Fillings – what are the chances?

Aims

> ➢ to help learners apply their understanding of the Poisson distribution to real life data

> ➢ to give learners time to practice and apply skills

Prepare

Start Excel on the PC and then open the *Sunhats & Fillings.xls* workbook. (Make sure that you save the project on a regular basis during the session.)

The columns of sheet 1 in this workbook correspond to the questions in Phase 6 secondary questionnaire of CensusAtSchool. You will find a pdf file of this questionnaire on the CensusAtSchool website.

Set the Scene

Kingsmead school has been approached by the local Primary Care Trust (PCT) to pilot dental hygiene support for pupils in school – with a particular focus on reducing the numbers of pupils needing fillings. There is only funding available for one year group but the PCT and the school are keen that the pilot is as effective as possible and tackles the worst of the issue.

The head of maths suspects that this is a problem her A level maths group could investigate – and although she does not have filling data available for Kingsmead, she has a random sample of data available for schools across the UK. Can modelling help here?

Apply

1) On the sheet 'Phase 6 data,' for the data in the column headed **teethfillings**:

   a) What type of variable is involved here?

   b) Could the distribution of this variable be Poisson?

   c) Use the **teethfillings** data which is summarised in the pivot table in sheet 2 and calculate basic summary statistics for the different year groups. In particular, ensure you have calculated the mean for year groups 7, 8, 9, 10, 11.

   d) Could the distribution of the number of teeth fillings for a particular year group have a Poisson distribution?

   e) Using the Excel formula "Poisson," assuming that the distribution is Poisson in each case, for each of the year groups in c), calculate the probability that a randomly selected child will have:

   i) No fillings

   ii) Between 1 and 3 fillings (inclusive)

   iii) More than 3 fillings.

   Do you think that the year groups differ in any way?

   NB. Excel formula: =POISSON(x, mean, cumulative) is required here where x is the number of occurrences and cumulative requires a TRUE or FALSE value which specifies whether it is just the count that is of interest (FALSE) or all the values before it (TRUE). Thus where the mean is 1.6, =POISSON(2,1.6,TRUE) returns the probability that a child has 0,1 or 2 fillings in a year group where the mean number of fillings is 1.6.

   f) Which year group do you think should be targeted for the dental hygiene pilot and why?

g) The data used is not specific to Kingsmead school. Will this data be sufficient for making inferences? How might the investigation be improved? What are the pros and cons for using this data?