only occurs in some places and you need to be in contact with it to spread. Diseases with a vaccine have the lowest total scores. |

| Identifies relationships | Malaria is the highest total score. There is no vaccine and it is high in all the risks. Malaria is one of the diseases that most widespread and affects a lot of people in the world.

HIV would be one of the highest because it is fatal but because it can’t mutate and you have to come into contact with infected fluids (sex or needles) it is not as high as other less fatal diseases.

Ebola is also very fatal but it has the same scores and patterns as HIV.

Hendra is third highest even though it has less cases so far than the other diseases on the list. You would expect Ebola and HIV to be higher. |

| Interpretation of information using qualitative techniques | **H5N1** is second highest. It is so high because it can mutate and it is easy to catch. It is not as deadly to healthy people so I would have expected it to have a lower score. |