



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

Open Excel. Open Fillings what are the chances.x/s. (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 *CensusAtSchool* questionnaire 2005/06. (See page 3.)

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 '2005 2006 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.



Fillings – What are the Chances?

- 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?



Fillings – What are the Chances?

CensusAtSchool Questionnaire 2005/06

<p>1. State the first part of your postcode (eg NG3 or PL23)</p> <input type="text"/>	<p>9. When going out on sunny days in the summer do you:</p> <p>Use Sun Cream <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never</p> <p>Wear a hat for protection <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never</p> <p>Wear sunglasses <input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never</p>	<p>15. What one thing do you think would improve your local environment?</p> <input type="checkbox"/> Less Traffic <input type="checkbox"/> Cycle Paths <input type="checkbox"/> Less Litter <input type="checkbox"/> Playgrounds <input type="checkbox"/> More Trees <input type="checkbox"/> More Shops <input type="checkbox"/> More Sports Facilities <input type="checkbox"/> Other - state _____
<p>2. Are you a ?</p> <input type="checkbox"/> Boy <input type="checkbox"/> Girl	<p>10. On how many days last week did you do physical activity that made you huff and puff, sweat or get tired?</p> <p>0 1 2 3 4 5 6 7</p>	<p>16. What best describes the kind of building you live in?</p> <input type="checkbox"/> Detached House/ Bungalow <input type="checkbox"/> Semi Detached <input type="checkbox"/> Terrace <input type="checkbox"/> Apartment/ Flat <input type="checkbox"/> Other
<p>3. Please state your age in completed years.</p> <input type="text"/> years	<p>11 a) How often do you (honestly) brush your teeth each day?</p> <input type="checkbox"/>	<p>17. How do you usually travel to school?</p> <input type="checkbox"/> Walk <input type="checkbox"/> Bus <input type="checkbox"/> Car <input type="checkbox"/> Cycle <input type="checkbox"/> Rail <input type="checkbox"/> Other
<p>4. Complete the following measurements.</p> <p>HEIGHT..... centimetres</p> <p>FOOT LENGTH..... centimetres</p> <p>Right Elbow to Wrist..... cm</p> <p>Open Arm Span..... cm</p>	<p>11 b) How many fillings do you have?</p> <input type="checkbox"/> Unsure <input type="checkbox"/>	<p>18. If you had £1000 to give to a charity of your choice what kind of organisation would you choose?</p> <input type="checkbox"/> Arts <input type="checkbox"/> Children <input type="checkbox"/> Education/Youth development <input type="checkbox"/> Environment <input type="checkbox"/> Health <input type="checkbox"/> International Aid <input type="checkbox"/> Law/Justice <input type="checkbox"/> Sport <input type="checkbox"/> Wildlife/ Animals <input type="checkbox"/> Other
<p>5. What is your favourite food type?</p> <input type="checkbox"/> Dairy (milk, cheese, eggs) <input type="checkbox"/> Protein (beans, meat, fish) <input type="checkbox"/> Carbohydrates (bread, pasta) <input type="checkbox"/> Fruit/Veg (apples, carrots)	<p>12. Which do you think is the most important environmental issue that needs to be dealt with in the next 10 years?</p> <input type="checkbox"/> Air Pollution <input type="checkbox"/> Global Warming <input type="checkbox"/> Water Pollution <input type="checkbox"/> Flooding <input type="checkbox"/> Energy Sources <input type="checkbox"/> Road Congestion <input type="checkbox"/> Landfill Sites <input type="checkbox"/> Other - state _____	<p>19. Estimate how often you contact your friends each week:</p> <input type="checkbox"/> Text <input type="checkbox"/> e-mail <input type="checkbox"/> Telephone (landline) <input type="checkbox"/> Telephone (mobile)
<p>6. In a normal week on how many days do you eat meat?</p> <p>0 1 2 3 4 5 6 7</p>	<p>13. Do you think that YOU personally do enough to improve the environment.</p> <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unsure	<p>20. Estimate the 3 angles given by the online questionnaire.</p> <input type="text"/> <input type="text"/> <input type="text"/>
<p>7. How many (palm of hand) portions of the following do you regularly eat per day?</p> <input type="checkbox"/> Fruit <input type="checkbox"/> Vegetables <input type="checkbox"/> Sweets <input type="checkbox"/> Crisps	<p>14. Which of the following does your household recycle? (Tick all that apply)</p> <input type="checkbox"/> Paper <input type="checkbox"/> Glass <input type="checkbox"/> Tins <input type="checkbox"/> Plastic <input type="checkbox"/> Other <input type="checkbox"/> Nothing	
<p>8. In the last year have you gone on a diet, changed your eating habits or done anything to control your weight. (leave blank if you wish)</p> <input type="checkbox"/> Yes <input type="checkbox"/> No		