



# Abertay University

## School of Applied Sciences

### Assessment Instrument Coversheet

Module Code: LSC103

Module Title: Principles of Biomedical Sciences

Unit of Assessment: 2

Learning Outcomes Assessed 1,2 (In addition, see module descriptor)

Lecturer / Assessor: Anne Savage

Latest Submission: Monday 9<sup>th</sup> November 2020 **23:59**

Latest Feedback: Monday 23<sup>rd</sup> November 2020 **23:59**

Feedback Type: Verbal formative feedback in class and written summative feedback via MyLearningSpace

Grading Criteria Refer to Page 2

#### Submission Requirements:

This is a copy of the on-line workbooks (MyLS quizzes). Your assignment should be submitted by completing and submitting the quizzes on-line via MyLS. This copy is for information, rough working and ease of access off-line

Your assessment must be submitted via MyLearningSpace. **There will be two links for each workbook. One link is for the workbook/quiz and the other is, for the MS Excel workbook which should contain all your calculations.** The maximum file size which can be submitted is 20MB so you may need to reduce the size of any image files within your document.

If you have any problems with submitting your work on the MyLearningSpace, please contact the Support Enquiry Zone on 01382 308833 or [sez@abertay.ac.uk](mailto:sez@abertay.ac.uk)

Submission of your work after the submission date deadline will be deemed as late submission and will incur penalty, including the possibility of the work being awarded a non-submission (NS) grade.

## Unit Grading Criteria

Literal grade	Grade point	Evaluative descriptor
A+	4.5	<p>Excellent overall.</p> <ul style="list-style-type: none"> <li>• Demonstrates an excellent grasp of the subject matter and methods.</li> <li>• Excellent understanding of the purpose of the calculations.</li> <li>• Excellent ability to compute and interpret answers</li> <li>• Excellent written communication skills.</li> <li>• MS Excel spreadsheet complete and correct for requested calculations.</li> </ul>
A	4	<p>Excellent overall.</p> <ul style="list-style-type: none"> <li>• Excellent understanding of the purpose of the calculations.</li> <li>• Excellent ability to compute and interpret answers</li> <li>• Excellent written communication skills.</li> <li>• MS Excel spreadsheet complete and correct for requested calculations.</li> <li>• One or two minor errors but overall the candidate has demonstrated an excellent grasp of the subject matter and methods</li> </ul>
B+	3.5	<p>Very good overall.</p> <ul style="list-style-type: none"> <li>• Very good understanding of the purpose of the calculations.</li> <li>• Very good ability to compute and interpret answers</li> <li>• Very good written communication skills.</li> <li>• MS Excel spreadsheet complete and correct for requested calculations.</li> </ul> <p>Some minor errors and/or misunderstandings but overall the candidate has demonstrated a very good grasp of the subject matter and methods</p>
B	3	<p>Very good overall.</p> <ul style="list-style-type: none"> <li>• Very good understanding of the purpose of the calculations.</li> <li>• Very good ability to compute and interpret answers</li> <li>• Very good written communication skills.</li> <li>• MS Excel spreadsheet complete and correct for requested calculations.</li> <li>• Some minor errors and/or misunderstandings but overall the candidate has demonstrated a very good grasp of the subject matter and methods.</li> <li>• There may be one or two omissions or areas that lack clarity.</li> </ul>

Literal grade	Grade point	Evaluative descriptor
C+	2.5	<p>Good overall.</p> <ul style="list-style-type: none"> <li>• Good understanding of the purpose of the calculations.</li> <li>• Good ability to compute and interpret answers</li> <li>• Good written communication skills.</li> <li>• MS Excel spreadsheet mostly complete and correct for requested calculations.</li> <li>• Minor errors and/or misunderstandings but overall the candidate has demonstrated a good grasp of the subject matter and methods but there may be some omissions or areas that lack clarity.</li> </ul>
C	2	<p>Good overall.</p> <ul style="list-style-type: none"> <li>• Good understanding of the purpose of the calculations.</li> <li>• Good ability to compute and interpret answers</li> <li>• Good written communication skills.</li> <li>• MS Excel spreadsheet mostly complete and correct for requested calculations.</li> <li>• Minor errors and/or misunderstandings in some sections but overall the candidate has demonstrated a good grasp of most of the subject matter and methods but there may be some areas of weakness, omissions or areas that lack clarity.</li> </ul>
D+	1.5	<p>Satisfactory overall.</p> <ul style="list-style-type: none"> <li>• Satisfactory understanding of the purpose of the calculations.</li> <li>• Satisfactory ability to compute and interpret answers but there may be omissions or areas that lack clarity</li> <li>• Satisfactory written communication skills.</li> <li>• MS Excel spreadsheet mostly complete and correct for requested calculations but there may be some omissions or weaknesses..</li> <li>• Minor errors and/or misunderstandings throughout but overall the candidate has demonstrated a satisfactory grasp of most of the subject matter and methods but there may be some areas of weakness, omissions or areas that lack clarity.</li> </ul>
D	1	<p>Adequate.</p> <p>Achievement of all threshold standards but grasp of some subject areas and graduate attribute development may be more limited.</p>

MF	0.5	Marginal fail. Performance just below the threshold standard. A reasonable expectation that a pass is achievable by reassessment without the need to repeat the module.
F	0	Performance well below the threshold level. Some limited evidence of achievement of the outcomes.
NS		No assessments submitted.

### **Weightings**

Workbook 1	25% of Module	Anne Savage
Workbook 2	25% of Module	Anne Savage
Workbook 3a & 3b	25% of Module	Anne Savage
Workbook 4	25% of Module	Kevin Smith

Weightings for individual parts within each workbook are shown in parenthesis after each question.

## **Please Read Carefully.**

### **Basic Instructions**

Read the narrative and answer the questions by typing in the boxes. This word document can be used for a rough draft of your answers but when you are ready to submit your assessment, please copy all your answers into in the online electronic version of Workbook 2 which is in the same folder on MyLS as this document. Some questions require just a number e.g. a numerical answer to a calculation, but other questions require a sentence or paragraph.

### **Supporting Material**

Supporting material is available in the form of recorded lectures and PDFs/PowerPoints of the lectures. Topics will be discussed during class meetings so **please take notes** during these meetings.

For Case Study 2 (workbook 2) on-line resources and textbooks are **not required** to answer the questions but you may like to explore the topic for your own interest. For later workbooks, you will be directed to specific website resources to help with some questions. **Please read the section 'Written Answers' very carefully.**

### **What am I assessing in workbook 2?**

For this part of the assessment, I need to see that you

- Can calculate an odds ratio from a data set along with a 95% confidence interval.
- Can interpret an odds ratio and express your interpretation in a clear, complete and concise statement.
- Can identify sources of bias and suggest simple methods for eliminating or adjusting for them.
- Understand the impact of confounding variables and how to stratify data.
- Can calculate a Mantel-Haenszel odds ratio from stratified data.
- Compare an aggregated odds ratio and a Mantel Haenszel odds ratio to judge whether a variable use to stratify the data is a confounding variable.
- Formulate a judgement based on several aspects of a data set.
- Have basic MS Excel skills e.g. data entry, calculations and can produce a simple plot. All calculations should be carried out using MS Excel calculations and functions and your spreadsheet should be submitted at the same time as your workbook.

### **Written answers**

A key outcome of a statistical analysis is turning numbers or data into a clear narrative. Written answers in Case Study 2 test specific interpretive, analytical and written communication skills.

- Have you understood and answered the question?
- Can you filter out unnecessary and repetitive information? You are more likely to include unnecessary information if you by-pass the lecture notes and class activities and go straight to Google to search for answers. You will not find the answers to these questions on the internet moreover, you may encounter information on-line that is related but not appropriate for your level of study and this invariably leads to confusion.

(Remember **P**oint, **E**vidence, **E**valuate)

- Can you use numerical information and results to answer clinical questions? (make your **P**oint concisely)
- Can you identify and present relevant numerical evidence to support your point? (present **E**vidence to support your point)
- Can you identify unanswered questions in the case studies and suggest further areas of research or improvement? (**E**valuate the study)

### **MS Excel Calculations**

All calculations should be carried out in MS Excel using appropriate cell referencing. All worksheets for a Case Study workbook should be contained within one MS Excel workbook. The MS Excel should be uploaded via MyLearningSpace as part of the assessment for this Unit. Please refer to the grade criteria for more information on how the MS Excel document contributes to the final grade.

### **General considerations:**

If you have or suspect that you may have difficulty with any of the following, please contact student services who can offer specialist advice. During the BMS programme, you will produce numerous documents so, if required, please seek help as soon as possible so that you can concentrate on the course content without worrying about your writing skills.

- Can you write in sentences?
- Are you confident in your numerical skills?
- Are you confident at spelling, grammar and using punctuation?
- Can you write concisely i.e. answer the question without excess or repetitive information. Most written questions have a word limit.

N.B. In this exercise, marks are not deducted for poor spelling, punctuation and grammar if the answer is understandable. Marks will be reduced if the answer is not understandable and the marker cannot ascertain if the learning objective of the question has been addressed

## **Workbook 2 Case Study 2: Contraception and Ovarian Cancer Case Study**

### **Weighting for Case Study 2: 25% of module**

#### ***Background***

The fourth leading cause of cancer death among women in the United States in 1980 was ovarian cancer. In that year there were approximately 18,000 new cases and 11,000 deaths attributed to ovarian cancer among American women.

Several studies suggested that pregnancy reduced the risk of ovarian cancer since there was an increased risk among women of low parity. By the 1980s, more than 40 million women in the USA were using oral contraception (OC) and researchers wondered whether oral contraceptives increased the risk by preventing pregnancy. Others argued that by simulating pregnancy i.e. through suppression of pituitary gonadotropin release and inhibition of ovulation, OCs might reduce the risk of ovarian cancer. Given the prevalence of contraceptive use, the public health impact of either relationship would be of major importance.

To study the nature of the relationship between oral contraceptive use and ovarian cancer, the Centers for Disease Control and Prevention (CDC) launched a case-control study in 1980 – the ‘Cancer and Steroid Hormone (CASH) Study’.

#### **Exercise 1:**

Contraception can be a sensitive issue; even more so forty years ago and some women may have been reluctant to participate or disclose information. Which types of bias that are likely to influence the result of this case-control study? How would you minimise these sources of bias? **(10%) (max 60 words)**

Some women may not have given all the correct details as it was a controversial issue and it was not accepted in some regions. Religion and traditional gender roles have influence when we talk about this topic. One way to avoid it is doing the study with women who see contraception as a regular and normal way to avoid pregnancy.

### **Exercise 2: (part 1)**

Women aged 20-54 years, ovarian cancer cases and controls, were asked if they had ever used oral contraception (Table 1).

Table 1. Results of the survey

	ovarian cancer	No ovarian cancer
oral contraception	93	959
No oral contraception	86	683

Using MS Excel, calculate the odds ratio for the association between ovarian cancer and oral contraception. **(2%) Give your answer to 2 decimal places**

*(Hint: You used MS Excel to calculate an odds ratio and confidence interval in workbook 1 so copy the spread sheet and change the numbers (a to d) in the table. The spreadsheet should update with the new answers. Remember to edit the row and column headings in the table).*

**You must submit your MS Excel spreadsheet when you submit your workbook.**

0.77

### **Exercise 2: (part 2)**

Using MS Excel, calculate the lower confidence interval for the odds ratio calculated in Exercise 2 :( part 1) **(4%) Give your answer to 2 decimal places**

0.57

### **Exercise 2: (part 3)**

Using MS Excel, calculate the upper confidence interval for the odds ratio calculated in Exercise 2 :( part 1) **(4%) Give your answer to 2 decimal places**



## 1.05

### Exercise 2: (part 4)

Is there a relationship between oral contraceptive use and ovarian cancer? Justify your answer by referring to and correctly interpreting the odd ratio and its 95% confidence limits. **(4% max 25 words)**

Even if the odds ratio is below 1 (0.77), it cannot be concluded that an association exists because the confidence interval includes 1 (0.57, 1.05).

### Exercise 3 part (1)

In the course of the study, it was observed that oral contraceptive users and ovarian cancer patients tended to be younger than 'never users' implying that age could be a confounding variable. The researchers decided to stratify the data by age. They then calculated stratum-specific odds ratios and the Mantel-Haenszel ( $OR_{MH}$ ) to investigate the possibility that age is a confounding variable. The data in table 1 was stratified into 3 age groups (Table 2 (a to c)).

Table 2 (a to c). Data stratified by age of participant

#### (a) Age 20 to 39

	Disease	No Disease	
Exposure	46	285	
No Exposure	12	51	

#### (b) Age 40 to 49

	Disease	No Disease	
Exposure	30	463	
No Exposure	30	301	

#### (c) Age 50 to 54

	Disease	No Disease	
Exposure	14	211	
No Exposure	44	331	

**Using MS Excel formulae**, complete the tables to include row, column and overall totals. **(5%)**.

When you have finished **all calculations** for this workbook, submit the MS Excel spreadsheet via the link in MyLS>LSC103>submit module assessment. Click 'True' to indicate that you have read and understood this instruction.

**Give your answer to Exercise 3 (Parts a to i) to 3 decimal places** and remember to submit the MS Excel worksheet with the calculation.

### **Exercise 3: (part 2a)**

**Using MS Excel formulae**, calculate the stratum-specific odds ratios for Table 2(a) Age 20 to 39. **(3%)**

0.686

### **Exercise 3: (part 2b)**

**Using MS Excel formulae**, calculate the stratum-specific lower confidence interval for Table 2(a) Age 20 to 39. **(3%)**

0.340

### **Exercise 3: (part 2c)**

**Using MS Excel formulae**, calculate the stratum-specific upper confidence interval for Table 2(a) Age 20 to 39. **(3%)**

1.384

### **Exercise 3: (part 2d)**

**Using MS Excel formulae**, calculate the stratum-specific odds ratio for Table 2(b) Age 40 to 49. **(3%)**

0.650

**Exercise 3: (part 2e)**

**Using MS Excel formulae**, calculate the stratum-specific lower 95% confidence limit for Table 2(b) Age 40 to 49. **(3%)**

0.384

**Exercise 3: (part 2f)**

**Using MS Excel formulae**, calculate the stratum-specific upper 95% confidence limit for Table 2(b) Age 40 to 49. **(3%)**

1.101

**Exercise 3: (part 2g)**

**Using MS Excel formulae**, calculate the stratum-specific odds ratio for Table 2(c) Age 50 to 54. **(3%)**

0.499

**Exercise 3: (part 2h)**

**Using MS Excel formulae**, calculate the stratum-specific lower 95% confidence interval for Table 2(c) Age 50 to 54. **(2%)**

0.267

**Exercise 3: (part 2i)**

**Using MS Excel formulae**, calculate the stratum-specific upper 95% confidence interval for Table 2(c) Age 50 to 54. **(2%)**

0.933

### **Exercise 3: (part 3)**

**Using MS Excel formulae**, calculate the Mantel-Haenszel odds ratio ( $OR_{MH}$ ) for the stratified data in Table 2(a to c). **(15%)**

Give your answer to 3 decimal places in the box below and remember to submit the MS Excel worksheet with the calculation.

**Most of the marks for this answer are allocated to the calculation in the spreadsheet. A correct answer without the calculation will not receive full marks**

0.601

### **Exercise 3: (part 4)**

Compare the 3 stratum specific odds ratios. What is the range (min to max) of the stratum specific odds ratios? **(3%)**

(0.267, 1.384)

### **Exercise 3: (part 5)**

Do you think age might be a confounding variable? Justify your answer by referring to the odds ratio values for the age groups that you calculated in Exercise 3: (parts 2). **(5%) max 30 words**

The confidence intervals are all overlapping, so it cannot be concluded that age is a confounder.

### **Exercise 3: (part 6)**

Compare the Mantel-Haenszel odds ratio ( $OR_{MH}$ ) with the aggregated odds ratio ( $OR_{agg}$ ) calculated in table. Do you think they are different or similar (only a subjective impression required) **(1%) (max 10 words)**.

We have no evidence to say they are significantly different.

### **Exercise 3: (part 7)**

Does the ( $OR_{MH}$ ) lie outside the range of the  $OR_{agg}$  that you calculated in Exercise 3 (part 4) **(2%)**. **Yes or No required**

No

### **Exercise 3: (part 8)**

Do you think that age is a confounding variable? Justify your answer by referring to your answers to Exercise 3: (part 6 & 7). **(5% max 30 words)**.

Age is not a confounding variable. The Mantel-Haenszel odds ratio (0.601) is not significantly different to the range of the  $OR_{agg}$  (0.267, 1.384), as it lies inside the range.

### **Exercise 4:**

In the background paragraph, it was suggested that pregnancy could be protective against ovarian cancer. The researchers investigated this further by splitting the data by parity. (Parity means the number of pregnancies i.e. parity 2 = 2 pregnancies)

Table 3 Data stratified by parity. N.B seven participants excluded (four never-users and three ever-users) and one case (ever-user) with unknown parity. Age-adjusted odds ratios in Table 3 were obtained by calculating a summary odds ratio adjusted for age, within each parity stratum. The odds ratios were age-adjusted because age was considered to be a confounder.

Parity		Disease	No Disease	Stratum Odd Ratio	95% Confidence Intervals
0	Exposure	20	67	0.3	0.1 to 0.8
	No Exposure	25	80		
1-2	Exposure	42	369	0.8	0.4 to 1.5
	No Exposure	26	199		
≥3	Exposure	30	520	0.7	0.4 to 1.2
	No Exposure	35	400		

Examine the results in table 3. Is it plausible that pregnancy is protective against ovarian cancer? Justify your answer by considering the confidence intervals and the OR and by identifying the direction of the relationship for each parity and comparing. **(15% max 60 words)**

**To formulate your answer, think about the following points.**

- Do the stratum odds ratios suggest negative or positive associations between exposure (oral contraception) and disease (ovarian cancer)?
- Now look at the confidence intervals. Which strata have confidence intervals that include 1? What can you conclude about the associations implied by the odds ratios for these strata?
- One stratum has a confidence interval entirely below 1. What does this suggest about the association between exposure and disease for this stratum?
- Which stratum has the smallest odds ratio? Is the odds ratio value of this stratum within the confidence interval of the other two strata or below it?
- Based on this evidence, do you think that pregnancy protects against ovarian cancer in oral contraception users

**From these answers, construct a short paragraph (max 60 words) explaining whether or not you think that pregnancy protects against ovarian cancer in oral contraception users. Remember to quote and compare values for the odds ratios and confidence intervals to support your answer.**

All odds ratios are below 1 and the entire confidence intervals of 0 pregnancies is lower than 1. This is suggesting that pregnancy is negative associated with ovarian cancer. The others confidence intervals include 1, so we cannot say any association exists. Concluding that it is a lower odds of association pregnancy protecting against ovarian cancer in oral contraception users.

## References:

- (1) Centers for Disease Control. Oral contraceptive use and the risk of ovarian cancer: the Centers for Disease Control Cancer and Steroid Hormone Study. *JAMA* 1983;249:1596-9.
- (2) Centers for Disease Control. The reduction in risk of ovarian cancer associated with oral contraceptive use: the Cancer and Steroid Hormone Study of the Centers for Disease Control and the National Institute of Child Health and Human Development. *N Engl J Med* 1987; 316:650-5.

## Further Reading:

- (1) The Open University (2007) M249 Practical Modern Statistics Book 1 'Medical Statistics' ISBN 978 0 74921366 4

## Exercises have been adapted from:

**Centers for Disease Control and Prevention** (Epidemic Intelligence Service) 2016 <http://www.cdc.gov/eis/casestudies.html>

