(Lecture 2)

ERRORS IN DEMOGRAPHIC DATA:

The accuracy of demographic statistics varies from one country to another. That happened, because of lack of administrative machinery, individual ignorance about certain personal details

Errors in the demographic data are mainly of two types, namely, coverage and content errors.

1. **Coverage Errors** (خطأ التغطية) : are due to persons being missed, Individual of a given age may have been missed by the census officials, this type is called **under enumeration**, while the second type represents **over enumeration**, counted more than once (i.e. counted twice).
2. **Content Errors** in demographic data refer to inaccuracies arising during the reporting, tabulation, and compilation of information. The primary sources of content errors include:
   a. **The respondent** (المستجيب): Mistakes made by individuals providing information, whether intentional or unintentional.
   الأخطاء التي يرتكبها الأفراد الذين يقدمون المعلومات، سواء بقصد أو بغير قصد
   b. **The enumerator** (العدّاد)- where he/she classifies a person incorrectly even though give the correct information.
   حيث يقوم بتصنيف شخص ما بشكل غير صحيح على الرغم من تقديم المعلومات الصحيحة.
   c. **The coding process** (خطا الترميز)- errors caused from the failure to allocate information on the census or survey schedule to the proper code.
   الأخطاء الناتجة عن الفشل في تخصيص المعلومات الخاصة بجدول التعداد أو المسح بالرمز المناسب.
   d. **he editing process (خطأ عملية التحرير)** : Errors introduced during the editing process, which involves reviewing and correcting data for consistency and accuracy.
   الأخطاء التي تحدث أثناء عملية التحرير، والتي تتضمن مراجعة البيانات وتصحيحها للتأكد من اتساقها ودقتها.
   e. **Errors may arise at all stage** of the compiling process or during tabulations.
   قد تنشأ أخطاء في جميع مراحل عملية التجميع أو أثناء الجدولة.

❖ Demographic indicators:

It aims to measure the frequency of occurrence of vital events (births, deaths, marriage, divorce, migration) that are recorded in a particular society regularly throughout the year. This measurement is taken in a year for a specific period of time, which is often a year.

1. **Crude rates**:

Crude death rates can be calculated using the following formula:

$$\mu_{death} = \frac{D}{\bar{P}} * k$$

Where

$$\bar{P} = \frac{P_1 + P_2}{2}$$

μ_{death}: crude death rates

D: Death rate during the year

$\bar{P}$: number of the population in the middle of the year

k: is constant (mostly 1000)

While the crude birth rate, it can be calculated as follows:

$$\mu_{brith} = \frac{B}{\bar{P}} * k$$

Where

B: birth rate during the year

Note that this rate represents the frequency of births per person per year, and is often expressed as the number of births per 1,000 populations. Crude rates can be calculated for the population of one country or for the population of any geographic region.

By calculating the difference between the crude birth and death rates, **The Crude Rate of Natural Increase** can be obtained, as follows:

$$NI = \left(\frac{B}{\bar{P}} - \frac{D}{\bar{P}}\right) * 1000$$

$$= \frac{(B - D)}{\bar{P}} * 1000$$

2. Special rates:

It is known that the probability of death, marriage, divorce, etc. is not the same degree for all individuals in society, and these probabilities depend on a number of factors, the most important of which are age and gender.

Mortality has less impact on average work, and it is different for males than it is for females. Marriage and childbearing are related to age, and marriage divides society into homogeneous groups.

We call these rates the **special rates**. The special rates can be calculated according to the available statistics as follows:

$$\mu_x = \frac{D_x}{P_x} * k$$

μ_x: Age-specific death rate *x*

D_x: Number of deaths within the age group *x*

P_x: Population mean (population) for age group number *x*

k: is constant (mostly 1000)

We can be calculated the age specific birth rate as the same way as follows:

$$\mu_x = \frac{B_x}{P_x} * k$$

μ_x: Age-specific birth rate *x*

D_x: Number of birth within the age group *x*

3.Standard rate:

A standard rate, often used in demographic and epidemiological studies, is a rate that has been adjusted or standardized to account for differences in age, sex, or other relevant factors between populations. Standardization allows for fair comparisons between groups or

populations with different demographic compositions. The two common types of standardization are:

1. Age-Standardized Rate: Adjusts for differences in age distribution between populations. This is particularly important when comparing health outcomes or mortality rates across populations with varying age structures.

لمعدل الموحد للعمر: يضبط الاختلافات في التوزيع العمري بين السكان. وهذا مهم بشكل خاص عند مقارنة النتائج الصحية أو معدلات الوفيات بين السكان ذوي الهياكل العمرية المختلفة.

2. Sex-Standardized Rate: Adjusts for differences in sex distribution when comparing rates between populations with different gender compositions.

المعدل الموحد للجنس: يضبط الاختلافات في توزيع الجنس عند مقارنة المعدلات بين السكان ذوي التركيبات الجنسية المختلفة.

The standardization process involves applying weights to different age or sex groups to create a standardized rate that reflects the hypothetical rate that would exist if the populations being compared had the same demographic structure.

تضمن عملية التوحيد تطبيق الأوزان على مجموعات عمرية أو جنسية مختلفة لإنشاء معدل موحد يعكس المعدل الافتراضي الذي قد يكون موجودًا إذا كان السكان الذين تتم مقارنتهم لديهم نفس التركيبة الديموغرافية.

There are two methods for finding standard rates:

1. **Direct method**: This method boils down to choosing one of the population communities as a standard, and considering the relative distribution by age of the population of this community as weights that outweigh the rates of the actual community.

In mortality (death) rates, for example, the standard mortality rate is extracted in the following formula:

$$R_{death} = \sum \mu_x^o w_x^s$$

And

$$w_x^s = \frac{P_x^s}{\sum P_x^s}$$

Where:

R_{death}: Direct standard death rate

μ_x^o: The death rate for the actual population

w_x^s: The weights with which the rates of the actual population are given

Example 1:

In the following table showing the death rates for the actual population and the population in the standard population for the same age groups, find the standard death rate using the direct method.

age categories	the death rates for the actual population(μ_x^o)	the population in the standard population(P_x^s)	w_x^s	$\mu_x^o w_x^s$
-35	0.0047	27242	0.355	0.0017
35-44	0.0071	23971	0.312	0.0022
45-45	0.0146	14247	0.186	0.0027
55-46	0.0285	7472	0.097	0.0028
56-	0.053	3811	0.050	0.027
Sum.		76743		0.0364

Solution:

$$w_x^s = \frac{P_x^s}{\sum P_x^s}$$

$$w_{35}^s = \frac{P_{35}^s}{\sum P_{35}^s} = \frac{27242}{76743} = 0.355$$

$$w_{44}^s = \frac{P_{44}^s}{\sum P_{44}^s} = 0.312$$

:

Then

$R_{death} = \sum \mu_x^o w_x^s$= 0.0364