Suggested answers: Paper critique of 'A radiographic method for assessing lung area in neonates'

1. *What is the coefficient of repeatability? How can the intraobserver coefficient of repeatability of 1.0 cm^2 be interpreted?* The coefficient of repeatability is calculated either from twice (or 1.96 times) the standard deviation of the differences or from $2\sqrt{2}$ or $1.96\sqrt{2}$) times the within subject standard deviation. We expect that 95% of differences between pairs of measurements will be less than the repeatability. Thus we expect that if pairs of measurements are made on the same infant by the same observer, 95% of such pairs of lung areas will be closer than 1.0 cm^2.
2. *What is the purpose of the figure?* The figure is to investigate whether the measurement error between the observers can be assumed to be uniform, or varies with the magnitude of the measurement. Here the number of observations is small, but there is nothing to suggest that the observations become more widespread as the lung area increases.
3. *What can we deduce about the effect of using a different observer to measure lung area?* The intraobserver repeatability coefficient was 1.0 cm^2, the interobserver repeatability coefficient was 1.06 cm^2. Thus the differences when two different observers measured were more variable by only a tiny amount. The observer makes very little difference to the precision.
4. *Why did the authors use the Spearman rank correlation coefficient?* Both measured lung area and lung volume have positively skew distributions, as shown by the median being nearer to the lower end of the range than to the upper. Thus neither variable follows a Normal distribution. For a correlation coefficient we need Normal data. They could either use a transformation, such as the logarithm, or use a method which is unaffected by skewness. They chose the Spearman rank correlation coefficient.
5. *What are the problems with this approach?* Correlation does not tell us how good lung area will be at predicting lung volume. The correlation will depend on how variable the subjects were. The rank correlation cannot be interpreted in terms of the measurements for an individual child.
6. *Why would the 95% limits of agreement method not be possible here?* We could not use limits of agreement because we are not comparing methods of measuring the same thing. The differences between the lung area and lung volume would not mean anything. They are in different units (cm^2 and cm^3).
7. *What other analysis might be preferable to that used?* A plot of lung volume against lung area would help to show how closely the two measurements were related. Regression of lung volume against area, using a logarithmic transformation, would enable us to predict volume from area, with a 95% confidence interval for the predicted lung volume. This would not depend on the choice of the sample of babies.

8. *The authors' conclusion was that 'computer assisted analysis of the chest radiograph lung area is a reliable method of assessing lung volume in neonates.' Is this supported by the results?* It would be reasonable to conclude that the measurement of lung area is repeatable. Two measurements of lung area are unlikely to be more than one square cm apart, which is small compared to the standard deviation of measured area, almost five square cm. However, the authors only present a rank correlation between measured volume and lung area. The correlation is highly significant and there is strong evidence that a relationship exists in the population. The correlation is not very high, however, and evidence of a relationship is not the same as evidence of a reliable prediction. This correlation does not indicate a close relationship, although the closeness would depend on the range of the sample chosen. Correlation is not usually very helpful in comparing different methods of measurement.