

The logo for MEI (Mathematics Education in Industry) features the letters 'MEI' in a bold, sans-serif font. The 'M' and 'I' are dark blue, while the 'E' is a lighter blue.

**Innovators in  
Mathematics  
Education**

**Mathematics in  
Education and  
Industry**

Over 50 years  
at the forefront  
of Mathematics  
Education



# Statistics in Further Mathematics

# A travel survey

- In 2011 30% of employed people in Bromley travelled to work by train.
- It is a few years since 2011.
- Imagine you are going to do a survey of a random sample of 100 employed people from Bromley.
- How many travelling by train in the survey would convince you that the percentage travelling by train is no longer 30?

# What is a confidence interval?

**Table 3 95% confidence intervals for average (mean) employee wages, 2011, by gender and sector**

**Mean hourly earnings (£), 2011**

UK employees

**95% confidence interval**

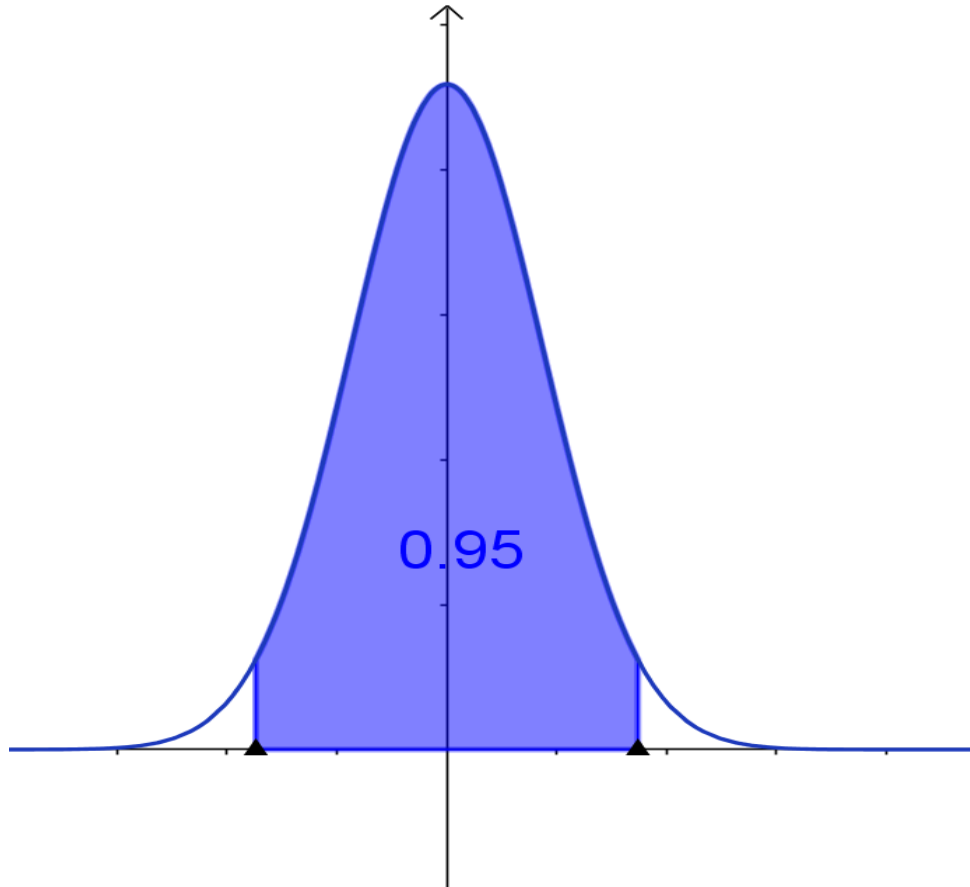
	<u>Estimate</u>	<u>lower bound</u>	<u>higher bound</u>
<u>whole economy</u>			
all employees	£12.60	£12.39	£12.81
trade union members	£14.18	£13.92	£14.44
non-members	£12.01	£11.75	£12.27

From an ONS publication

# Confidence Intervals

- A random sample of 49 adults had a mean pulse rate of 69.59 and a variance of 148.
- The Central Limit Theorem says that sample means will be Normally distributed,  $\bar{X} \sim N(\mu, \frac{\sigma^2}{49})$ .
- $\bar{X} - \mu \sim N(0, \frac{\sigma^2}{49})$  where  $\sigma^2$  is the population variance.
- Using 148 as an estimate of the population variance,  $\bar{X} - \mu \sim N(0, \frac{148}{49})$

The difference between sample mean and population mean is Normally distributed with mean 0 and standard deviation 1.738. 95% of the time the difference will be within 2 standard deviations of the mean (0).



A 95% CI for the population mean is  
 $\bar{x} \pm 2s$  (approx.)  
 $69.59 \pm 2 \times 1.738$

# What is a confidence interval?

- If many such confidence intervals were calculated, 95% of them would contain the true population mean.

# Some ready prepared simulations

- See the files from Neil Sheldon's 2014 MEI conference session Press F9. Downloadable at <http://mei.org.uk/conference14>



# About MEI

- Registered charity committed to improving mathematics education
- Independent UK curriculum development body
- We offer continuing professional development courses, provide specialist tuition for students and work with industry to enhance mathematical skills in the workplace
- We also pioneer the development of innovative teaching and learning resources