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**Applied Biostatistics**  
**Exercise: confidence intervals**

**Question 1**

A UK study of factors affecting the outcome of pregnancy among 1513 women reported that the overall incidence of preterm births was 7.5%, SE=0.68%, 95% CI 6.1 to 8.8% (Peacock *et al.* 1995).

- (a) What is meant by SE=0.68%?
- (b) What is meant by 95% CI 6.1 to 8.8%?
- (c) How would the confidence interval change if 90% limits were used?
- (d) How would the confidence interval change if 99% limits were used? }

Another study conducted at about the same time in Denmark and including 51851 women, reported that the overall incidence of preterm birth was 4.5% (95% CI 4.3 to 4.7%).

- (e) Explain why this 95% confidence interval is narrower than that reported in the UK study. Do you think that there is a real difference in preterm birth rates between the two populations being studied?

**Question 2**

141 babies who developed cerebral palsy were compared to a control group of babies made up from the two babies immediately after each cerebral palsy baby in the hospital delivery book. Hospital notes were reviewed by a researcher who was blind to the baby's outcome. Failure to respond to signs of foetal distress was noted in 25.8% of the cerebral palsy babies and in 7.1% of the delivery book babies. The difference was 18.7 percentage points, with standard error 4.2 and 95% confidence interval 10.5 to 26.9 percentage points (Gaffney *et al.* 1994).

- (a) What is meant by 'the difference was 18.7 percentage points'?
- (b) What can we conclude from the 95% confidence interval?

**Question 3**

In a study of bone density and falls in older women, 118 volunteers were randomized to receive either calcium supplements plus a program of exercise classes or to calcium alone for two years. Twelve subjects dropped out from the calcium group and 14 from the calcium group taking exercise, leaving 92 subjects who completed the two year project. The percentage change in bone mineral content and bone mineral density in two years was calculated for each individual. The authors reported that for the ultradistal forearm the change in bone mineral content was -2.6 (95% confidence interval -4.6 to -0.6) in the calcium only group and 1.14 (95% confidence interval -0.8 to 3.1) in the calcium group taking exercise (McMurdo *et al.* 1997).

- (a) What do the confidence intervals for the change in bone mineral content mean? To what population do they refer?

(b) Confidence intervals are presented for each group separately. Suggest a more informative confidence interval. To which population would this relate?

### **References**

Gaffney, G., Sellers, S., Flavell, V., Squier, M., and Johnson, A. (1994) Case-control study of intrapartum care, cerebral palsy, and perinatal death. *British Medical Journal* **308**, 743-50.

McMurdo, M.E., Mole, P.A., and Paterson, P.R. (1997) Controlled trial of weight bearing exercise in older women in relation to bone density and falls. *British Medical Journal* **314**, 569.

Peacock, J.L., Bland, J.M., and Anderson, H.R. (1995) Preterm delivery: effects of socioeconomic factors, psychological stress, smoking, alcohol, and caffeine. *British Medical Journal* **311**, 531-5.

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