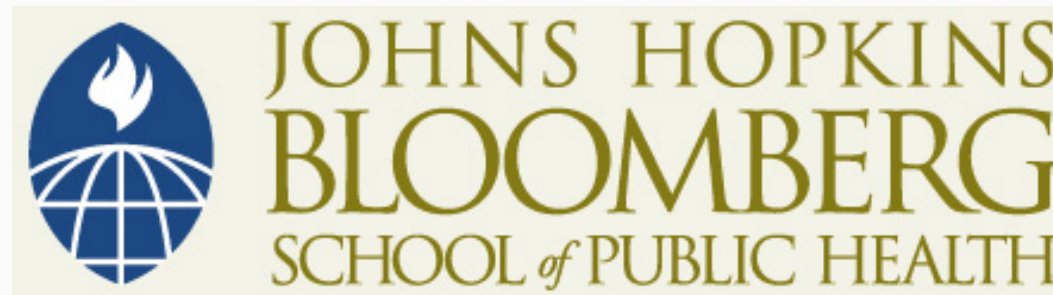


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JOHNS HOPKINS
BLOOMBERG
SCHOOL *of* PUBLIC HEALTH

Lecture 5f: Practice Problem Solutions

John McGready
Johns Hopkins University

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

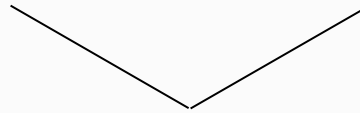
- b) Compute the average rank for each group
- For example, with the series of 3s we first assign them ascending ranks as if they were increasing

	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
```