12

chapter problem

Does exposure to lead affect IQ scores?

An important study involved children who lived within 7 km (about 4 miles) of a large ore smelter in El Paso, Texas. Because the smelter emitted lead pollution, there was concern that these children would somehow suffer. The focus of this Chapter Problem is to investigate the possible effect of lead exposure on performance IQ scores as measured by the performance scale on Wechsler intelligence tests. Data from the study are included in Data Set 5 of Appendix B. Based on measured blood lead levels, the children were partitioned into a low lead level group, a medium lead level group, or a high lead level group. (See Data Set 5 for the specific blood lead-level cutoff values.) The relevant data are included in Table 12-1 on the following page (based on data from "Neuropsychological Dysfunction in Children with Chronic Low-Level Lead Absorption," by Landrigan, P. J., Whitworth, R. H., Baloh, R. W., Staehling, N. W., Barthel, W. F. and Rosenblum, B. F., *Lancet*, Vol. 1, Issue 7909).

Before jumping to application of a particular statistical method, we should first explore the data. Some results are shown in the table below. See also the following boxplots of the three sets of performance IQ scores. Informal and subjective comparisons show that the low group has a mean that is somewhat higher than the means of the medium and high groups. The boxplots all overlap, so differences are not dramatic. But we need more formal methods that

	Low Blood Lead Level	Medium Blood Lead Level	High Blood Lead Level
Sample Size *n*	78	22	21
$\bar{x}$	102.7	94.1	94.2
s	16.8	15.5	11.4
Distribution	Approximately Normal	Approximately Normal	Approximately Normal
Outliers	Potential low outlier of 51 and high outliers of 146 and 149, but they are not radically far from the other data values.	None	None

MINITAB BOXPLOTS OF PERFORMANCE IQ SCORES