Lecture 3

1. **Indirect method (rate):** This method is used when the gender and age distribution and the total vital events of the population in the actual community match. This method is summed up by obtaining the estimated number of vital events prevailing in the standard community E^s, by summing the result of multiplying the total age population in the actual community P_x^o by the corresponding standard rates μ_x^s , i.e.

$$E^s = \sum P_x^o \, \mu_x^s$$

By dividing the total number of events that actually took place in the actual society E^o by the estimated number of these events E^s, we obtain an indicator *(I)* that expresses the difference between the demographic experience in the actual and standard societies, which is due to age or something else.

$$I = \frac{E^o}{E^s} = \frac{\sum P_x^o \mu_x^o}{\sum P_x^o \mu_x^s}$$

By multiplying this indicator by the standard raw rate, we obtain the standard rate by the indirect method

$$Ri_{death} = I * \mu^s$$

$$= \frac{E^o}{E^s} * \mu^s$$

$$Ri_{death} = \frac{\sum P_x^o \mu_x^o}{\sum P_x^o \mu_x^s} * \mu^s$$

Where:

E^o: the number of events in actual population

E^s: the estimated number of events in standard population

μ^s: the crude rate in standard population

Example 2:

The following table shows the distribution of the population in the actual population and the standard death rates by age groups. If you assume that the number of actual deaths in the actual population E^o= 1055 and the crude death rate in the standard country μ^s= 0.0091 , find the standard death rate using the Standard indirect method.

age categories	the population in the standard population(P_x^o)	the death rates for the actual population(μ_x^s)	$E^s = \sum P_x^o \mu_x^s$
-35	7068	0.0021	14.84
35-44	9614	0.0032	30.76
45-54	9537	0.0076	72.48
55-64	7453	0.0219	163.22
65-	4242	0.0777	329.60
Sum			610.9129

$$Ri_{death} = \frac{\sum P_x^o \mu_x^o}{\sum P_x^o \mu_x^s} * \mu^s$$

$$= \frac{1055}{610.9129} * 0.0091 = 0.0157$$

❖ **Measures of the gender and age composition of the population**

Measures of the gender and age composition of the population

1. The ratio of gender

There are three types of this ratio:

a. The ratio of males:

$$R_m = \frac{P_m}{P} * 100$$

b. The ratio of females:

$$R_f = \frac{P_f}{P} * 100$$

c. The ratio of the gender as a whole:

$$R = \frac{P_m}{P_f} * 100$$

2. The ratio of age:

This ratio is considered one of the basic indicators that can be calculated based on the type of population by age and gender, and is calculated as follows:

$$A_x = \frac{P_x}{\frac{1}{2}\left[P_{(x+n)} + P_{(x-n)}\right]} * 100$$

Where **n** is the length of class (category)

3. Dependency ratio:

The dependency ratio for any society depends on the fact that every member of society is a consumer of its material goods, but only a part of it contributes to the production of these goods.

The proportion of countries in which the proportion of the population that participates in the production of goods and services is high is better off from an economic standpoint than the other country in which this proportion is lower.

In agricultural societies, workers are widespread at an early age, and in other societies, the elderly contribute to production, while in some countries the elderly are not allowed to work, and therefore demographers have suggested expressing the population between the ages of 15 - 59 as the working age.

ان نسبة الاعالة لأي مجتمع تعتمد على حقيقة ان كل فد في المجتمع مستهلك لخيراته المادية، ولكن جزء منه فقط يساهم في انتاج هذه الخيرات. ان نسبة البلاد التي ترتفع فيه نسبة السكان الذين يشاركون في انتاج السلع والخدمات هم افضل حالا من الناحية الاقتصادية من البلد الاخر تقل فيه هذه النسبة.

ففي المجتمعات الزراعية ينتشر فيها العمال في سن مبكر، وفي مجتمعات اخرى يساهم كبار السن في الانتاج، بينما في بعض البلدان لا يسمح لكبار السن بالعمل، ولذلك فقد اقترح الديمغرافيين بالتعبير عن السكان من سن 15-59 بسن العمر.

There are three types of dependency ratios:

1. Total dependency ratio

$$Total\ dependency\ ratio = \frac{Number\ of\ nonworking\ age\ population\ (less\ than\ 15\ +\ more\ than\ 60\ years)}{The\ number\ of\ working-age\ population\ (between\ 15-59)\ years} * 100$$

2. Dependency ratio for the children

$$Dependency\ ratio\ for\ the\ children = \frac{Number\ of\ children\ under\ 15\ years\ of\ age}{The\ number\ of\ working-age\ population\ (between\ 15-59) years} * 100$$

3. Dependency ratio for the elderly

$$Dependency\ ratio\ for\ the\ elderly = \frac{Population\ aged\ 60\ years\ and\ older}{the\ number\ of\ working-age\ population\ (between\ 15-59) years} * 100$$

Example 3:
The following table shows the number of males and the number of females in a population, according to age groups, find:
1. The ratio of gender
2. Dependency ratio

age categories	No. male	No. female
0-4	5420	4420
5-9	3790	3800
10-14	5320	5430
15-19	2240	2800
20-24	3925	3950
25-29	3540	3640
30-34	3990	4000
35-39	4540	4670
40-44	5500	5800
45-49	5600	5730
50-54	5420	5600
55-59	5320	5475
60-	4990	5040
sum	59595	60355

Sol.

1. The ratio of gender

The total numbers of the population = No. male + no. female

Total = 59595 + 60355

= 119950

a. The ratio of males:

$$R_m = \frac{P_m}{P} * 100$$

$$= \frac{59595}{119950} * 100 = 49.6832\%$$

b. The ratio of females:

$$R_f = \frac{P_f}{P} * 100 = \frac{60355}{119950} * 100 = 50.3168\%$$

c. The ratio of the gender as a whole:

$$R = \frac{P_m}{P_f} * 100 = \frac{59595}{60355} * 100 = 98.74078\%$$

2. Dependency ratio

a. Total dependency ratio

$$total = \frac{less\ than\ 15 + greater\ than\ 60}{The\ number\ of\ working - age\ population\ (between\ 15 - 59)\ years}$$

$$= \frac{5420 + 3490 + 5320 + 4990 + 4420 + 3800 + 5430 + 5240}{2240 + 3925 + \cdots + 5320 + 2800 + 3950 + .. + 5475} * 100$$

$$= \frac{33410}{76700} * 100 = 43.55932\%$$

b. Dependency ratio for the children **(homework)**

$$Dependency\ ratio\ for\ the\ children = \frac{Number\ of\ children\ under\ 15\ years\ of\ age}{The\ number\ of\ working - age\ population\ (between\ 15 - 59) years} * 100$$

$$= \frac{5420 + 3790 + 5320 + 4420 + 3800 + 5430}{79254} * 100$$

$$= \frac{28180}{79264} * 100 = 35.5\%$$

c. Dependency ratio for the elderly **(homework)**

$$Dependency\ ratio\ for\ the\ elderly = \frac{Population\ aged\ 60\ years\ and\ older}{the\ number\ of\ working - age\ population\ (between\ 15 - 59) years} * 100$$

$$= \frac{4990 + 5040}{79264} * 100 = 12.65\%$$