

QUESTIONS

1. Given below is the data regarding deaths in two districts. On the basis of the given data, calculate the standardized death rates. Give your comments.

<i>Age-range</i>	<i>District A</i>		<i>District B</i>		<i>Age-distribution of a standard 1000</i>
	<i>Population</i>	<i>No. of deaths</i>	<i>Population</i>	<i>No. of Deaths</i>	
0—10	2000	50	1000	20	206
10—55	7000	75	3000	30	583
55 and above	1000	25	2000	40	211

2. Calculate the crude and standardised death rates for the local population from the following data and compare them with crude death rate of the standard population.

<i>Age-group</i>	<i>Standard population</i>	<i>Deaths</i>	<i>Local population</i>	<i>Deaths</i>
0—10	600	18	400	16
10—20	1000	5	1500	6
20—60	3000	24	2400	24
60—100	400	20	700	21

3. The age-specific death rate (A.S.D.R.) for a district together with the population in the same age-groups for the state are given below. Compute a standardised death rate for the district.

<i>Age-groups</i>	<i>A.S.D.R.(per 1000 in district)</i>	<i>Population(\times 1000 in state)</i>
0—5	72	6855
5—10	35	6971
10—20	18	12342
20—30	13	9816
30—40	15	7732
40—50	22	6015
50—60	36	3923
60—70	42	1281
70—80	59	825
> 80	79	363

4. Calculate the crude and standardised death rates for the following data.

<i>Age-group</i>	<i>Population ($\times 1000$)</i>	<i>Number of Deaths</i>	<i>Standard Population per 1000</i>
0—9	21	350	221
10—24	30	102	298
25—44	37	229	285
45—64	17	354	149
65 and over	5	415	47

5. Compute the crude and standardised death rates of the two populations A and B, regarding A as standard population, from the data below :

<i>Age-group (Years)</i>	<i>A</i>		<i>B</i>	
	<i>Population</i>	<i>Deaths</i>	<i>Population</i>	<i>Deaths</i>
<i>Under 10</i>	20000	600	12000	372
<i>10 — 20</i>	12000	240	30000	660
<i>20 — 40</i>	50000	1250	62000	1612
<i>40 — 60</i>	30000	1050	15000	525
<i>Above 60</i>	10000	500	3000	180

6. Suppose the following are the statistics of population and unemployment in -
- your country as a whole and
 - the local administrative area in which you live.

	<i>Age (in years)</i>			
	15—30	30—45	45—60	above 60
<i>Standard population age-composition</i>	250	350	300	100
<i>Unemployment %</i>	5	8	12	15
<i>Local population age-composition</i>	300	300	350	50
<i>Unemployment %</i>	4	9	12	20

Calculate -

- the crude rate of unemployment in the total area.
- the standardised death rate of unemployment in the local area (taking the age-distribution of the country as standard).

7. The age-specific death rates for Poland and Sweden for 1957 and the age-distribution of a standard population are given below. Compute the standardized death rates for the two countries. Compare the mortality conditions in the two countries.

Age	Death rate per thousand		Standard population(in thousand)
	Poland	Sweden	
0—4	18.870	4.348	119.9
5—14	0.759	0.465	206.9
15—24	1.385	0.767	183.2
25—34	2.048	1.075	147.9
35—44	3.326	1.882	120.5
45—54	7.006	4.669	93.9
55—64	18.111	12.477	70.8
65—74	45.795	34.060	40.5
75 and over	124.258	116.433	16.4

8. The mortality experiences in a given calendar year of two populations A and B consisting of men aged 70—74 as follows :

Age x	Population A			Population B		
	No. exposed to risk at age x	Deaths of age x	m_{xa}	No. exposed to risk at age x	Deaths of age x	m_{xb}
70	2000	64	0.032	3000	81	0.027
71	1200	42	0.035	3500	112	0.032
72	1400	56	0.040	3000	117	0.039
73	1800	81	0.045	4000	184	0.046
74	1600	80	0.050	8500	140	0.056
total	8000	325		16000	634	

Express the mortality of population B at ages 70—74 as a single percentage ratio of that of population A by means of the following :

- (i) indirect standardisation
- (ii) direct standardisation
- (iii) comparative mortality index

Discuss the differences between the results and the reasons for these differences.

9. A part of a life table is given here with most of the entries missing. On the basis of the available figures, supply the missing ones.

Age x	l_x	d_x	q_x	L_x	T_x	e_x^0
10	74600		.00350			
11			.00338			
12			.00361			
13			.00420			
14			.00517			
15			.00530			
16			.00538			
17			.00544			
18			.00549			
19			.00554		2607040	

Hence determine, according to the life table, the probability

- that a child of age 10 will live at least 5 years more.
 - that two children aged 10 and 11 will each live at least 5 years more.
 - that of two children aged 10 and 11, at least one will die within 9 years.
10. In the second and third columns of the following table are given the age-specific death rates for Kerala and West Bengal for the year 1993. The figures in the fourth column give the estimated age-distribution of the Indian population for the same year.

Age (years l.b.d.)	Death rate (per thousand)		Percentage in estimated population
	Kerala	West Bengal	
0 — 4	3.4	17.0	12.8
5 — 9	0.1	1.5	12.1
10 — 14	0.3	0.9	11.2
15 — 19	0.8	1.7	10.5
20 — 24	0.9	2.3	9.7
25 — 29	1.1	1.7	8.2
30 — 34	1.7	2.4	6.9
35 — 39	1.7	2.3	6.2
40 — 44	2.4	4.0	5.0
45 — 49	4.1	4.8	4.4
50 — 54	7.4	10.1	3.6
55 — 59	12.2	16.9	3.0
60 — 64	21.6	24.6	2.4
65 — 69	27.3	40.5	1.8
70+	85.5	79.5	2.2
All ages	6.0	7.4	100.0

Computer the standardised death rates for Kerala and West Bengal taking all-India population as standard.

11. The number of births occurring in Israel in 1988 is shown here classified according to age of mother, together with the female population in each age-group of the child-bearing period :

Age	Female Population ($\times 1000$)	Number of births to mothers in the age-group
15 — 19	200.6	4227
20 — 24	173.5	26099
25 — 29	161.7	32844
30 — 34	160.9	23449
35 — 39	155.7	11588
40 — 44	125.6	2071
45 — 49	87.6	122
Total	1065.6	100400

The total population of Israel in 1988 was 4441.7 thousand. With the above information, determine

- the crude birth rate,
 - the general fertility rate,
 - the age-specific fertility rates,
 - the total fertility rate for 1988. Also compute,
 - the gross reproduction rate, assuming that the sex-ratio at birth was 104.5 male births to 100 female births in 1988.
12. The quinquennial fertility rates (computed on the basis of female births alone) for England and Wales, 1954, are shown in the following table, together with the survival factor for each 5-year age-group (which is the probability for a newborn female to survive till the mid-point of the age-group and is approximately equal to ${}_5^fL_x/5^fl_0$) :

Age	Fertility rate (female births)	Survival factor
15 — 19	0.0108	0.969
20 — 24	0.0662	0.967
25 — 29	0.0675	0.963
30 — 34	0.0413	0.958
35 — 39	0.0216	0.952
40 — 44	0.0063	0.942
45 — 49	0.0004	0.928

Compute the *GRR* and *NRR* for England and Wales for 1954 on the basis of the above data.

13. The following table shows, for a certain country, the 1984 female population in 5-year age-groups, the life table value ${}_5^f l_x$ according to projected mortality and the projected age-specific fertility rates :

Age l.b.d.	Population in 1984 (in thousands)	${}_5^f l_x$ according to projected mortality (with ${}_5^f l_0 = 1000$)	Projected <i>ASFR</i> (per thousand females)
0 — 4	10136	4890	—
5 — 9	10006	4873	—
10 — 14	9065	4865	0.86
15 — 19	8045	4855	2.80
20 — 24	6546	4839	219.90
25 — 29	5614	4820	179.44
30 — 34	5632	4795	103.90
35 — 39	6193	4758	50.03
40 — 44	6345	4704	30.821
45 — 49	5796	4624	0.81
50 — 54	5336	4505	—
55 — 59	4642	4334	—
60 — 64	4451	4093	—
65 — 69	3481	3742	—
70 — 74	2799	3253	—
75 — 79	1702	2604	—
80 — 84	1074	1792	—
85 — 89	411	923	—
90 — 94	78	176	—
95 — 99	27	10	—
Total	97379		

Give your projection of the female population of the country for 1994 (in 5-year age-groups), assuming the effect of migration is negligible and that the proportion of female births among all births is 0.4885.

14. The population of India, as recorded in each of the last ten decennial censuses, is shown below :

Census year	Population (millions)
1911	252.0
1921	251.2
1931	278.9
1941	318.5
1951	361.0
1961	439.1
1971	547.0
1981	683.3
1991	846.3
2001	1028.6

Fit a logistic curve to the data. in case you find the fit to be unsatisfactory, suggest reasons for the same.

15. Compute

- (i) $G.F.R.$,
- (ii) $S.F.R.$,
- (iii) $T.F.R.$ and
- (iv) the *gross reproduction rate*, from the data given below :

<i>Age-group of child bearing females</i>	<i>Numer of women ('000)</i>	<i>Total Births</i>
15 — 19	16.0	260
20 — 24	16.4	2244
25 — 29	15.8	1894
30 — 34	15.2	1320
35 — 39	14.8	916
40 — 44	15.0	280
45 — 49	14.5	145

Assume that the proportion of female births is 46.2 per cent.

16. The following table gives the population of a country for the year 2001, together with the estimated number of births and deaths based on a special vital statistics enquiry conducted in the country. Calculate :

- (i) crude death rates for the total population and for males and females,
- (ii) crude birth rate for the total population,
- (iii) general fertility rate,
- (iv) total fertility rate,
- (v) gross reproduction rate, and
- (vi) net reproduction rate.

<i>Age (l.b.d.)</i>	<i>Males</i>		<i>Females</i>		<i>Births</i>		<i>Survival Rates</i>
	<i>Population</i>	<i>Deaths</i>	<i>Population</i>	<i>Deaths</i>	<i>Males</i>	<i>Females</i>	
0 — 4	442532	18623	434980	17308			
5 — 9	419042	1809	416736	1709			
10 — 14	393543	984	384616	1638			
15 — 19	308269	1233	314056	1329	3578	3343	0.914
20 — 24	257852	1289	269340	1481	7293	6690	0.899
25 — 29	230629	1776	236187	1677	6775	6361	0.844
30 — 34	204188	1633	203477	1465	4233	4187	0.868
35 — 39	182270	1588	176534	1289	2999	2685	0.852
40 — 44	162509	1967	145037	1233	593	725	0.834
45 — 49	128784	2138	122946	1352	129	128	0.819
50 — 54	102971	1905	96589	1188			
55 — 59	80717	2478	78311	1605			
60 — 64	58899	3099	58142	1980			
65 — 69	37797	2428	39099	2468			
70 and above	45099	5981	48866	7175			

17. Calculate the *general fertility rate*, *total fertility rate* and the *gross reproduction rate* from the following data assuming that for every 100 girls 106 boys are born.

<i>Age of Women</i>	<i>Number of Women</i>	<i>Age-S.F.R. (per 1000)</i>
15 — 19	212619	98.0
20 — 24	198732	169.6
25 — 29	162800	158.2
30 — 34	145362	139.7
35 — 39	128109	98.6
40 — 44	106211	42.8
45 — 49	86753	16.9

18. From the following data, calculate the *gross reproduction rate* and the *net reproduction rate*.

<i>Age-group</i>	<i>Number of children born to 1,000 women passing through the age-group</i>	<i>Mortality rate (per 1000)</i>
16 — 20	150	120
21 — 25	1500	180
26 — 30	2000	150
31 — 35	800	200
36 — 40	500	220
41 — 45	200	230
46 — 50	100	250

Sex ratio being *males : females :: 52 : 48*.

19. Given the following table for l_x , the number of rabbits living at age x , complete the life table for rabbits.

x	0	1	2	3	4	5	6
l_x	100	90	80	75	60	30	0

X, Y, Z are three rabbits of age 1, 2 and 3 years respectively. Find the probability that :

- (i) at least one of them will be alive for one year more,
- (ii) X, Y, Z will be alive for two years time,
- (iii) exactly one of the three is alive in two years, and
- (iv) all will be dead in two years time.

20. The number of persons dying at age 75 is 476 and the complete expectation of life at 75 and 76 years are 3.92 and 3.66 years. Find the numbers living at ages 75 and 76.