Student Worksheet 2 Answers

1. The data in Table 1 shows urinary tract infection coliform rates by age group and antibiotic resistance. Data has been provided by Public Health Wales.

a. Using the data provided, calculate the % resistance for each age group and add into the table.

Table 1

Year	Antibiotic name	Age group (years)	Number sampled	Number antibiotic resistant	%Resistant
2013	Amoxicillin	<15	4743	2507	52.9
2013	Amoxicillin	15-24	5882	2899	49.3
2013	Amoxicillin	25-49	13746	7282	53.0
2013	Amoxicillin	50-79	36915	21308	57.7
2013	Amoxicillin	80+	20383	13186	64.7
2013	Nitrofurantoin	<15	4712	329	7.0
2013	Nitrofurantoin	15-24	5875	267	4.5
2013	Nitrofurantoin	25-49	13684	827	6.0
2013	Nitrofurantoin	50-79	36799	4453	12.1
2013	Nitrofurantoin	80+	20419	3785	18.5
2013	Trimethoprim	<15	4718	1398	29.6
2013	Trimethoprim	15-24	5880	1636	27.8
2013	Trimethoprim	25-49	13716	4114	30.0
2013	Trimethoprim	50-79	36871	12281	33.3
2013	Trimethoprim	80+	20454	9119	44.6

b. Describe how resistance varies between antibiotics and between age groups.

Resistance to amoxicillin is much higher than the other two antibiotics. Nitrofurantoin has the lowest resistance. Resistance for all antibiotics is highest in the over 80's.

c. Describe why antibiotic resistance is higher in the elderly and young.

Prescribing of antibiotics is higher in the elderly and young, due to their weakened immune system. Also the elderly have had a lifelong exposure to antibiotics – repeated courses of antibiotics leads to an increase in resistance.

2. The data in Table 2 shows antibiotic prescription rates and % resistance for the 15-24 age group. The % prescription rates are for all antibiotics across Wales in 2008.

Table 2

Antibiotic	% resistance for 15-24 age group	% of total prescriptions
Amoxicillin	49.3	33
Nitrofurantoin	4.5	4
Trimethoprim	27.8	9
Fluoroquinolones	4.3	3
Cephalosporins	4.5	8
Co-amoxiclav	6.0	6

a. By looking at the data in Table 2 and your % resistance values from question 1, do you think there is a correlation between antibiotic prescribing and antibiotic resistance?

The data appears to show a correlation between antibiotic prescribing and antibiotic resistance. Amoxicillin has the highest prescribing rate and also the highest resistance.

b. Calculate the Spearman's rank coefficient for these two sets of data.

Antibiotic	% resistance for 15-24 age group (X)	% of total prescriptions (Y)	Rank X	Rank Y	*d*	d^2
Amoxicillin	49.3	33	6	6	0	0
Nitrofurantoin	4.5	4	3	2	1	1
Trimethoprim	27.8	9	5	5	0	0
Fluoroquinolones	4.3	3	1	1	0	0
Cephalosporins	4.5	8	3	4	-1	1
Co-amoxiclav	6.0	6	4	3	1	1
						$\Sigma d^2 = 3$

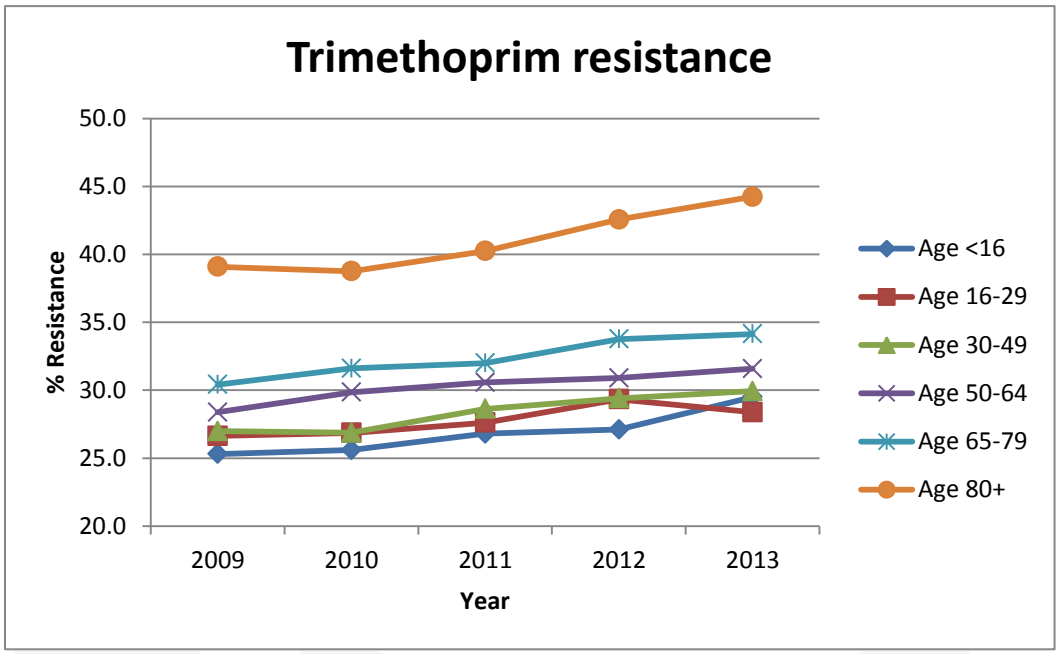
$$p = 1 - \frac{6\,\Sigma d2}{n(n2-1)} = 1 - \frac{(6x3)}{6 \times (62 - 1)} = 0.914$$

c. What do your results show? Is there a significant correlation between antibiotic prescribing and antibiotic resistance?

The results show that there is a significant correlation between antibiotic prescribing and antibiotic resistance (p is close to 1).

3. Table 3 shows the number of urinary tract coliform infections resistant to Trimethoprim by age group and year over the past 5 years. Data has been provided by Public Health Wales.

a. Using this data, plot a graph of % resistance by year, including data for each age group.



b. Calculate the % change in resistance between 2009 and 2013 for the over 80 age group.

[(44.2 – 39.1)/39.1] x 100 = 13%

c. Estimate the % resistance in 2017 for Trimethoprim in the over 80's.

If resistance increased by another 13%, in 2017 the resistance for trimethoprim in the over 80's would be 50%

d. What is the mean change in resistance per year for Trimethoprim for the 16-29 age group?

2009-2010 = 1.1% change
2010-2011 = 2.6% change
2011-2012 = 6.2% change
2012-2013 = 3% change
Average = 3.2% change in resistance

e. Between 2010 and 2011, which age group had the largest increase in resistance?

The 30-49 age group.