

PUB – POS 316 Week 7

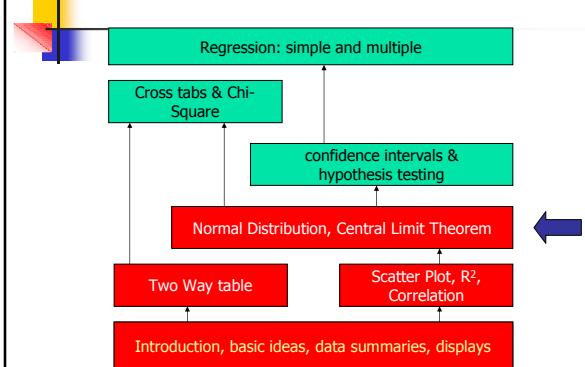
Normal Distribution, Central Limit Theorem

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Last updated – Jan 1, 10

Course Road Map



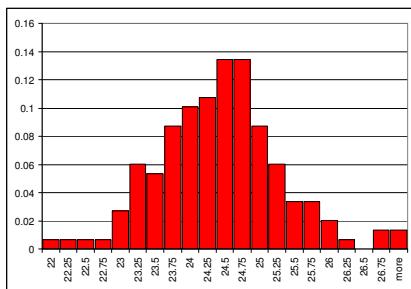
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Review

Example: Biological clocks



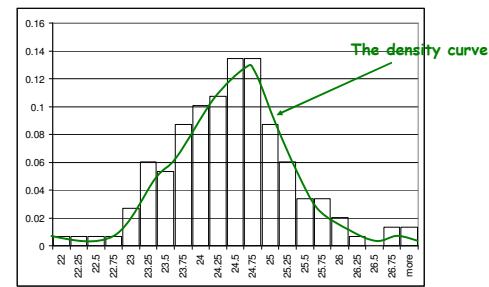
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Review

Example: Biological clocks



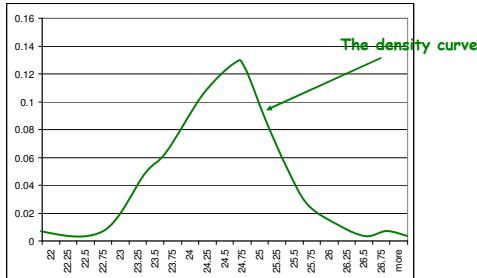
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Review

- Example: Biological clocks



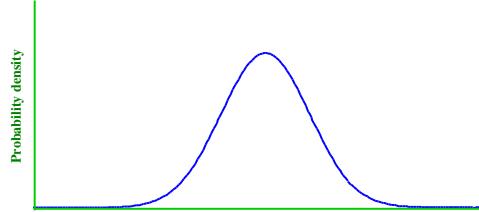
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Review

- Normal distribution is a bell-shaped, symmetric density curve. Average is shown by μ and variance is shown by σ .



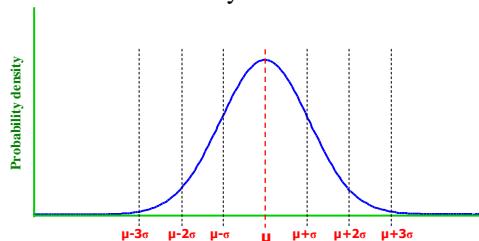
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Review

- Normal distribution is a bell-shaped, symmetric density curve. Average is shown by μ and variance is shown by σ .



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Review

Density curve

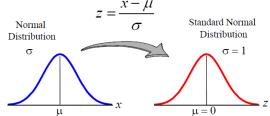
- Normal distribution is a bell-shaped, symmetric density curve. Average is shown by μ and variance is shown by σ .
- Standard normal distribution is a normal distribution with $\mu=0$, $\sigma=1$. $N(0, 1)$
- Many times we want to transform a normal distribution to a standard normal distribution in order to be able to say something about the distribution.
- Use: $Z=(X- \mu)/ \sigma$

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Review



Clarify the **normal distribution** characteristics

Find the equivalent **z-distribution** (standard normal dis)

Make inferences for the **normal distribution**

Analyze **z-distribution**

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Review

Example:

- Scores on SAT tests are approximately normally distributed with mean of 500 and standard deviation of 100. What is the proportion of scores between 550 and 650?

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The Main Procedure

Samples (means).

- The central limit theorem:** when n is large, the sampling distribution of the sample mean is approximately normal with mean of μ and $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$
- Basically when n is very very very large, we get exactly μ !!

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The Main Procedure

Samples (means).

- The central limit theorem:** when n is large, the sampling distribution of the sample mean is approximately normal with mean of μ and $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$
- Example: You take a sample of 36 from a population with the mean of 100, and standard deviation of 10. Find the mean and standard deviation of the sampling dis. of your sample mean.

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The Main Procedure

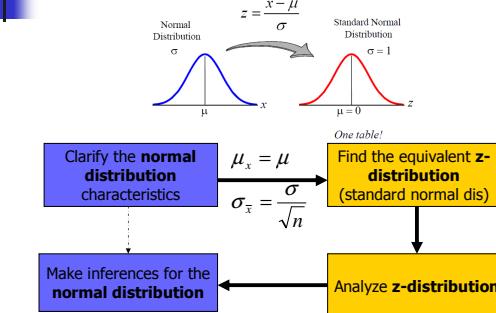
- samples (mean)
 - Example D: Scores on SAT tests are approximately normally distributed with mean of 500 and standard deviation of 100. We take a sample of 100 people. What is the probability that the mean sample becomes less than 480 about this?

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The Main Procedure



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The Main Procedure

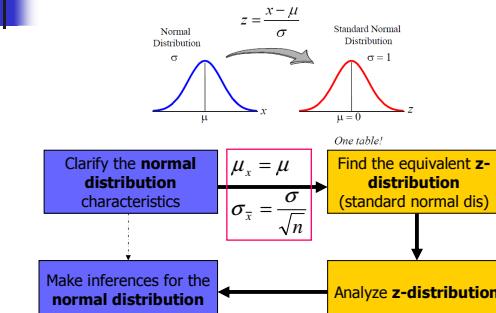
- samples (mean)
 - Example D: Scores on SAT tests are approximately normally distributed with mean of 500 and standard deviation of 100. We take a sample of 10,000 people. What is the probability that the mean sample becomes less than 480?

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The Main Procedure



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The Main Procedure

- samples (mean)
 - Example D: Scores on SAT tests are approximately normally distributed with the mean of 500 and the standard deviation of 100. We take a sample of 10,000 people. What is the probability that the mean sample becomes less than 480?
 - Let's discuss.. What if I get a sample of 16 people?
 - What is the proper sample size?

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The Main Procedure

- samples (mean)
 - Example E: Scores on SAT tests are approximately normally distributed with mean of 500 and standard deviation of 100. We take a sample of 100 people. What is the probability that we get more than 4% error?

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The Main Procedure

- Applications of standard normal distribution to the study of
 - 1) population (mean)
 - 2) samples (mean)
 - 3) samples (proportion)
 - Next class

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