**Excel Directions**

These directions can be shared with your students if you want to make this a self-guided activity. If your students have strong Excel skills, you might omit these directions. Of course, it is recommended to work through these steps yourself beforehand so you are in a better position to assist your students as they complete the activity.

Step 1: Install Data Analysis ToolPak: To create a histogram in Excel, you must first install the Data Analysis ToolPak. At the top of the screen, click the FILE tab. Click Options. In the Excel Options dialog box, click Add-Ins from the left menu bar. Click the Go… button. Select Analysis ToolPak and click OK.

Step 2: Create histogram: First, we will need the 71 lead values in a column. We will also need the numbers 0, 1, 2, …, 104 to get the data organized into bins properly. These directions assume you have the 71 lead values in cells B1 through B71, and the numbers 0–104 in cells C1 through C105. Click the DATA tab at the top of the screen, then click the Data Analysis button to the right. In the Data Analysis dialog box, select Histogram, then click OK. In the Histogram dialog box, select Chart Output. For the Input Range, select the 71 lead values (B1:B71), and for the Bin Range, select the 0–104 numbers (C1:C105). Click OK.

Step 3: “Fix” histogram (omit gaps): Drag a corner to enlarge the graph. Click twice on one of the histogram bars so the Format Data Point menu appears to the right. Under SERIES OPTIONS, and within that, Series Options (the icon that looks like a bar chart with 3 bars), change the gap width to 0%.

Step 4: Spotlight the two controversial points: Click on the 104 ppb value, making sure it is the only bar selected. Right-click your mouse. This should give you, among other options, a Fill option (with a paint pail icon). Click the Fill button and select a contrasting color. Repeat for the 20 ppb value, using the same contrasting color. A legend appears at the right side of the graph; it is not useful, so you may select and delete it.

Step 5: Add reference lines: Add a reference line for the 15 ppb action limit by clicking the INSERT tab on the top menu. In the Illustrations area, there is a Shapes feature (icon has a square, circle, and diamond). Select the Line feature. Use your mouse pointer to draw a vertical line at 15 ppm. If you right-click on the line, you can change the color; we suggest red. Repeat the process to add vertical reference lines for the 90th percentile—once for when it is computed on the full *n* = 71 sample and once for when it is computed on the *n* = 69 sample that excludes the two values. Text boxes can be inserted to indicate what the lines refer to.

Step 6: Confirm hand calculation of percentiles: The PERCENTILE.EXC function can be used to confirm our hand calculation of the 90th percentile, but note that Excel uses the second method, with the index formula *p*(*n* + 1), which gave us 19.6 for the full sample and 13 for the *n* = 69 sample. The arguments for the PERCENTILE.EXC function are (array, *k*), where the lead values are the array and *k* is a value between 0 and 1 indicating the percentile. Thus, we enter 0.9 for *k*. In an empty cell, type =PERCENTILE.EXC and supply the 71 lead values along with *k* = 0.9. This should give 19.6. In another empty cell, type =PERCENTILE.EXC and supply the 69 lead values (omit 20 and 104), along with *k* = 0.9. This should give 13.