



1. The data in Table 1 provides information on the number of coliform bacterial strains that were found to be antibiotic resistant in Wales in 2013 (coliforms are a group of bacteria found in the gut). The strains are resistant to amoxicillin, nitrofurantoin or trimethoprim. *E. coli* is a member of the coliform group. The data shows urinary tract infection coliform rates by age group and antibiotic resistance. Data has been provided by Public Health Wales.

**Table 1**

Year	Antibiotic name	Age group (years)	Number sampled	Number antibiotic resistant	%Resistant
2013	Amoxicillin	<15	4743	2507	
2013	Amoxicillin	15-24	5882	2899	
2013	Amoxicillin	25-49	13746	7282	
2013	Amoxicillin	50-79	36915	21308	
2013	Amoxicillin	80+	20383	13186	
2013	Nitrofurantoin	<15	4712	329	
2013	Nitrofurantoin	15-24	5875	267	
2013	Nitrofurantoin	25-49	13684	827	
2013	Nitrofurantoin	50-79	36799	4453	
2013	Nitrofurantoin	80+	20419	3785	
2013	Trimethoprim	<15	4718	1398	
2013	Trimethoprim	15-24	5880	1636	
2013	Trimethoprim	25-49	13716	4114	
2013	Trimethoprim	50-79	36871	12281	
2013	Trimethoprim	80+	20454	9119	

- Using the data provided, calculate the % resistance for each age group and add into the table.
- Describe how resistance varies between antibiotics and between age groups.
- Describe why antibiotic resistance is higher in the elderly and young.





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

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?

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

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





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.

**Table 3**

Year	Antibiotic name	Age group (years)	Number sampled	Number antibiotic resistant	%Resistant
2013	Trimethoprim	<16	5318	1567	29.5
2013	Trimethoprim	16-29	8939	2537	28.4
2013	Trimethoprim	30-49	11877	3555	29.9
2013	Trimethoprim	50-64	14755	4659	31.6
2013	Trimethoprim	65-79	25455	8690	34.1
2013	Trimethoprim	80+	22290	9859	44.2
2012	Trimethoprim	<16	5023	1362	27.1
2012	Trimethoprim	16-29	8848	2595	29.3
2012	Trimethoprim	30-49	11411	3355	29.4
2012	Trimethoprim	50-64	14002	4327	30.9
2012	Trimethoprim	65-79	23913	8072	33.8
2012	Trimethoprim	80+	20966	8923	42.6
2011	Trimethoprim	<16	4839	1298	26.8
2011	Trimethoprim	16-29	8298	2291	27.6
2011	Trimethoprim	30-49	11085	3173	28.6
2011	Trimethoprim	50-64	13296	4064	30.6
2011	Trimethoprim	65-79	21673	6935	32.0
2011	Trimethoprim	80+	19492	7843	40.2
2010	Trimethoprim	<16	4401	1126	25.6
2010	Trimethoprim	16-29	7991	2146	26.9
2010	Trimethoprim	30-49	10389	2791	26.9
2010	Trimethoprim	50-64	12286	3667	29.8
2010	Trimethoprim	65-79	19991	6317	31.6
2010	Trimethoprim	80+	18026	6987	38.8
2009	Trimethoprim	<16	4338	1099	25.3
2009	Trimethoprim	16-29	8232	2192	26.6
2009	Trimethoprim	30-49	10473	2826	27.0
2009	Trimethoprim	50-64	12312	3493	28.4
2009	Trimethoprim	65-79	19510	5933	30.4
2009	Trimethoprim	80+	17431	6813	39.1

[Questions overleaf]





- Using this data, plot a graph of % resistance by year, including data for each age group.
  
- Calculate the % change in resistance between 2009 and 2013 for the over 80 age group.
  
- Estimate the % resistance in 2017 for Trimethoprim in the over 80's.
  
- What is the mean change in resistance per year for Trimethoprim for the 16-29 age group?
  
- Between 2010 and 2011, which age group had the largest increase in resistance?

