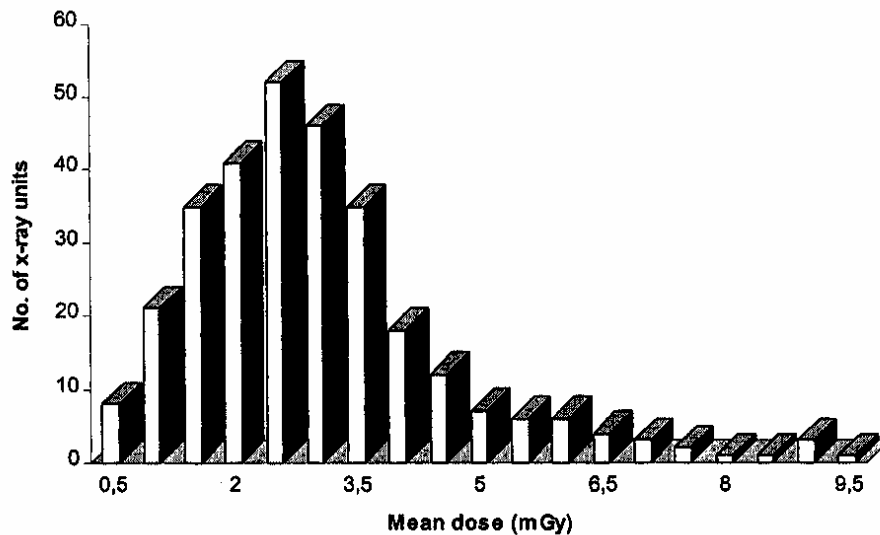


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Department of Health Sciences
Applied Biostatistics
Exercise: Variability

Question 1.

A study was carried out of the radiation dose used in dental X-ray diagnostics, based on quality control tests performed on 307 X-ray odontology installations in Spain. (*British Journal of Radiology*, 2001; **74**, 153-156.) The estimated mean exposure value was 2.89 ± 2.12 mGy, with a median of 2.43 mGy, and the 75th percentile was 3.37 mGy. The following figure shows a frequency plot, which excludes five cases with mean dose values above 10



mGy.

- (a) The mean dose was 2.89 with standard deviation 2.12 mGy. Why did the authors say 'The standard deviation suggests that very few X-ray units irradiate the patient above 7 mGy (less than 5% based on this work)'?

Question 2.

In a study of muscle training in patients with rheumatoid arthritis, patients were randomized to receive either a standardized exercise regime or normal care. Measurements were made before and after six weeks' treatment. The observer was blind to the treatment (*Physiotherapy Research International* 4: 55-67).

The following tables were given among the results:

TABLE 1: The study population

Characteristic	Exercise group	Control group
Number	17	18
Females (males)	15 (2)	14 (4)
Age (mean \pm SD) (years)	51.4 (\pm 11.1)	49.7 (\pm 15.3)
Body weight (mean \pm SD) (kg)	71.0 (\pm 23.4)	69.4 (\pm 17.9)
Height (mean \pm SD) (m)	1.63 (\pm 0.6)	1.66 (\pm 0.8)

TABLE 2: Mean (\pm SD) for parameters measured in the control and experimental subjects before and after completion of the six-week study

Measure	Control group		Experimental group	
	Pre-test	Post-test	Pre-test	Post-test
Peak speed (deg/sec ⁻¹)	125.2 (\pm 33.9)	121.6 (\pm 27.7)	132.0 (\pm 40.6)	154.0 (\pm 45.8)
TUG (sec)	12.6 (\pm 1.5)	12.2 (\pm 1.3)	11.7 (\pm 1.9)	10.4 (\pm 1.8)
P _{VAS} (mm)	4.1 (\pm 2.4)	3.9 (\pm 2.4)	4.3 (\pm 2.2)	2.4 (\pm 2.1)
HAQ	0.7 (\pm 0.4)	0.8 (\pm 0.3)	1.0 (\pm 0.6)	0.7 (\pm 0.6)

In these tables, 'post-test' means the test done after the six weeks of treatment. Peak speed is the peak angular velocity of the knee movement in rising from a sitting position, measured in degrees per second. TUG is the time to get up and go from a sitting position, in seconds. P_{VAS} is pain measured on a visual analogue scale, where patients are given a 10 cm line, marked 'no pain at all' at one end and 'worst pain you can imagine' at the other. The patient marks the point which they think best represents the pain. HAQ, health assessment questionnaire, is a scale of limitations on activity, high scores being more limited. (*Physiotherapy Research International*, 1999; 4: 55-67)

- What does 'SD' stand for and what does it mean?
- In Table 1 there are two obvious misprints in the standard deviations. What are they?
- In Table 2, there are two obvious misprints in the units in which variables are measured. What are they?
- In Table 2, which variables must have a skew distribution?

Question 2 taken from Martin Bland and Janet Peacock: *Statistical Questions in Evidence-based Medicine*, Oxford University Press, Oxford, 2000.