

T Level Technical Qualification in Science

Occupational specialism assessment (OSA)

Laboratory Sciences

Assignment 3

Assignment brief

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Scenario

Antibiotics have been used to treat bacterial infections for almost 100 years. However, strains of bacteria that are resistant to antibiotics have emerged. This is because of the overuse of some antibiotics.

Antibiotic-resistant infections result in patients spending more time in hospital, with higher medical costs and often fewer effective treatments for the patient. This is a great concern to healthcare settings.

As part of your role, your manager has tasked you with reviewing the data on the rates of Methicillin-resistant *Staphylococcus aureus* (MRSA) infection in your region's hospitals since 2015, as well as national data on the number of infections. You need to identify if any emerging trends are cause for concern within the hospitals.

You have been provided with local and national data representing the total number of *Staphylococcus aureus* infections and the number of these infections that are caused by Methicillin-resistant *Staphylococcus aureus* (MRSA). This data is in the form of a laboratory information management system (LIMS).

SAMPLE

Task 1

Using the raw data on the rate of MRSA infection given in the LIMS spreadsheet:

- calculate the percentage of MRSA infections per year both locally and nationally given in the LIMS document
- evaluate the accuracy of the local data you have been provided with compared with the national data

(8 marks)
(30 minutes)

SAMPLE

Task 2

Determine, with justification, the possible sources of error in the raw data given in the LIMS spreadsheet concerning **local** MRSA infections.

Explain and justify whether the errors in the spreadsheet are systematic or random.

(6 marks)
(30 minutes)

SAMPLE

Task 3

Using the LIMS data and the percentages calculated for local and national percentage of MRSA infections per year in Task 1:

- plot a graph to show both trends.
- describe the trend in local and national MRSA infections over the time provided.
- describe the factors that may affect the overall trend in infections within the local hospitals

(8 marks)
(30 minutes)

SAMPLE

Task 4

In order to determine whether the yearly mean infections for your region are in line with the national percentages, your laboratory need to report the MRSA rates for your hospital as a comparison:

- using the data provided for your hospital and nationally, decide whether or not your hospitals infection rates are comparable to the national mean, including in terms of overall trend
- use the LIMS data to calculate the standard deviation for the MRSA infection rates for each year both locally and nationally – you should use the spreadsheet to carry out your calculations
- using a statistical technique determine whether the average yearly rate of infections in 2015 and 2021 are similar or different to the national rates.
- use your statistics to justify your conclusion

(11 marks)
(1 hour)

Task 5

Your line manager would like your input on how the rates of MRSA infections compare with the national rates.

They would like your input on whether the rates of MRSA infections in the region's hospitals are under control.

They would also like some recommendations on how these rates could be improved. Write your recommendations in a short response.

Use information from the literature resource pack, data sheets and your own findings to justify your choices.

(8 marks)
(30 minutes)

SAMPLE

Literature list

<https://www.ncbi.nlm.nih.gov/books/NBK562156/>

<https://asm.org/getattachment/5c95a063-326b-4b2f-98ce-001de9a5ece3/gram-stain-protocol-2886.pdf>

<https://vlab.amrita.edu/?sub=3&brch=73&sim=208&cnt=2>

<https://www.healthline.com/health/gram-stain>

<https://www.technologynetworks.com/immunology/articles/gram-positive-vs-gram-negative-323007>

<https://www.ncbi.nlm.nih.gov/books/NBK470553/>

<https://www.medicalnewstoday.com/articles/157973#uses>

<https://www.cdc.gov/mrsa/community/index.html#:~:text=Maintain%20good%20hand%20and%20body,such%20as%20towels%20and%20razors.>

<https://www.msdmanuals.com/en-gb/home/infections/bacterial-infections-gram-negative-bacteria/overview-of-gram-negative-bacteria>

<https://www.nhs.uk/conditions/mrsa/#:~:text=MRSA%20is%20a%20type%20of,it%20called%20a%20%22superbug%22.>

Document information

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Owner: Head of Assessment Design

Change History Record

Version	Description of change	Approval	Date of issue
v1.0	Additional sample material		01 September 2023
v1.1	Sample added as watermark	November 2023	20 November 2023