**HW #11 Ref: Chapter 13, Due@ 4/19/2022**

**Risk difference, relative risk and odds ratio for 2x2 contingency Table**

* All problems must be completed using SAS coding along with the manual verification.
* Copy and paste or type answers from the SAS output in answering questions as appropriate.

Consider the 2x2 contingency table below due to the exposure of certain chemical at work and the development of any health problem resulting from a cohort study design.

**Table of Health Problem by Exposure**

| **Exposed** | **HealthProblem** | | |
| --- | --- | --- | --- |
| **Yes** | **No** | **Total** |
| **Yes** | |  | | --- | | 575 | | |  | | --- | | 350 | | |  | | --- | | 925 | |
| **No** | |  | | --- | | 15 | | |  | | --- | | 50 | | |  | | --- | | 65 | |
| **Total** | |  | | --- | | 590 | | |  | | --- | | 400 | | |  | | --- | | 990 | |

**Answer the following questions by showing all your computations and then implementing SAS for verifying your answers.**

1. Answer the following question.
2. Find a point estimate of RD in the exposed group.
3. Find a standard error of your estimate in (a).
4. Find a 95% confidence interval estimate of the RD.
5. How would you interpret the results in (c)?

Solution：**(a) and (b)**

**(c)** **95% CI:** A 95% CI of is

1. **Conclusion:** 95% CI of **does not contain 0** and the interval is **positive**. Therefore, at 5% level of significance, it appears that **the exposure of certain chemical at work** ***is positively associated with*** **the development of any health problem.**

SAS :

data HealthProblem;

length Exposed $10 HealthProblem $20;

input Exposed $ HealthProblem $ count;

datalines;

Yes case 575

Yes control 350

No case 15

No control 50

;

run;

ods select RiskDiffCol1 RiskDiffCol2;

proc freq data=HealthProblem order=data;

title'Risk Difference Measures';

tables Exposed\*HealthProblem/riskdiff alpha=0.05;

weight count;

run;

**Risk Difference Measures**

**The FREQ Procedure**

**Statistics for Table of Exposed by HealthProblem**

| **Column 1 Risk Estimates** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Risk** | **ASE** | **95% Confidence Limits** | | **Exact 95% Confidence Limits** | |
| **Difference is (Row 1 - Row 2)** | | | | | | |
| **Row 1** | 0.6216 | 0.0159 | 0.5904 | 0.6529 | 0.5895 | 0.6530 |
| **Row 2** | 0.2308 | 0.0523 | 0.1283 | 0.3332 | 0.1353 | 0.3519 |
| **Total** | 0.5960 | 0.0156 | 0.5654 | 0.6265 | 0.5646 | 0.6267 |
| **Difference** | 0.3909 | 0.0546 | 0.2838 | 0.4979 |  |  |

| **Column 2 Risk Estimates** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Risk** | **ASE** | **95% Confidence Limits** | | **Exact 95% Confidence Limits** | |
| **Difference is (Row 1 - Row 2)** | | | | | | |
| **Row 1** | 0.3784 | 0.0159 | 0.3471 | 0.4096 | 0.3470 | 0.4105 |
| **Row 2** | 0.7692 | 0.0523 | 0.6668 | 0.8717 | 0.6481 | 0.8647 |
| **Total** | 0.4040 | 0.0156 | 0.3735 | 0.4346 | 0.3733 | 0.4354 |
| **Difference** | -0.3909 | 0.0546 | -0.4979 | -0.2838 |  |  |

1. Find a point estimate of the relative risk in the exposed group.
2. Find a point estimate of logRR.
3. Find an estimate of standard error of the logRR estimate in (b).
4. Find a 95% confidence interval estimate of the logRR.
5. Find a 95% confidence interval estimate of the RR.
6. How would you interpret the results in (e)?

Solution：**(a) and (b).(c)**

**(d) 95% CI:** A CI of is =

**(e)95% CI:** A CI of is

**(f)Conclusion:** 95% CI of **does not contain 1** and the **lower limit of the interval is above 1**. Therefore, at 5% level of significance, it appears that **the exposure of certain chemical at work** ***is positively associated with*** **the development of any health problem.**

SAS :

ods select RelativeRisks;  
proc freq data=HealthProblem order=data;  
title'Relative Risk & OR Measures';  
tables Exposed\*HealthProblem/relrisk alpha=0.05;  
weight count;  
run;

**Relative Risk & OR Measures**

**The FREQ Procedure**

**Statistics for Table of Exposed by HealthProblem**

| **Odds Ratio and Relative Risks** | | | |
| --- | --- | --- | --- |
| **Statistic** | **Value** | **95% Confidence Limits** | |
| **Odds Ratio** | 5.4762 | 3.0292 | 9.8998 |
| **Relative Risk (Column 1)** | 2.6937 | 1.7233 | 4.2106 |
| **Relative Risk (Column 2)** | 0.4919 | 0.4206 | 0.5753 |

1. Find a point estimate of OR in the exposed group.
2. Find a point estimate of logOR.
3. Find an estimate of standard error of the logOR estimate in (b).
4. Find a 95% confidence interval estimate of the logOR.
5. Find a 95% confidence interval estimate of the OR.
6. How would you interpret the results in (e)?

Solution: (a).(b).(c)

**(d) 95% CI:** A CI of is =

(e)Then, a CI of is

**(f)Conclusion:** 95% CI of **does not contain 1** and the **lower limit of the interval is above 1**. Therefore, at 5% level of significance, it appears that **the exposure of certain chemical at work** ***is positively associated with*** **the development of any health problem.**

SAS :

ods select RelativeRisks;  
proc freq data=HealthProblem order=data;  
title'Relative Risk & OR Measures';  
tables Exposed\*HealthProblem/relrisk alpha=0.05;  
weight count;  
run;

**Relative Risk & OR Measures**

**The FREQ Procedure**

**Statistics for Table of Exposed by HealthProblem**

| **Odds Ratio and Relative Risks** | | | |
| --- | --- | --- | --- |
| **Statistic** | **Value** | **95% Confidence Limits** | |
| **Odds Ratio** | 5.4762 | 3.0292 | 9.8998 |
| **Relative Risk (Column 1)** | 2.6937 | 1.7233 | 4.2106 |
| **Relative Risk (Column 2)** | 0.4919 | 0.4206 | 0.5753 |