

S1 Appendix. Methodology for estimating sensitivity and specificity

The study design provided two estimates of reader sensitivity: one from the 10% sample of radiographs reviewed when reader A and B were in agreement, and the other from radiographs reviewed when the two readers were in disagreement. To obtain an overall estimate of sensitivity we applied the law of total probability:

$$p(T + | D+) = p(T + | D+, A +)p(A + | D +) + p(T + | D+, A -) (1 - p(A + | D+))$$

Where

T+ = reader classifies radiograph pneumonia positive

D+ = radiograph true positive (as decided by the expert panel)

A+ = readers agree

A- = readers disagree.

To calculate probability of agreement for true positives we used data presented in Table 4, S2 Table, Figure 1, and the formula:

$$p(A + | D +) = \frac{p(D + | A+)p(A+)}{p(D + | A+)p(A+) + p(D + | A-)p(A-)}$$

Similarly, to calculate specificity we used:

$$p(T - | D-) = p(T - | D-, A +)p(A + | D -) + p(T - | D-, A -) (1 - p(A + | D-))$$

Where

T- = reader classifies radiograph pneumonia negative

D- = radiograph true negative.

And for the probability of agreement for true negatives we used:

$$p(A + |D -) = \frac{p(D - |A+)p(A+)}{p(D - |A+)p(A+) + p(D - |A-)p(A-)}$$