Ages	Percentage of Population[a]	Initial Values, 15-Level Model	1900[b] (millions) 4-Level Model
0–4	16.1	260[c]	
5–9	13.0	210	650
10–14	11.2	180	
15–19	9.9	160	
20–24	9.2	145	
25–29	7.9	120	700
30–34	6.8	105	
35–39	5.8	90	
40–44	5.0	80	
45–49	4.1	65	
50–54	3.4	55	190
55–59	2.7	40	
60–64	2.0	30	
65–69	1.4		
70–74	0.8		
75–79	0.4	60	60
80–84	0.2		

[a]Taken from typical age structure, developing country (Bogue 1969, p. 148).
[b]Calculated, assuming a total world population of 1.6 billion in 1900 (Carr-Saunders 1936, p. 42).
[c]Age 0–1, 50; age 1–4, 210.

Figure 2-79 Initial values for population levels in age disaggregations

Ideally, each age-specific mortality should be a direct function of the four factors selected as inputs to the death rate: food per capita, health services per capita, pollution, and crowding. Unfortunately, there is not yet enough knowledge to express the influence of each of these factors on the probabilities of death in the different age groups. To represent the variations in age-specific death rates as these four influences vary, we made one assumption: that the basic nonlinear pattern of the curve of human age-specific death rates will not change radically in the future. The relative constancy of this pattern over widely different mortality conditions and in widely different populations is shown in Figure 2-80. The great susceptibility of the very young and the very old to unfavorable environmental conditions seems to be a fundamental biological characteristic of the species regardless of the exact mix of environmental factors involved.

In both the four-level and the fifteen-level age disaggregations, life expectancy at birth was taken as the general indicator of population health. Age-specific mortalities were then determined as nonlinear functions of life expectancy. Although there is not necessarily a one-to-one relationship between a given life expectancy and a set of age-specific mortalities, variations from one population to another are negligible, given the degree of accuracy we seek with this model (for model life tables representing regional differences, see Coale and Demeny 1966). A model life table,

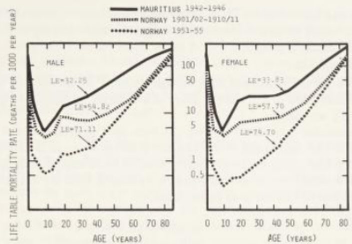

Figure 2-80 Age-specific mortality rates, Norway and Mauritius
Source: U.N. 1962.

based on data averaged from many different national populations (U.N. 1956), was used as the basis for the age-specific mortality functions in all the age disaggregations described here.

For the four-level model, age-specific death rates were calculated from the l_x column of the life table (U.N. 1956) under the simplifying assumption that deaths occur within each age level as a process of simple exponential decay with a constant rate:

$$l_t = l_o e^{-Mt}$$

which can be solved for M as follows:

$$\ln(l_t/l_o) = Mt$$

$$M = \frac{\ln(l_t/l_o)}{t}$$

For example, with a 20-year life expectancy the model life table indicates that only 42,805 of an initial cohort of 100,000 will survive to age 15. Therefore l_0 = 100,000, l_t = 42,805, and t = 15. The exponential decay constant M then equals:

$$\frac{\ln(42{,}805/100{,}000)}{15} = 0.0567.$$

Similarly, for a 60-year life expectancy, 88,500 of the initial 100,000 live to age 15, and M is:

$$\frac{\ln(88{,}500/100{,}000)}{15} = 0.0082.$$

The age-specific mortality of the age group P4 (age 65+) is also assumed to be an exponential decay constant, which is calculated from both the l_x and L_x columns of the life table. At life expectancy = 20 years there are 6,324 survivors of a cohort of