4.5 Outside? $n = 18$. Depth of median = 9.5, and the value of median = 114. Q1 has a depth of (9 + 1) / 2 = 5 and a value of 101. Q3 has a depth of 5 from the top and has a value of 120. Thus, the 5-point summary: 88, 101, 114, 120, 152 and IQR = 120 – 101 = 19. $\text{Fence}_{\text{Upper}} = 120 + (1.5)(19) = 148.5$, and the value 152 is clearly outside this fence.

4.4 Seizures following meningitis. (a) The mean is 25.9. The median is 24.
(b) Mean > Median. Therefore, the distribution has a positive skew.
(c) The median is preferred when describing skewed distributions because is less likely to be misinterpreted.

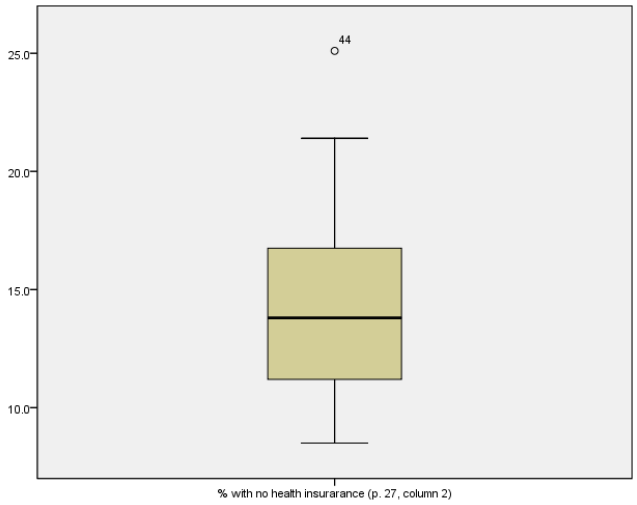
4.6 ***Seizures following bacterial meningitis.*** The ordered array for the data set is: {0.10, 0.25, 0.50, 4, 12, 12, 24, 24, 31, 36, 42, 55, 96}. Note than $n = 13$, the median has a depth of 7 and value of 24. Q1 has a depth of = (7 + 1) / 2 = 4, and value of 4. Q3 has a depth of 4 from the top and a value of 36. Thus, the 5-point summary is 0.1, 4, 24, 36, 96 and IQR = 36 – 4 = 32.

- $\text{Fence}_{\text{Lower}} = 4 - (1.5)(32) = -44$. There are no values outside the lower fence. The lower inside value is 0.10.
- $\text{Fence}_{\text{Upper}} = 36 + (1.5)(32) = 84$. There is one value outside the upper fence (96). The upper inside value, is 55.

Are there any outside values…? Yes, observation 13 (value = 96). …*evidence of asymmetry*? Yes, positive skew (note: longer upper tail and upper outside value).

4.17 Health insurance by state.
(a) Mean = 14.28, Median = 13.8. Mean > median, suggesting the distribution has a positive skew.
(b) $n = 51$. Depth of median = (51 + 1) / 2 = 26. Value of median = 13.8.
Depth of Q1 (lower hinge) = (26 + 1) / 2 = 13.5. Value of Q1 = average(11.0, 11.4) = 11.2.
Q3 has a depth of 13.5 from the top and a value = average of (16.7, 16.8) = 16.75.
The five-point summary is {8.5, 11.2, 13.8, 16.5, 25.1}.
(c) IQR = 16.75 – 11.2 = 5.55
$\text{Fence}_{\text{Upper}} = 16.75 + (1.5)(5.55) = 25.075$. The value 25.1 is outside.
$\text{Fence}_{\text{Upper}} = 16.75 - (1.5)(5.55) = 8.425$. There are no outside values on the bottom.

NEW –Health Insurance boxplot



NEW- Health Insurance stemplot

```
0|89
1|00000000011111111233333334444
1|555666667777888899
2|1
22|5
×10
```

4.8 ***Standard deviation for site 1.*** $\bar{x} = \frac{1}{8} \cdot 290 = 36.25$.

i	*X*	Deviations	Squared deviations
1	68	68 – 36.25 = 31.75	1008.0625
2	22	22 – 36.25 = –14.25	203.0625
3	36	36 – 36.25 = –0.25	0.0625
4	32	32 – 36.25 = –4.25	18.0625
5	42	42 – 36.25 = 5.75	33.0625
6	24	24 – 36.25 = –12.25	150.0625
7	28	28 – 36.25 = –8.25	68.0625
8	38	38 – 36.25 = 1.75	3.0625
∑	290	0	1483.5000

Standard deviation $s = \sqrt{\frac{1}{n-1}\sum (x_i - \bar{x})^2} = \sqrt{\frac{1}{7} \cdot 1483.5} = 14.6.$

Compare this standard deviation… The standard deviation for Site 2 was 2.88 μg/m^3. The standard deviation at this Site is much larger. *How does this related to what you see in Figure 4.5?* Figure 4.5 shows a greater hinge spread and whisker-spread in group 1, supporting the difference observed when comparing the standard deviations.