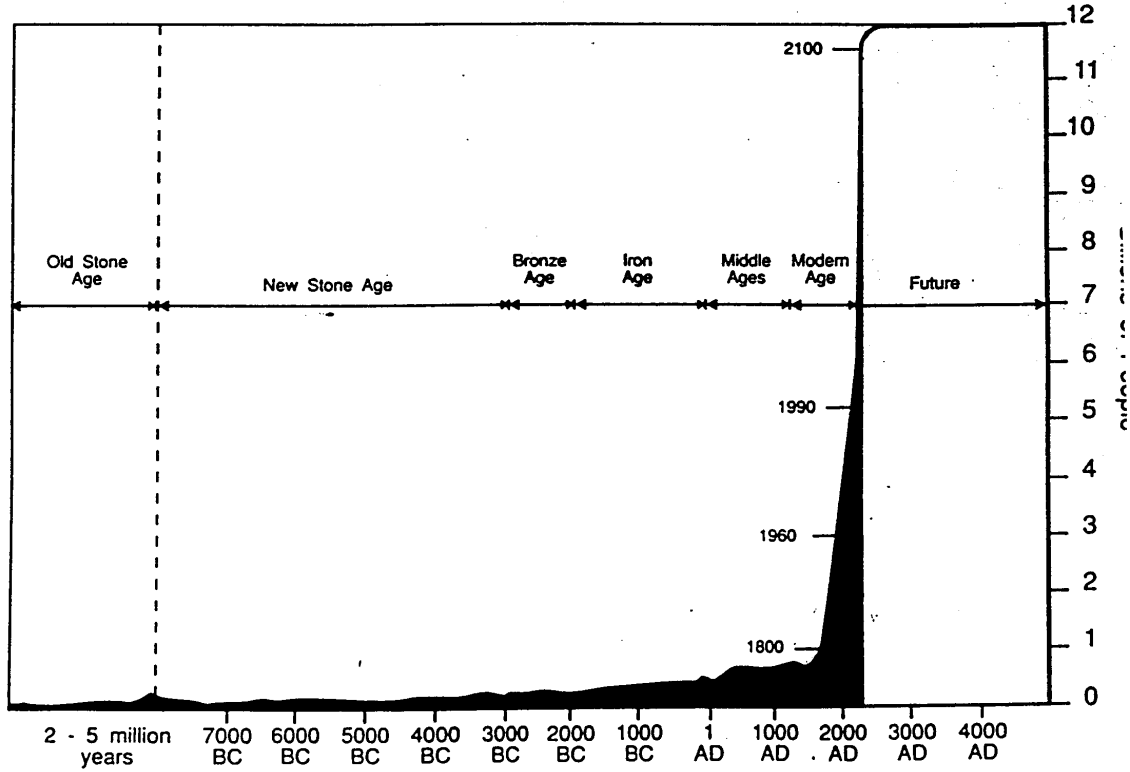
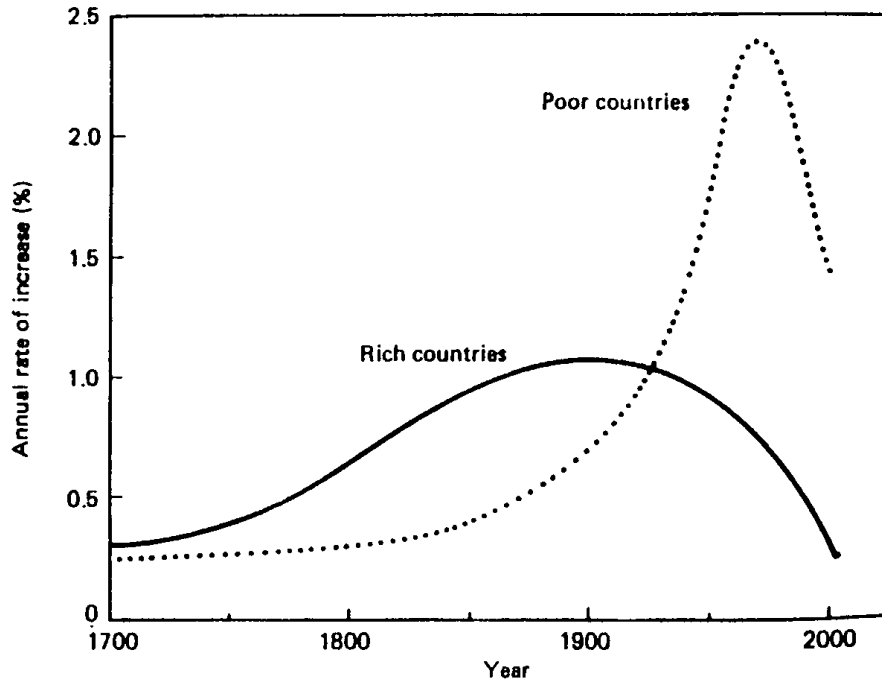


**Figure 9**  
**World Population Growth through History**



Source: Population Reference Bureau.



*Figure 5.1* Comparison of demographic transitions: Rates of increase for poor and rich populations (1700–2000)

Table 5.1 World, rich country (Europe, North America, Australia, New Zealand, Japan), and poor country populations (1900-90)

Year	Population (in millions)			Annual increase (%) <sup>a</sup>			Percentage share		
	Rich	Poor	World	Rich	Poor	World	Rich	Poor	World
1900	563	1,071	1,634	-	-	-	34.5	65.5	100
1920	654	1,203	1,857	0.7	0.6	0.6	35.2	64.8	100
1930	727	1,309	2,036	1.1	0.8	0.9	35.7	64.3	100
1940	794	1,473	2,267	0.9	1.2	1.1	35.0	65.0	100
1950	832	1,683	2,515	0.5	1.3	1.0	33.1	66.9	100
1960	954	2,074	3,019	1.3	2.1	1.8	31.3	68.7	100
1970	1,049	2,648	3,698	1.0	2.4	2.0	28.4	71.6	100
1980	1,136	3,313	4,450	0.8	2.2	1.9	25.5	74.4	100
1990	1,206	4,086	5,292	0.6	2.1	1.7	22.8	77.2	100

<sup>a</sup> Compared to previous date.

Source: Estimates of the United Nations (1920-90) and of the author (1900)

1998      1,182    4,719      5,901                      1.33      20.0      80.0      100

Table 5.2 Demographic indicators of world population (1950-90)

Region	Population (in millions)		Annual rate of growth (%)			Birth rate (per 1,000)		Death rate (per 1,000)		Total fertility rate		Life expectancy at birth	
	1950	1990	1950-90	1950-5	1985-90	1950-5	1985-90	1950-5	1985-90	1950-5	1985-90	1950-5	1985-90
	World	2,515	5,292	1.86	1.80	1.7	37.4	27	19.7	10	5.00	3.5	45.9
More-developed regions <sup>a</sup>	832	1,206	0.93	1.28	0.5	22.6	15	10.1	10	2.84	1.9	65.7	74
Less-developed regions	1,683	4,086	2.22	2.05	2.1	44.6	31	24.3	10	6.18	3.9	41.0	61
Africa	224	642	2.63	2.18	3.0	48.9	45	27.0	15	6.61	6.2	38.0	52
North America	166	276	1.27	1.80	0.8	24.6	15	9.4	9	3.47	1.8	69.0	76
Latin America	165	448	2.50	2.74	2.1	42.5	29	15.3	7	5.86	3.6	51.2	67
Eastern Asia <sup>b</sup>	671	1,336	1.72	1.75	1.3	40.8	20	23.3	7	5.72	2.4	42.7	70
Southeast Asia <sup>c</sup>	182	445	2.24	1.92	2.0	44.1	30	24.4	9	5.99	3.7	41.2	61
Southern Asia <sup>d</sup>	479	1,200	2.30	2.03	2.3	44.9	35	25.1	12	6.11	4.7	38.8	57
Western Asia <sup>e</sup>	42	132	2.86	2.70	2.8	47.5	36	23.4	9	6.78	5.1	43.5	64
Europe	393	498	0.59	0.79	0.2	19.8	13	11.0	11	2.59	1.7	65.3	74
USSR	180	289	1.18	1.71	0.8	26.3	18	9.2	11	2.82	2.4	64.1	70
Oceania	13	26	1.73	2.25	1.5	27.6	19	12.4	8	3.83	2.5	60.8	71
China	555	1,139	1.80	1.87	1.4	43.6	21	25.0	7	6.24	2.5	40.8	69
India	358	853	2.17	2.00	2.1	44.1	32	25.0	11	5.97	4.3	38.7	58

<sup>a</sup> More-developed regions: Europe, USSR, North America, Australia, New Zealand, Japan.

<sup>b</sup> Eastern Asia: China, Japan, Korea, and smaller countries.

<sup>c</sup> Southeast Asia: Burma, Indochinese peninsula, Indonesia, the Philippines, etc.

<sup>d</sup> Southern Asia: Indian subcontinent, Afghanistan, Iran.

<sup>e</sup> Western Asia: The so-called Near East.

Source: United Nations, *World Population Prospects 1988* (New York, 1989); United Nations, *United Nations World Population Chart 1990* (New York, 1990)

## POPULATION FOR WORLD AND MAJOR AREAS, 1750-2050

<i>Major area</i>	<i>1750</i>	<i>1800</i>	<i>1850</i>	<i>1900</i>	<i>1950</i>	<i>1998</i>	<i>2050</i>
<i>A. Population size (thousands)</i>							
World .....	791	978	1262	1650	2521	5901	8909
Africa .....	105	107	111	133	221	749	1766
Asia .....	502	635	809	947	1402	3585	5268
Europe .....	163	203	276	408	547	729	628
Latin America and the Caribbean .....	16	24	38	74	167	504	809
Northern America .....	2	7	26	82	172	305	392
Oceania .....	2	2	2	6	13	30	46
<i>B. Percentage distribution</i>							
World .....	100	100	100	100	100	100	100
Africa .....	13.4	10.9	8.8	8.1	8.8	12.7	19.8
Asia .....	63.5	64.9	64.1	57.4	55.6	60.8	59.1
Europe .....	20.6	20.8	21.9	24.7	21.7	12.4	7.0
Latin America and the Caribbean .....	2.0	2.5	3.0	4.5	6.6	8.5	9.1
Northern America .....	0.3	0.7	2.1	5.0	6.8	5.2	4.4
Oceania .....	0.3	0.2	0.2	0.4	0.5	0.5	0.5

*Sources:* United Nations, 1973. *The Determinants and Consequences of Population Trends*, Vol.1 (United Nations, New York).  
 United Nations, (forthcoming). *World Population Prospects: The 1998 Revision* (United Nations, New York).

**Definitions:**

$N(T)$  = Population size at time T

$N(0)$  = Population size at time 0

B = Number of births between 0 and T

D = Number of deaths between 0 and T

I = Number of immigrants between 0 and T

O = Number of out-migrants between 0 and T

**Demographic Balancing Equation:**

In words:

Population at time T = ( Population at time 0 ) + ( births between 0 and T ) - ( deaths between 0 and T ) + ( immigrants between 0 and T ) - (out-migrants between 0 and T)

$$N(T) = N(0) + B - D + I - O$$

Example using actual numbers:

$$N(1991) = N(1990) + B - D + I - O$$

For U.S.:

$$250,878 = 248,168 + 4179 - 2162 + 854 - 160$$

$$\text{Natural increase} = \text{births} - \text{deaths} = 4179 - 2162 = 2017$$

$$\text{Net migration} = \text{in-migrants} - \text{out-migrants} = 854 - 160 = 693$$

For World:

$$5,337,612 = 5,295,071 + 142,959 - 50,418 + 0 - 0$$

**Balancing Equation #2:**

Rate: The number of events in a specified period / Population at risk of that event in that period (0 to T)

Example: Crude death rate (CDR) in 1990 = Number of deaths in 1990 / Population in 1990

OR

(more precisely) Crude death rate in 1990 = Number of deaths in 1990 / Person years lived in 1990

The denominator of most demographic rates is number of "person-years" lived from 0 to T.

We can estimate this by  $(\bar{N}) * T$ .

$(\bar{N})$  = Average population over the period examined

So, in above example for the U.S., the number of person-years =  $(\bar{N}) * T =$

$$[(248168 + 250878)/2] * 1 = 249,523$$

**Change in population size over a period:**

The change in population size over a period = births - deaths + in-migrants - out-migrants

$$\Delta N = B - D + I - O$$

To get an annualized rate of population growth over a period, we can divide both sides by person-years lived 0 to T.

$$\frac{\Delta N}{PY} = \frac{B}{PY} - \frac{D}{PY} + \frac{I}{PY} - \frac{O}{PY}$$

Rate of population growth (annualized) = CBR – CDR + CRIM – CROM

Crude rate of natural increase: CBR – CDR

Crude rate of net migration: CRIM - CROM

For U.S.:

$$0.0109 = 0.0167 - 0.0087 + 0.0034 - 0.0006$$

OR

$$1.09\% \text{ per year} = 16.7 \text{ per } 1000 - 8.7 \text{ per } 1000 + 3.4 \text{ per } 1000 - 0.6 \text{ per } 1000$$

**Alternative Way to Calculate Growth Rates: (for those with some math background)**

$$r \text{ (o to T)} = \ln [N(t)/n(0)] / T$$

OR

$$N(T) / N(0) = e^{rt}$$

Since  $e^{0.69} = 2$ , the population doubles when  $r \cdot T = 0.69$ .

So  $T^* = \text{Doubling Time} = 0.69/r$