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اسم المادة باللغة العربية : الحصاء الحياتي
اسم المادة باللفة الانكليزية : Biostatistics لـ اسم المحاضرة السادسة باللغة العربيه: التوزيع الاحتمالي المستمر
Continuous probability distribution :اسم المحاضرة السادسة باللغة الانكليزية

## L6 <br> CONTINUOUS PROB ABILITY DISTRIBUTIONS

- The standard deviation is a way statisticians use to measure the amount of variability (or spread) among the numbers in a data set.
- It is a standard (or typical) amount of deviation (or distance) from the average (or mean, as statisticians like to call it).
- It is also used to describe where most of the data should fall, in a relative sense, compared to the average.
- The following shows a histogram of erythromycin content of 500 tablets from an Alpha tablet machine



## Characteristics of the Normal Distribution

1. It is symmetrical about its mean, $\mu$ the curve on either side of $m$ is a mirror image of the other side.
2. The mean, the median, and the mode are all equal.
3. The total area under the curve above the x -axis is one square unit. This characteristic follows from the fact that the normal distribution a probability distribution.
Because of the symmetry already mentioned, 50 percent of the area is to the right of a perpendicular erected at the mean, and 50 percent is to the left.


FIGURE 4.6.1 Graph of a normal distribution.
4. If we erect perpendiculars a distance of 1 standard deviation from the mean in both directions, the area enclosed by these perpendiculars, the x-axis, and the curve will be approximately 68 percent of the total ar a distance of two standan approximately 95 percen extending them a distand approximately 99.7 perc

(a)




5. The normal distribution is completely determined by the parameters $\mu$ and $\sigma$.In other words, a different normal distribution is specified for each different value of $\mu$ and $\sigma$. Different values of $\mu$ shift the graph of the distribution along the $x$-axis as is shown in Figure 4.6.3. Different values of s determine the degree of flatness or peakedness of the graph of the distribution as is shown in Figure 4.6.4. Because of the characteristics of these two parameters, $m$ is often referred to as a location parameter and $s$ is often referred to as a shape parameter


FIGURE 4.6.3 Three normal distributions with different means but the same amount of variability.


FIGURE 4.6.4 Three normal distributions with different standard deviations but the same mean.

The last-mentioned characteristic of the normal distribution implies that the normal distribution is really a family of distributions in which one member is distinguished from another on the basis of the values of $\mu$ and $\sigma$.

Importance of normal distribution: -
-To expect the location of most of the data in relation to others (means \& standard deviations of population )
-Form the basis of significance testing

The most important member of this family is the standard normal distribution or unit normal distribution, as it is sometimes called, because it has a mean of 0 and a standard deviation of 1 . It may be obtained from Equation 4.6 .1 by creating a random variable

$$
\begin{gathered}
X^{-}-\mu \\
Z=--------------------~
\end{gathered}
$$

$$
\sigma
$$

- $\mathrm{Z}=\mathrm{Z}$ score
- $\mathrm{X}^{-}$sample mean
- $\mu=$ population mean
- $\sigma=$ standard deviation of population
- Probability =
$=\mu \pm 1 \sigma(\mathrm{SD}$ of population $)=68 \%=1 / 268 \%=34 \%$
$=\mu \pm 2 \sigma($ SD of population $)=95 \%=1 / 295 \%=47.5$
$=\mu \pm 3 \sigma($ SD of population $)=99 \%=1 / 299 \%=49.5$

Z-score: Z score is a measure of the distance that a particular population member is from the population's mean. It is so named because it is frequently used on populations that have a normal distribution, which is also known as a Z distribution.

- A z-score is also known as a standard score because it is measured in units of standard deviation, which allows observations from different distributions to be compared

In statistics, a z-score (or standard score) is used to compare means from Different normally distributed sets of data. The actual score indicates how many standard deviations an observation is above or below the mean.

- The z-score is useful in research utilizing statistical analysis because it allows for the comparison of observations from different normal distributions. In effect, when items from different data sets are transformed into z-scores, then they may then all be compared. This article will show you how to calculate a z-score (or standard score).

EX : The weights of a certain population of young adult females are approximately distributed with a mean of 132 pounds and a standard deviation of 15 . normally Find the probability that a subject selected at random from this population will weigh:
(a)Between 117-147 pounds. (b) Between 102 and 162 pounds
(c) Between 87 and 177

Sol :
(a)Between 117-147 pounds

117-132

- = ------------------ =-1

probability $=-1<\mathrm{z}>+1=68 \%$
(b) Between 102 and 162 pounds

177
87-132
177-132
$=-------------3 \backslash=---------==3 \backslash \quad$ So probability $=-3<Z>+3=99 \%$
15
15
$\mathrm{mg} / \mathrm{dl}$. Find the probability that an individual picked at random from this population will have a cholesterol value:
a - between 180 and $220 \mathrm{mg} / \mathrm{dl}$
b - Less than $160 \&$ and greater than 240 mg
Q2 $\$ Assume that the mean length of stay of patients in certain medical wards 80 days with a standard deviation of 10 . Suppose that the length of stay is normally distributed. Find the probability of a randomly chosen:
a-Less than 90 days.
b-Between 100 - 110.

Q3\If the mean fasting blood sugar in general population is 110 mg per 100 ml with a standard deviation of 7 , is it reasonable to assume that the following individuals are diabetics?

- 112, 130, 108, 159, 92.

