

DEPARTMENT OF EPIDEMIOLOGY
SCHOOL OF PUBLIC HEALTH
UNIVERSITY OF NORTH CAROLINA

Epid. 160

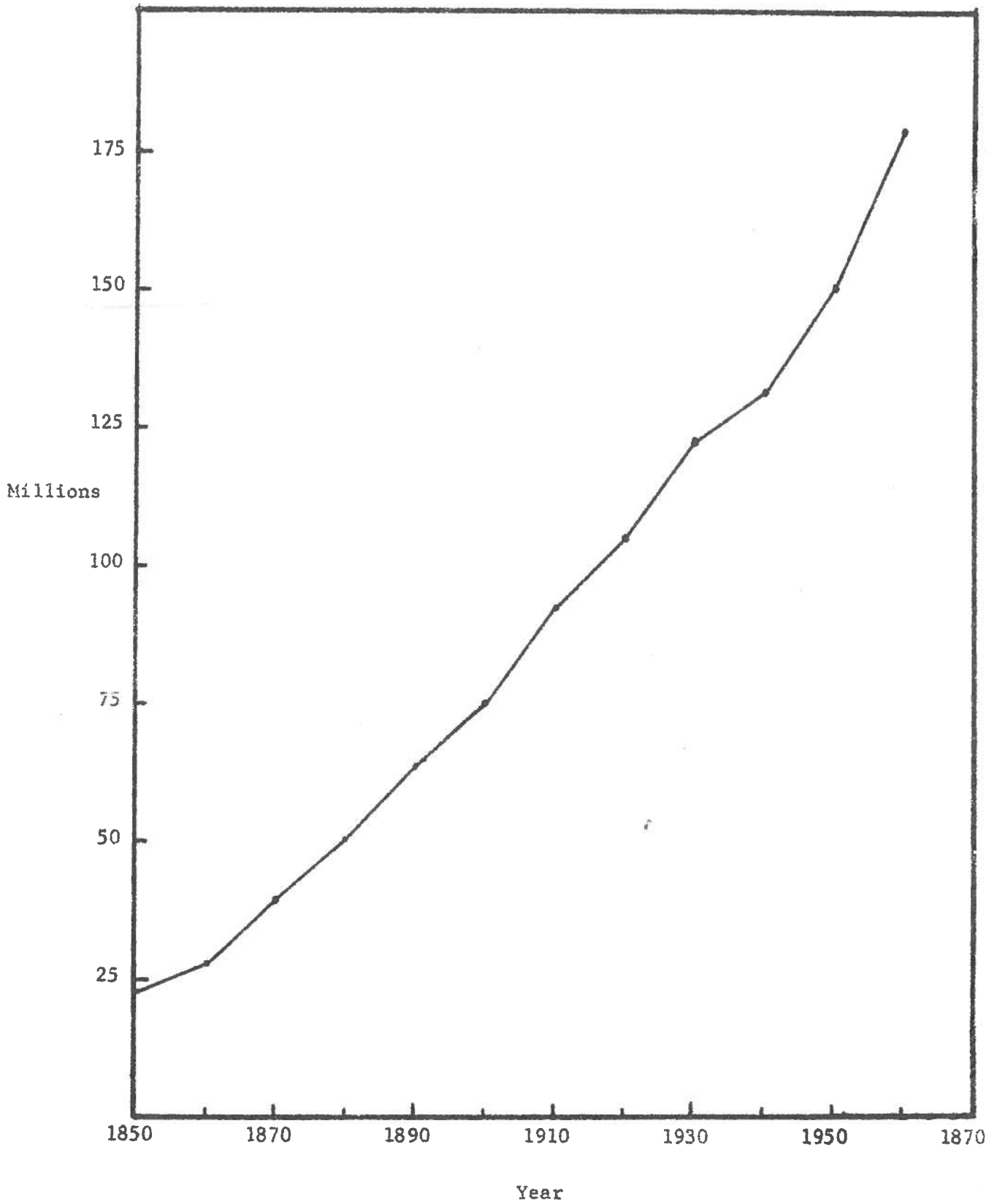
Principles of Epidemiology

"It is to the current census and to the local health department and its division of vital statistics that most physicians turn for their information about populations, health conditions, and trends of disease within their local communities and cities. For instance, one can usually determine, in the United States at least, the total number of people living within a given area according to the last census, their ages, sexes (-----), and the relative racial percentages. Added to this it is obviously desirable to know the local birth and death rates, and particularly the current and past frequency with which reportable and even some nonreportable diseases, illnesses, or accidents have occurred. Other features desirable to know are: the local seasonal effect upon the rates for diseases and injury; what areas in the community are prone to high rates of this or that illness; and what the impact of local industrial practices or living conditions is upon this picture. It is obvious that, if one is to understand or interpret these data, one must know the people from whom they come, for diseases shift constantly, with growth or decline of populations, changing customs, new fashions, and new ways of living."

Ref:

1. Paul, John R., Clinical Epidemiology, The University of Chicago Press, Chicago, 1966, pp. 98-99.

ESTIMATED TOTAL POPULATION FOR THE UNITED STATES
JUNE 1, 1850 TO APRIL 1, 1960



(b) Change in age composition.

Age Distribution of the Population
United States, 1850-1960

Year	Percent Distribution					
	Total	Under 5	5-19	20-44	45-64	65 and Over
1850	100.0	15.1	37.4	35.1	9.8	2.6
1860	100.0	15.4	35.8	35.7	10.4	2.7
1870	100.0	14.3	35.4	35.4	11.9	3.0
1880	100.0	13.8	34.3	35.9	12.6	3.4
1890	100.0	12.2	33.9	36.9	13.1	3.9
1900	100.0	12.1	32.3	37.8	13.7	4.1
1910	100.0	11.6	30.4	39.1	14.6	4.3
1920	100.0	11.0	29.8	38.4	16.1	4.7
1930	100.0	9.3	29.5	38.3	17.5	5.4
1940	100.0	8.0	26.4	38.9	19.8	6.9
1950	100.0	10.7	23.2	37.7	20.3	8.1
1960	100.0	11.3	27.1	32.2	20.1	9.2

Ref.

3. Spiegelman, Mortimer, Introduction to Demography, The Society of Actuaries, Chicago, 1955. p. 234.
4. U.S. Bureau of Census, op. cit., p. 24.

(c) Change in sex composition

Age-Sex Distribution of the Population
United States, 1850-1960

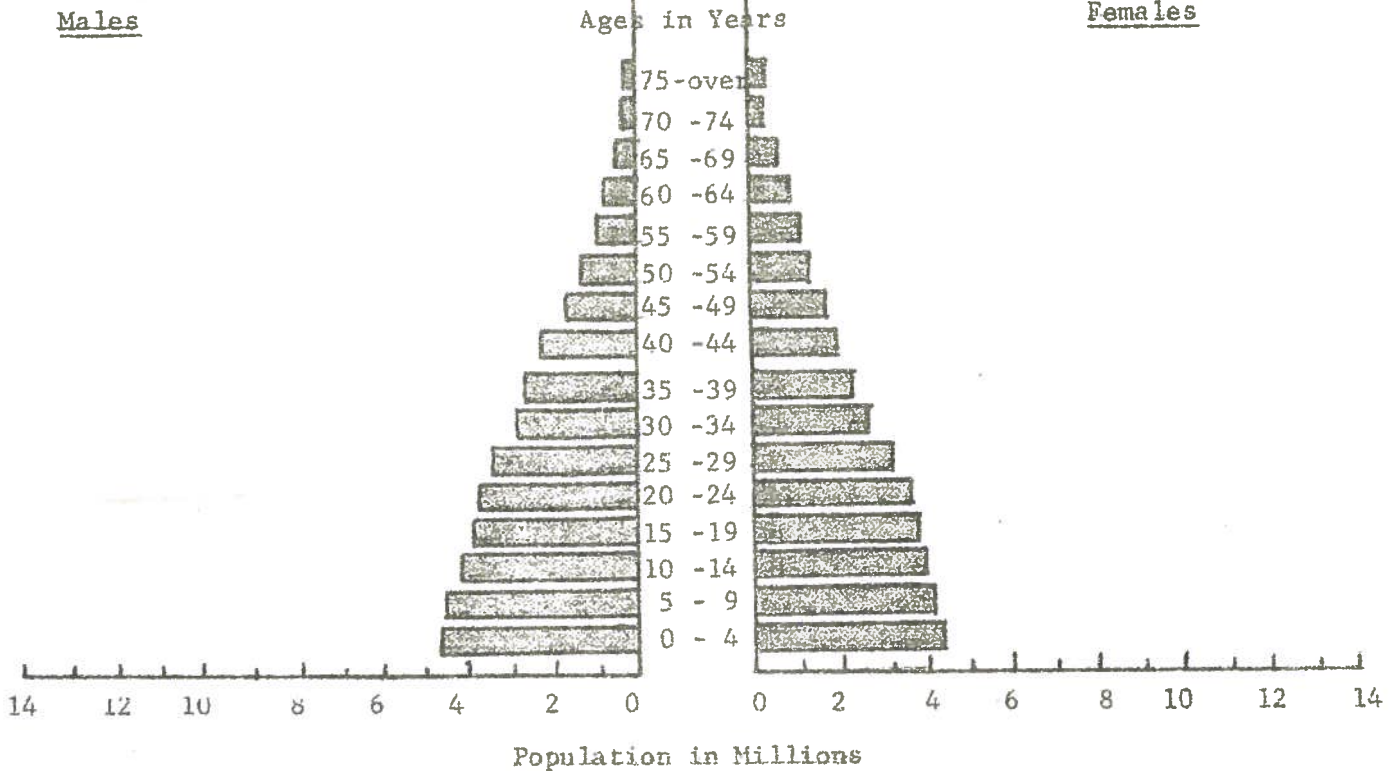
Males per 100 Females						
Year	Total	Under 5	5-19	20-44	45-64	65 and Over
1850	104.3	102.4	100.9	108.1	106.4	101.3
1860	104.7	102.4	101.2	107.9	111.5	98.3
1870	102.2	102.9	101.2	99.2	114.5	100.5
1880	103.6	103.0	101.3	104.0	110.2	101.4
1890	105.0	103.6	101.4	107.3	108.3	104.2
1900	104.4	102.1	100.9	105.8	110.7	102.0
1910	106.0	102.5	101.3	108.1	114.4	101.1
1920	104.0	102.5	100.8	102.8	115.2	101.3
1930	102.5	103.0	101.4	100.5	109.1	100.5
1940	100.7	103.2	102.0	98.1	105.2	95.5
1950	99.0	103.9	102.9	97.0	100.2	89.6
1960	97.1	103.4	102.7	95.6	95.7	76.3

Ref.

5. Spiegelman, Mortimer, op. cit., p. 234.
6. U.S. Bureau of Census, op. cit., p. 24.

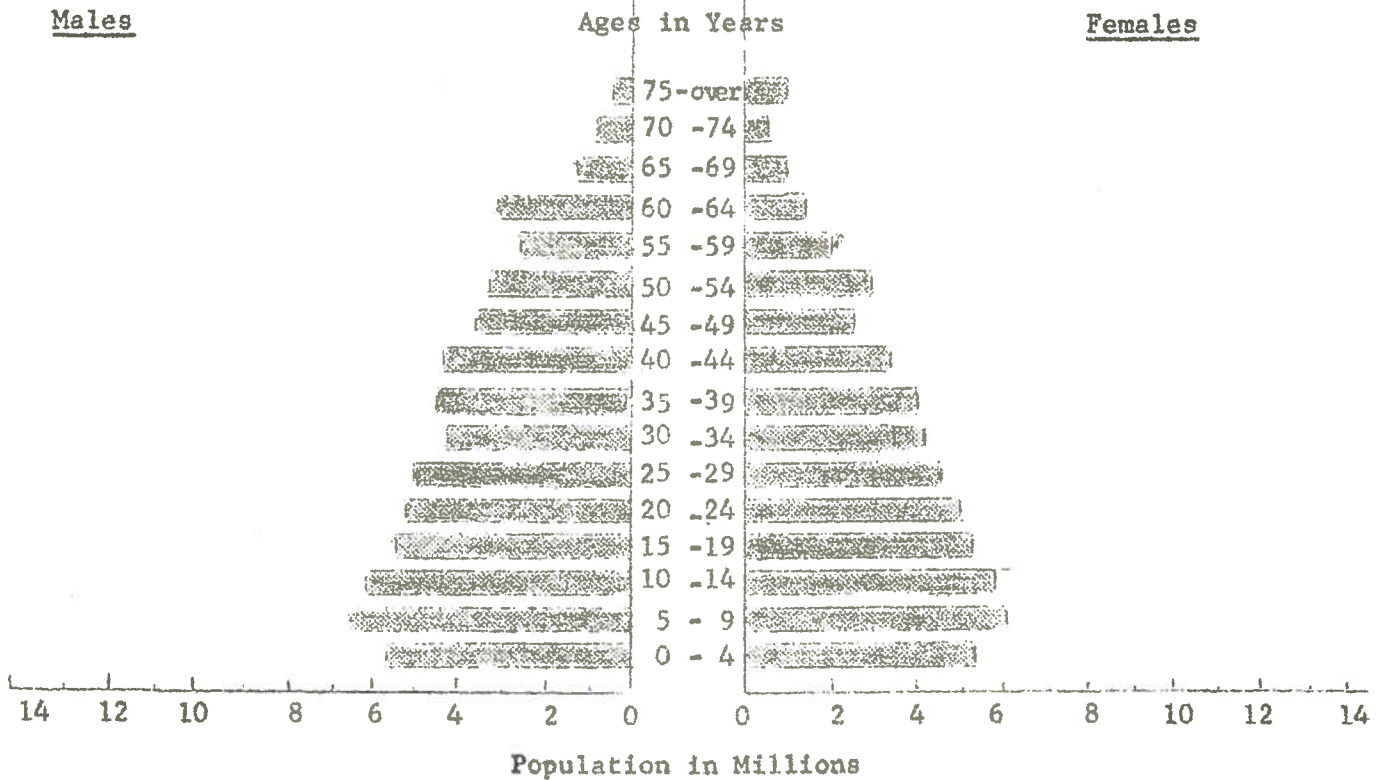
UNITED STATES

1900



UNITED STATES

1930

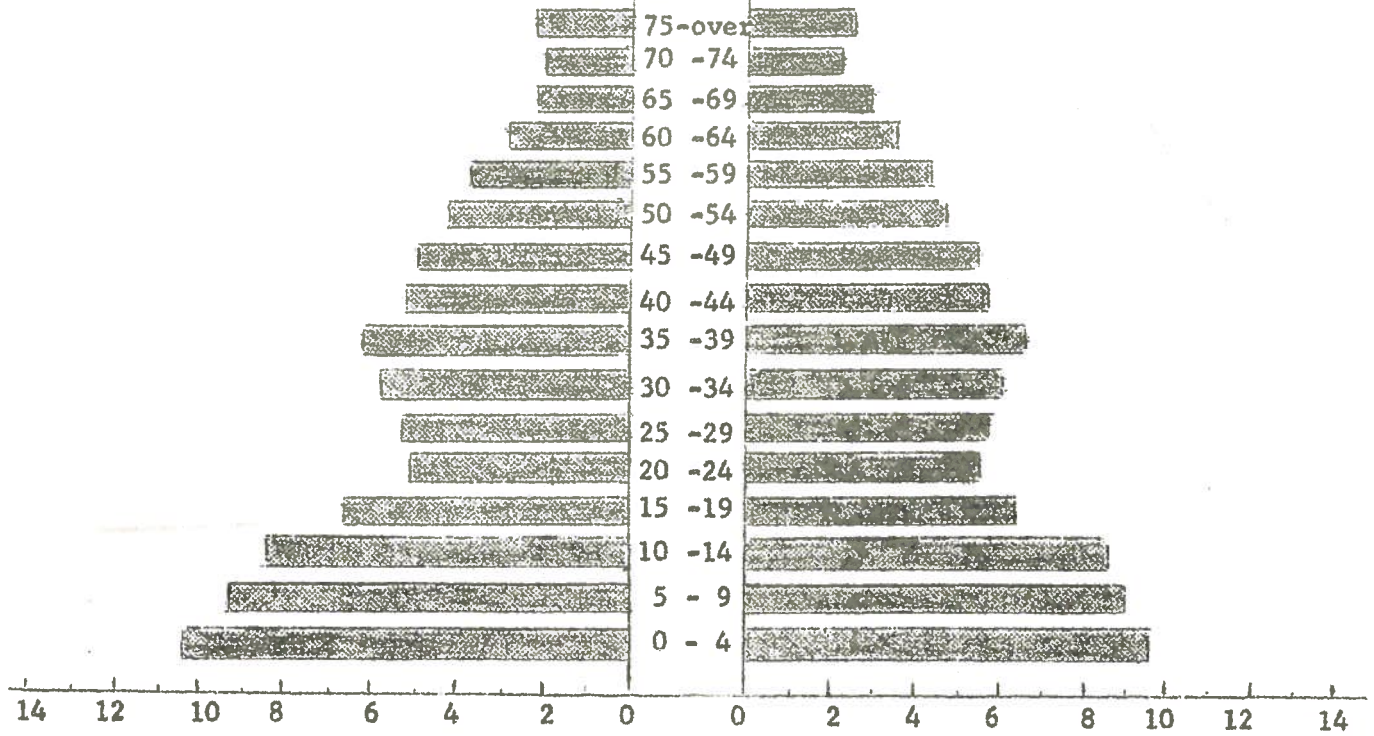


UNITED STATES 1960

Males

Ages in Years

Females



Source: U.S. Census of Population 1960 General Population Characteristics

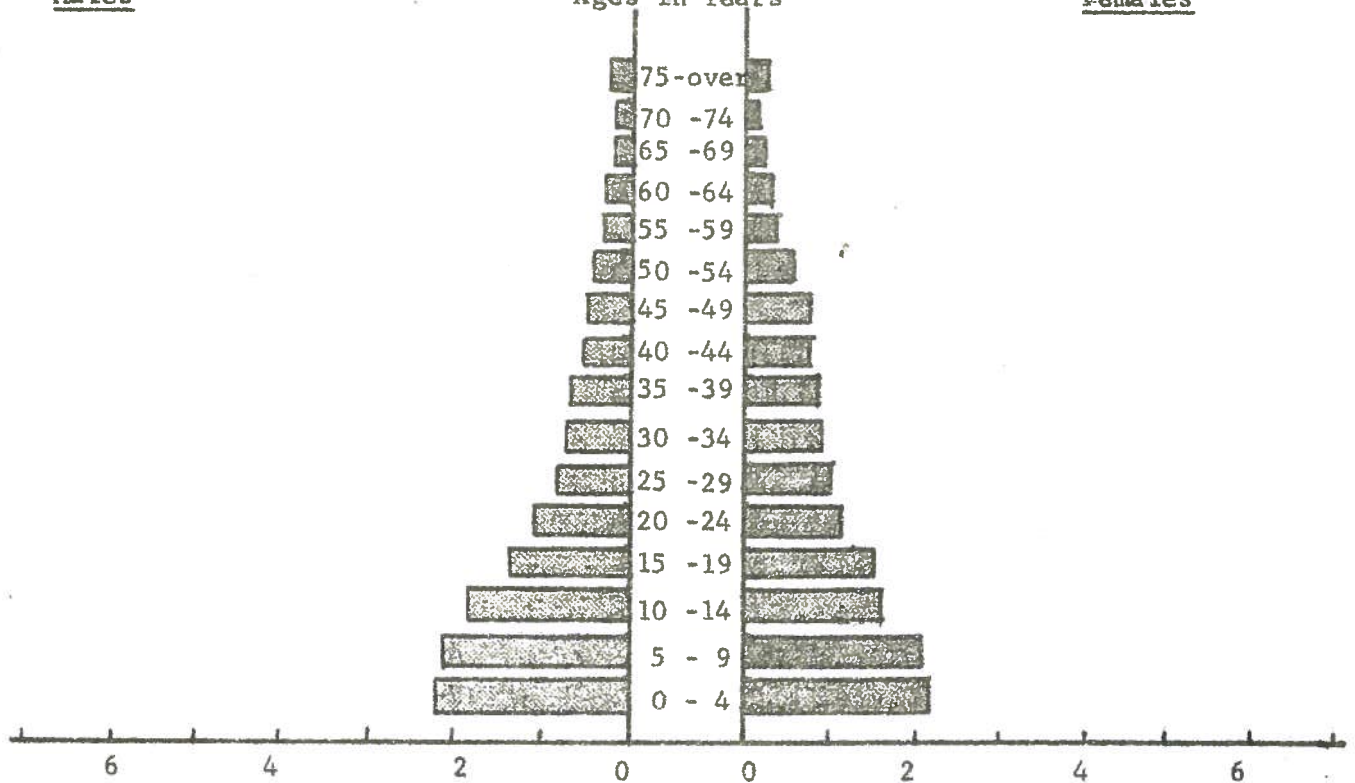
PHILIPPINES

1963

Males

Ages in Years

Females



(e) Change in life expectancy

Average Expectation of Life in Years

Year	At Birth		Age 20		Age 40		Age 65	
	Male	Female	Male	Female	Male	Female	Male	Female
White								
1900-1902	48.2	51.1	42.2	43.8	27.7	29.2	11.5	12.2
1909-1911	50.2	53.6	42.7	44.9	27.4	29.3	11.2	12.0
1919-1921	56.3	58.5	45.6	46.5	29.9	30.9	12.2	12.8
1929-1931	59.1	62.7	46.0	48.5	29.2	31.5	11.8	12.8
1939-1941	62.8	67.3	47.8	51.4	30.0	33.2	12.1	13.6
1949-1951	66.3	72.0	49.5	54.6	31.2	35.6	12.8	15.0
1959-1961	67.6	74.3	50.3	56.4	31.8	37.2	13.0	16.0
1962	67.6	74.4	50.2	56.4	31.7	37.3	12.9	16.0
Non-White								
1900-1902	32.5	35.0	35.1	36.9	23.1	24.4	10.4	11.4
1909-1911	34.0	37.7	33.5	36.1	21.6	23.3	9.7	10.8
1919-1921	47.1	46.9	38.4	37.2	26.5	25.6	12.1	12.4
1929-1931	47.6	49.5	36.0	37.2	23.4	24.3	10.9	12.2
1939-1941	52.3	55.5	39.7	42.1	25.2	27.3	12.2	14.0
1949-1951	58.9	62.7	43.7	46.8	27.3	29.8	12.8	14.5
1959-1961	61.5	66.6	45.8	50.2	28.7	32.4	13.0	15.4
1962	61.5	66.8	45.6	50.2	28.6	32.4	12.7	15.2

Ref.

7. U.S. Bureau of Census, op. cit., p. 56.

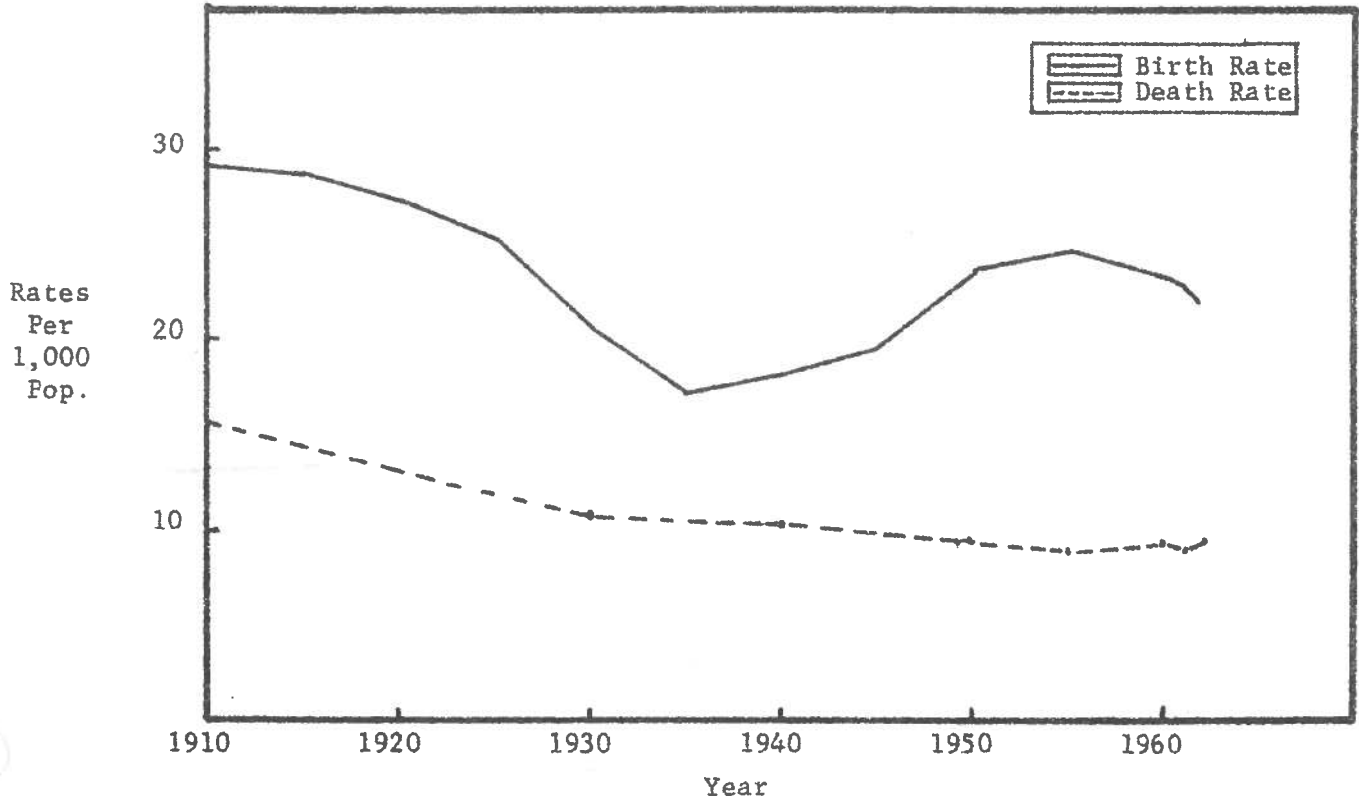
PART II Some Dynamics of Population Change

a) Changing Birth Rate and Total Death Rate (1900 - 1960)

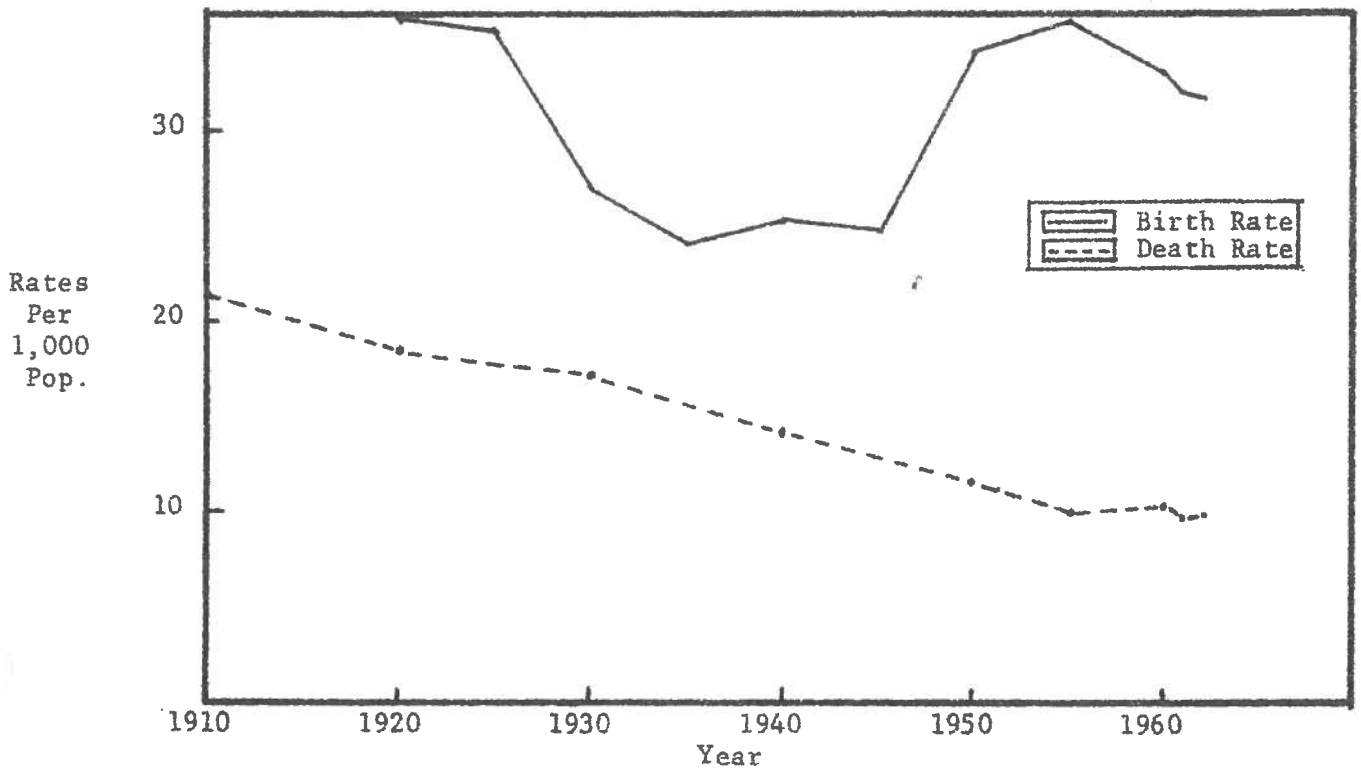
United States

BIRTH AND DEATH RATES PER 1000 POPULATION
UNITED STATES 1910 - 1962

White



Non-White



Annual Mortality Rates per 1,000 Persons at Specific Ages

United States Death Registration States

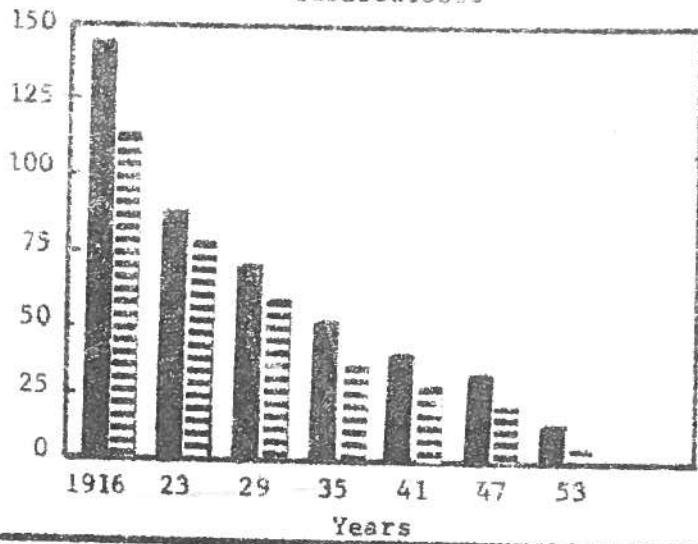
At Ages					
Males	<u>Under 1 Year</u>	<u>1-4</u>	<u>15-24</u>	<u>45-54</u>	<u>55-64</u>
1900	179.1	20.5	5.9	15.7	28.7
1910	145.5	14.6	4.8	15.2	28.7
1920	103.6	10.3	4.8	12.6	24.6
1930	77.0	6.0	3.5	13.6	26.6
1940	61.9	3.1	2.3	12.5	26.2
1950	37.3	1.5	1.7	10.7	24.1
1960	30.6	1.2	1.5	9.9	23.1
1964	27.8	1.0	1.6	9.6	22.9
Percent Decrease 1900 to 1964	84.47	95.12	72.88	38.85	20.20
Females					
1900	145.4	19.1	5.8	14.2	25.8
1910	117.6	13.4	4.2	12.1	23.7
1920	80.7	9.5	5.0	11.7	22.4
1930	60.7	5.2	3.2	10.6	21.2
1940	47.7	2.7	1.8	8.6	18.1
1950	28.3	1.3	0.9	6.4	14.1
1960	23.2	1.0	0.6	5.3	12.0
1964	21.5	0.9	0.6	5.2	11.4
Percent Decrease 1900 to 1964	85.21	95.28	89.65	63.38	55.81

Ref.: Vital Statistics Rates in the United States 1900 - 1940, United States Department of Commerce Bureau of the Census.

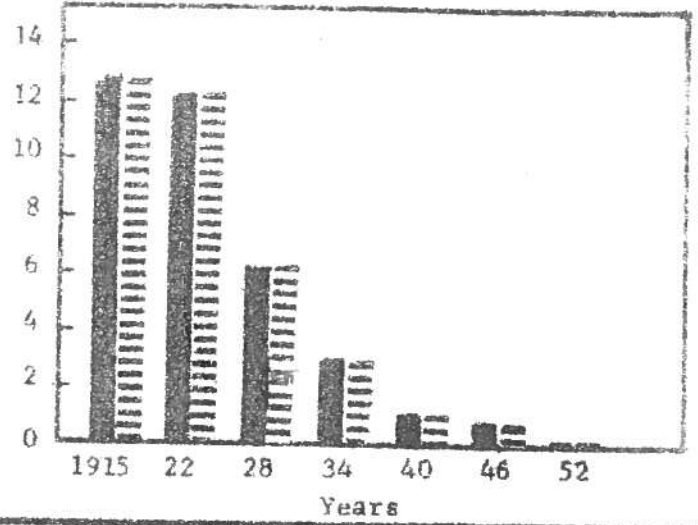
Vital Statistics of the United States 1950, 1960, 1964, United States Department of Health Education and Welfare, Public Health Service.

PART 3: CHANGES IN DISEASE PATTERNS
CHANGING MORTALITY RATES PER 100,000 FOR WHITES
BY SEX (AGE-ADJUSTED) FOR THE UNITED STATES

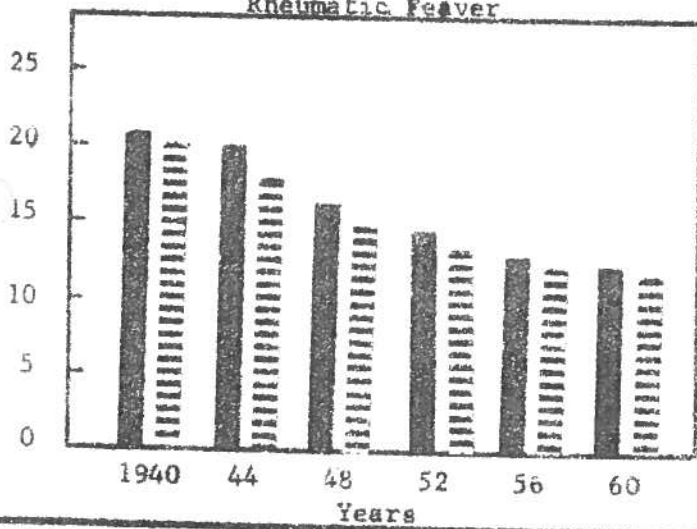
Tuberculosis



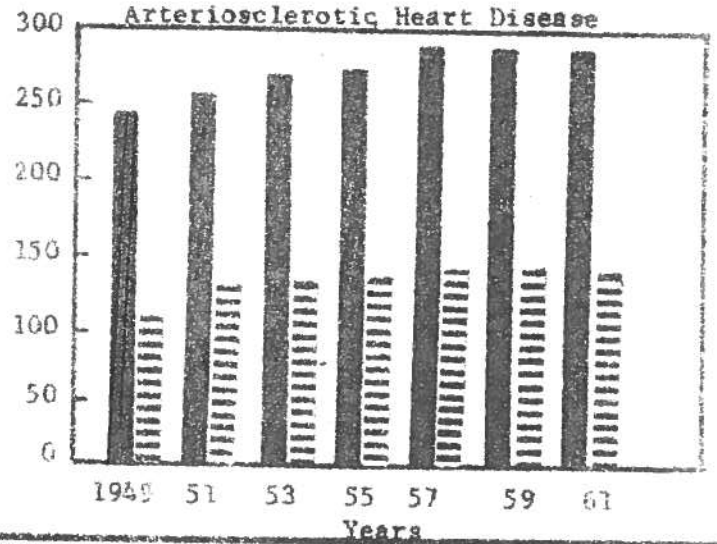
Diphtheria



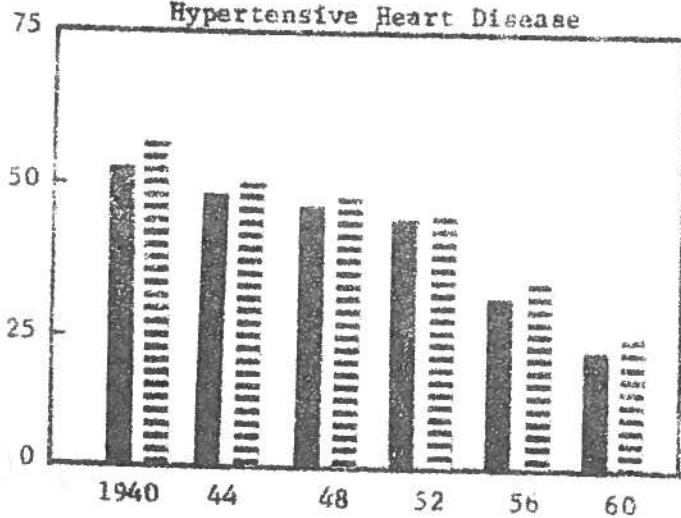
Rheumatic Fever



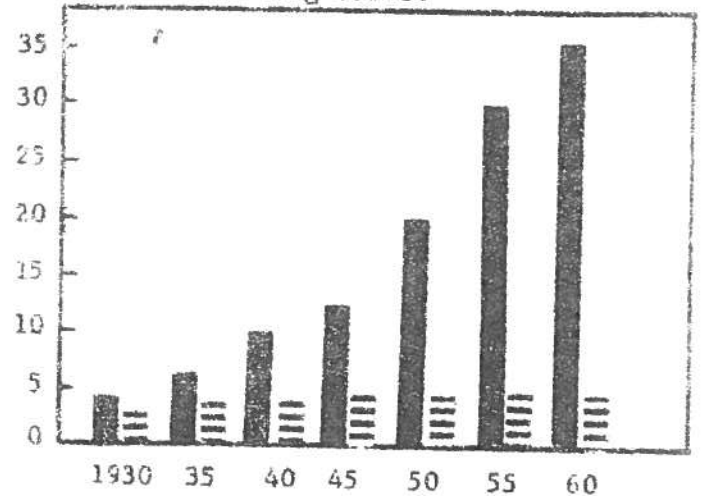
Arteriosclerotic Heart Disease



Hypertensive Heart Disease



Lung Cancer



Males
 Females

b) Five Leading Causes of Death for the United States and Selected Countries. (Death Rates per 100,000)

<u>United States, 1900</u> <u>Cause *</u>	<u>Death</u> <u>Rate</u>	<u>United States</u> <u>Cause **</u>	<u>1961</u>	<u>Death</u> <u>Rate</u>
1. Influenza and pneumonia	202.2	1. Arteriosclerotic and degenerative heart disease		304.3
2. Tuberculosis (all forms)	194.4	2. Malignant neoplasms, including neoplasms of lymphatic and haemato-poietic tissues		149.4
3. Gastritis	142.7	3. Vascular lesions affecting central nervous system		105.4
4. Diseases of the heart	137.4	4. All accidents		42.9
5. Vascular lesions affecting the central nervous system	106.9	5. Hypertension with heart disease		34.6
<u>Ceylon 1961</u> <u>Cause **</u>		<u>U.A.R. (Egypt) 1961</u> <u>Cause **</u>		
1. Pneumonia	49.2	1. Gastritis, duodenitis, enteritis and colitis except diarrhoea of the newborn		632.8
2. Gastritis, duodenitis enteritis and colitis except diarrhoea of the newborn	41.5	2. Bronchitis		150.7
3. All accidents	27.1	3. All accidents		59.9
4. Arteriosclerotic and degenerative heart disease	25.5	4. Hypertension with Heart Disease		44.6
5. Anaemias	24.9	5. Arteriosclerotic and degenerative heart disease		40.4

*Ref. 10

Monroe Lerner and Odin W. Anderson. Health Progress in the United States, 1900-1960, p. 16.*

<u>Guatemala</u> 1961 <u>Cause **</u>	<u>Death</u> <u>Rate</u>	<u>Philippines</u> 1961 <u>Cause **</u>	<u>Death</u> <u>Rate</u>
1. Gastritis, duodenitis, enteritis and colitis except diarrhoea of the newborn	220.5	1. Tuberculosis, all forms	87.1
2. Influenza	115.8	2. Pneumonia	82.6
3. Pneumonia	113.0	3. Gastritis, duodenitis, enteritis and colitis except diarrhoea of the newborn	57.5
4. Whooping cough	74.7	4. Bronchitis	39.7
5. Measles	61.2	5. Malignant neoplasms including neoplasms of lymphatic and haematopoietic tissue	20.2

** The causes are according to the classification used by the World Health Organization.

The following non-specific categories have been excluded:

1. All other diseases classified as infective and parasitic (B17)
2. Other diseases of heart (B27)
3. Other diseases peculiar to early infancy, and immaturity unqualified. (B44)
4. Senility without mention of psychosis, ill-defined and unknown causes (B45)
5. All other diseases (B46)

Also excluded:

1. Congenital malformations (B41)
2. Birth injuries, postnatal asphyxia and atelectasis (D1C)
3. Infection of the newborn (B43)

All forms of tuberculosis have been grouped into one category (B1 and B2).

All forms of accidents have been grouped into one category (BE47 and BE48).

**11. Annual Epidemiological and Vital Statistics, 1961, World Health Organization, Geneva, 1964.

c) Infant Mortality Rates per 1000 Live Births in
Selected Countries, 1901-1960

<u>Year</u>	<u>U.S.</u>	<u>England and Wales</u>	<u>Netherlands</u>	<u>Sweden</u>	<u>New Zealand</u>
1901	-	151.3	149.3	102.9	71.4
1905	-	128.2	130.9	88.3	67.5
1910	-	105.4	107.9	75.1	67.7
1915	99.9	109.7	86.8	75.8	50.1
1920	85.8	79.9	82.5	63.3	50.6
1925	71.7	75.0	58.4	55.7	40.0
1930	64.6	60.0	50.9	54.7	34.5
1935	55.7	56.9	40.0	45.9	32.3
1940	47.0	57.4	39.1	39.2	30.2
1945	38.3	47.0	79.7	29.9	28.0
1950	29.2	29.9	25.2	21.0	22.7
1955	26.4	24.9	20.1	17.4	20.1
1960	25.2	22.4	15.8	15.0	19.5

Ref.

12. Swaroop, Satya, Introduction to Health Statistics,
E. & S. Livingstone, LTD., London, p. 272 - 273.

d) Age and Sex Specific Death Rates for All Causes for United States and Selected Countries, 1961

Age	United States		Austria		Netherlands		Sweden		England and Wales		Yugoslavia	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0	28.4	22.0	37.0	28.1	17.8	12.9	17.7	13.7	23.9	18.8	85.5	78.7
1-4	1.1	0.9	1.5	1.1	1.2	0.8	0.9	0.7	1.0	0.8	4.3	4.6
5-9	0.5	0.4	0.6	0.4	0.6	0.3	0.5	0.4	0.5	0.3	0.8	0.7
10-14	0.5	0.3	0.5	0.3	0.4	0.3	0.4	0.3	0.4	0.2	0.6	0.5
15-19	1.2	0.5	1.3	0.5	0.7	0.3	0.9	0.3	0.9	0.4	1.1	0.8
20-24	1.8	0.7	1.8	0.6	1.1	0.4	1.0	0.5	1.1	0.5	1.5	1.2
25-29	1.7	0.9	2.0	0.8	1.0	0.5	1.1	0.6	1.1	0.6	1.8	1.6
30-34	2.0	1.2	2.1	1.1	1.0	0.6	1.4	0.7	1.3	0.9	2.1	1.7
35-39	2.8	1.8	2.8	1.5	1.5	1.1	1.7	1.0	1.9	1.3	2.4	2.0
40-44	4.5	2.7	3.7	2.4	2.5	1.7	2.3	1.6	3.0	2.2	3.7	2.8
45-49	7.3	4.1	5.4	3.3	4.1	2.6	3.7	3.0	5.2	3.5	5.5	3.9
50-54	12.1	6.3	9.8	5.4	7.3	4.3	6.5	4.4	9.3	5.4	8.7	6.5
55-59	17.9	8.9	16.9	8.5	12.0	6.4	10.8	6.7	16.8	8.1	14.6	9.2
60-64	27.9	14.5	27.3	14.2	19.3	10.6	18.2	11.1	28.6	13.7	23.3	15.9
65-69	41.2	22.2	43.9	23.1	29.8	19.1	29.6	19.5	44.0	23.0	38.7	27.9
70-74	57.1	56.5	60.1	42.0	45.9	34.0	48.6	36.8	68.5	40.7	58.9	48.2
75-79	83.2	57.9			74.3	64.0	78.5	66.5	104.1	69.1	88.0	74.8
80-84	127.6	99.8			123.3	110.3	131.2	117.2	163.5	118.2	136.4	119.5
85 +	209.1	187.8			216.3	200.9	231.5	211.4	257.4	227.1	205.8	177.6

All Ages

10.7	7.9	13.2	11.1	8.3	6.8	10.3	9.2	12.6	11.4	9.3	8.7
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Ref. 13. World Health Organization, op. cit., pp. 288-293.

INFANT MORTALITY RATES BY RACE: BIRTH-REGISTRATION STATES, 1915-1960

(Exclusive of fetal deaths. Deaths under 1 year per 1,000 live births in each specified group)

<u>YEAR</u>	<u>All Races</u>	<u>White</u>	<u>Nonwhite</u>
1960.	26.0	22.9	43.2
1959.	26.4	23.2	44.0
1958.	27.1	23.8	45.7
1957.	26.3	23.3	43.7
1956.	26.0	23.2	42.1
1955.	26.4	23.6	42.8
1954.	26.6	23.9	42.9
1953.	27.8	25.0	44.7
1952.	28.4	25.5	47.0
1951.	28.4	25.8	44.8
1950.	29.2	26.8	44.5
1949.	31.3	28.9	47.3
1948.	32.0	29.9	46.5
1947.	32.2	30.1	48.5
1946.	33.8	31.8	49.5
1945.	38.3	35.6	57.0
1944.	39.8	36.9	60.3
1943.	40.4	37.5	62.5
1942.	40.4	37.3	64.6
1941.	45.3	41.2	74.8
1940.	47.0	43.2	73.8
1939.	48.0	44.3	74.2
1938.	51.0	47.1	79.1
1937.	54.4	50.3	83.2
1936.	57.1	52.9	87.6
1935.	55.7	51.9	83.2
1934.	60.1	54.5	94.4
1933.	58.1	52.8	91.3
1932.	57.6	53.3	86.2
1931.	61.6	57.4	93.1
1930.	64.6	60.1	99.9
1929.	67.6	63.2	102.2
1928.	68.7	64.0	106.2
1927.	64.6	60.6	100.1
1926.	73.3	70.0	111.8
1925.	71.7	68.3	110.8
1924.	70.8	66.8	112.9
1923.	77.1	73.5	117.4
1922.	76.2	73.2	110.0
1921.	75.6	72.5	108.5
1920.	85.8	82.1	131.7
1919.	86.6	83.0	130.5
1918.	100.9	97.4	161.2
1917.	93.8	90.5	150.7
1916.	101.0	99.0	184.9
1915.	99.9	98.6	181.2

ASSIGNMENT

Pages 1-8

1. What are the predominant features of the population changes in U.S. since 1850? And what are the implications for health and health care?

2. What are the similarities and differences between the population pyramids for U.S. and Phillipines?

3. Describe the major changes in life expectancy shown in page 8 for different time periods for each race and sex and age of the U.S.

Page 9

4. Describe the trend in birth and death rates in the U.S. for whites and non-whites.

5. What possible forces may explain the changes noted?

Page 10

6. What facts emerge in respect of the changing mortality rates for the different sex-age groups shown.

Pages 12 and 13

7. In respect of the 6 diseases shown what are the changes seen in mortality rates for each sex?

8. What changes have occurred in the leading causes of death in the U.S.?

9. How do they compare with the causes of death in Ceylon, U.A.R., Guatemala and the Phillipines?

Page 15

10. Infant mortality rates have changed and are different in different countries. What have been the changes, and how do the countries shown compare?

11. What are possible explanations for the changes and the differences?

Page 16

12. What differences are shown in the age and sex specific death rates for the countries shown?

Summary

Briefly summarise the major changes in the U.S. population since 1910 and the extent to which births, deaths and life expectancy changes could have contributed to them.