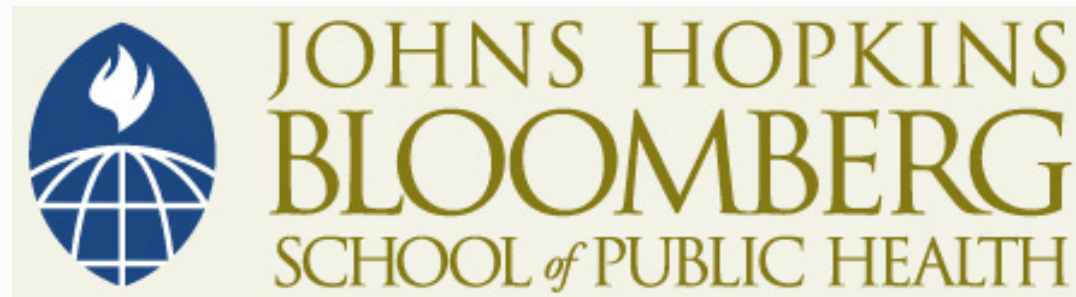


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## Lecture 5f: Practice Problem Solutions

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# Practice Problems

1. A health policy researcher is doing an ad-hoc study of gender differences in attitudes about medical confidentiality. He spends some time at a shopping mall and polls and asks individuals to rate their degree of agreement for a statement related to confidentiality using the following five-point scale:

Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

# Practice Problems

- Responses are coded from 1 to 5
- At the end of his tenure at the mall, this researcher has a total of 11 respondents: 6 male, 5 female
- The distribution of responses is as follows:

— M	1	3	4	2	3	5
— F	3	4	4	3	5	

# Practice Problems

- Despite the small sample size, the researchers is interested in testing for a difference in degree of agreement for males compared to females.
  - a) How could he do this using the ranks of the data values?
  - b) Compute the average rank for each gender group

# Practice Problem Solutions

- The final dataset was as follows:

— M	1	3	4	2	3	5
— F	3	4	4	3	5	

# Practice Problem Solutions

- Despite the small sample size, the researchers is interested in testing for a difference in degree of agreement for males compared to females
  - a) How could he do this using the ranks of the data values?
    - No surprises here, he could use the Mann-Whitney/Wilcoxon method

# Practice Problem Solutions

- b) Compute the average rank for each group
  - First, we must arrange the data from lowest to highest without regard for group
  - 1 2 3 3 3 3 4 4 4 5 5



# Practice Problem Solutions

b) Compute the average rank for each group

— Now, assign ranks to the data:

	1	2	3	3	3	3	4	4	4	5	5
Rank	1	2	3	?	?	?					

# Practice Problem Solutions

b) Compute the average rank for each group

— What to do about the ties?

	1	2	3	3	3	3	4	4	4	5	5
Rank	1	2	3	?	?	?					

# Practice Problem Solutions

- b) Compute the average rank for each group
  - FYI: With ties, we take the “average rank” of the group with ties, and assign it to each member of the group

# Practice Problem Solutions

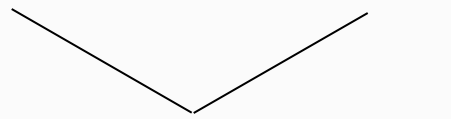
- b) Compute the average rank for each group
- For example, with the series of 3s we first assign them ascending ranks as if they were increasing

	1	2	3	3	3	3	4	4	4	5	5
Rank	1	2	3	4	5	6					

# Practice Problem Solutions

- b) Compute the average rank for each group  
— Then we average these ascending ranks

	1	2	3	3	3	3	4	4	4	5	5
Rank	1	2	3	4	5	6					


$$\frac{3 + 4 + 5 + 6}{4} = 4.5$$

# Practice Problem Solutions

- b) Compute the average rank for each group  
— Now reassign each “3” the average rank, 4.5

	1	2	3	3	3	3	4	4	4	5	5
Rank	1	2	4.5	4.5	4.5	4.5					

# Practice Problem Solutions

b) Compute the average rank for each group

— Rank the rest of the values, treating ties the same way

	1	2	3	3	3	3	4	4	4	5	5
Rank	1	2	4.5	4.5	4.5	4.5	7	8	9		

$$\frac{7 + 8 + 9}{3} = 8$$

# Practice Problem Solutions

b) Compute the average rank for each group

— Rank the rest of the values, treating ties the same way

	1	2	3	3	3	3	4	4	4	5	5
Rank	1	2	4.5	4.5	4.5	4.5	8	8	8	10.5	10.5



# Practice Problem Solutions

- b) Compute the average rank for each group  
— Reassign the group labels to the data

	1	2	3	3	3	3	4	4	4	5	5
Rank	1	2	4.5	4.5	4.5	4.5	8	8	8	10.5	10.5
Group	M	M	F	M	F	M	F	F	M	F	M

# Practice Problem Solutions

- b) Compute the average rank for each group
- Now we can compute group average ranks!
  - For females:

$$\bar{R}_{females} = \frac{4.5 + 4.5 + 8 + 8 + 10.5}{5} = 7.1$$

- For males:

$$\bar{R}_{males} = \frac{1 + 2 + 4.5 + 4.5 + 8 + 10.5}{6} = 5.1$$

# Practice Problem Solutions

- The Mann-Whitney-Wilcoxon compares the average ranks for males compared to females and tests:
  - $H_0$ : Distribution of degree of agreement is the same for males and females
  - $H_A$ : Distribution of degree of agreement is NOT the same for males and females
- The p-value for this test is .29, suggesting there is not enough evidence to conclude that the “degree of agreement” is different for males and females

# Practice Problem Solutions

## b) Data entered into Stata:

```
. list
```

```
      +-----+
      | response  sex |
      +-----+
  1. |         1    M |
  2. |         3    M |
  3. |         4    M |
  4. |         2    M |
  5. |         3    M |
      +-----+
  6. |         5    M |
  7. |         3    F |
  8. |         4    F |
  9. |         4    F |
 10. |         3    F |
      +-----+
 11. |         5    F |
      +-----+
```

# Practice Problem Solutions

## b) Results from Mann Whitney:

```
. ranksum response, by(sex)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

      sex |      obs   rank sum   expected
-----+-----
          F |         5     35.5     30
          M |         6     30.5     36
-----+-----
    combined |        11     66     66

unadjusted variance      30.00
adjustment for ties      -2.05
-----
adjusted variance      27.95

Ho: response(sex==F) = response(sex==M)
      z = 1.040
    Prob > |z| = 0.2982
```