

#3 Using Math to Get to the Source

Our inspectors have turned up several possible sources of lead contamination in the households of our children. The health department used a number of tests to determine whether the risk factors identified during the home inspection were the causes of the children's high blood lead. The results were inconclusive, meaning that while some of these factors caused some level of lead exposure, they didn't seem to be enough to cause such significant blood results. Now we must turn our attention to a possible *common source*.

- 1-3) According to the dossier you have assembled, list the blood level ($\mu\text{g}/\text{dl}$) of each of the three children in the three blanks below.

_____ , _____ , _____

- 4) Find the mean (average) blood level for this group, our initial "sample".

_____ $\mu\text{g}/\text{dl}$ (micrograms per deciliter)

- 5) How does this compare with the Centers for Disease Control's "level of concern"?

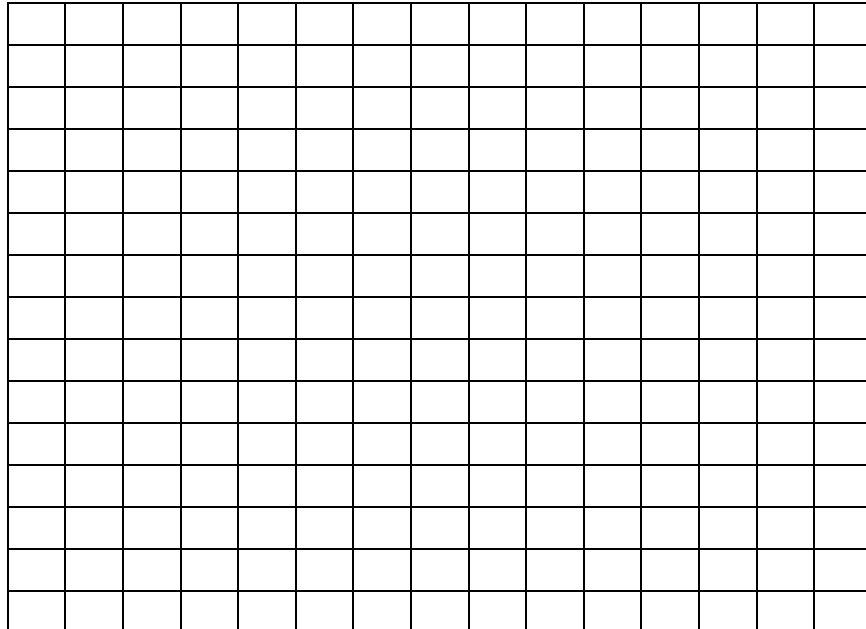
- 6) After the three children were diagnosed, the other mothers in the playgroup had their children's blood tested at a local doctor as well. Let's look at the blood lead levels of the other children belonging to the playgroup (a bigger sample).

<i>Name of Child</i>	<i>Blood Lead Levels</i>
Wendy	4
Lora	7
Gustavo	10
Paula	3
Susana	13
Dominick	8
Joseph	5
Diane	6
Ken	9

Find the mean blood level for the entire group (all 12 kids).

- 7) What is the range for the blood levels of all the children?

8) Label and plot the blood lead measurements and the mean blood lead level on the graph below.



9) Explain how it is possible that twice as many data points fall above the mean as below. Shouldn't there be an equal number of points on either side? Measure the length of the segment from each point to the line which denotes the mean as part of your answer.

10) Should we include the blood lead levels of the caregivers that bring the children to the group? Why or why not?

- 11) We know from large studies of many children that in the United States on average 4.4% of children have elevated blood lead levels (i.e. $> 10\mu\text{g}/\text{dl}$). However, a study in Miami showed that in some central areas of Miami 8.4% of children had elevated blood levels. Why might the children in some areas of Miami have a higher percent of children with lead poisoning than the rest of the nation?
- 12) If we assume that the 8.4% average is correct for the high risk areas of Miami, how many children would we expect to have elevated blood levels in the playgroup?
- 13) How many kids in the playgroup really do have "elevated" blood lead? Express this number as a percent of the whole playgroup.
- 14) This represents an increase of what percentage over what we had expected?
- 15) What is the next step in identifying a common source? Where might you begin the next part of your investigation?
- 16) **BONUS QUESTION** -- Could these children's high blood lead levels be purely the result of "chance"? Why or why not?