

rate) and the labor force (as an input to industrial production). To formulate these two age groups and keep track of the size of the total population as well, we can disaggregate the population into four age groups: prereproductive P1 (ages 0–14), reproductive working P2 (ages 15–44), nonreproductive working P3 (ages 45–64), and elderly P4 (ages 65+). The ages used to bound these four functional groups are only rough averages and are subject to much individual variation. The 15–44 delineation of the reproductive age is based on females only. The DYNAMO flow diagram of the four-level age structure is shown in Figure 2-78.

The total population is the sum of the four age levels as just defined:

$$1 \quad A \quad POP, K = P1, K + P2, K + P3, K + P4, K$$

The 0- to 14-year-old age level P1 is increased by births B, decreased by deaths D1, and decreased by the maturation of 14-year-olds MAT1 into the next age group. The other age levels are formulated similarly, except that they are increased by maturation from the level below, rather than by births:

$$\begin{aligned} 2 \quad L \quad & P1, K = P1, J + (DT) (B, JK - D1, JK - MAT1, JK) \\ & H \quad P1 = P1I \\ & C \quad P1I = 6567 \\ 6 \quad L \quad & P2, K = P2, J + (DT) (MAT1, JK - D2, JK - MAT2, JK) \\ & H \quad P2 = P2I \\ & C \quad P2I = 7017 \\ 10 \quad L \quad & P3, K = P3, J + (DT) (MAT2, JK - D3, JK - MAT3, JK) \\ & H \quad P3 = P3I \\ & C \quad P3I = 1927 \\ 14 \quad L \quad & P4, K = P4, J + (DT) (MAT3, JK - D4, JK) \\ & H \quad P4 = P4I \\ & C \quad P4I = 627 \end{aligned}$$

Since the age structure of the world population in 1900 is not known, the initial values for the four population age levels were taken from a typical age structure of a nonindustrialized country (Bogue 1969, p. 148) as shown in Figure 2-79.

The number of deaths in each age level each year is calculated from the number of people in the level PN ($N = 1-4$) times the age-specific mortality for that age level MN ($N = 1-4$).

$$\begin{aligned} 3 \quad R \quad & D1, KL = P1, K * M1, K \\ 4 \quad A \quad & M1, K = TABM1(M17, LK, K, 20, 80, 10) \\ & T \quad M17 = .0567 / .0366 / .0243 / .0155 / .0082 / .0023 / .001 \\ 7 \quad R \quad & D2, KL = P2, K * M2, K \\ & A \quad M2, K = TABM2(M27, LK, K, 20, 80, 10) \\ & T \quad M27 = .0266 / .0171 / .0110 / .0065 / .0040 / .0016 / .0008 \\ 11 \quad R \quad & D3, KL = P3, K * M3, K \\ 12 \quad A \quad & M3, K = TABM3(M37, LK, K, 20, 80, 10) \\ & T \quad M37 = .0562 / .0373 / .0252 / .0171 / .0118 / .0083 / .006 \\ 15 \quad R \quad & D4, KL = P4, K * M4, K \\ 16 \quad A \quad & M4, K = TABM4(M47, LK, K, 20, 80, 10) \\ & T \quad M47 = .13 / .11 / .09 / .07 / .06 / .05 / .04 \end{aligned}$$

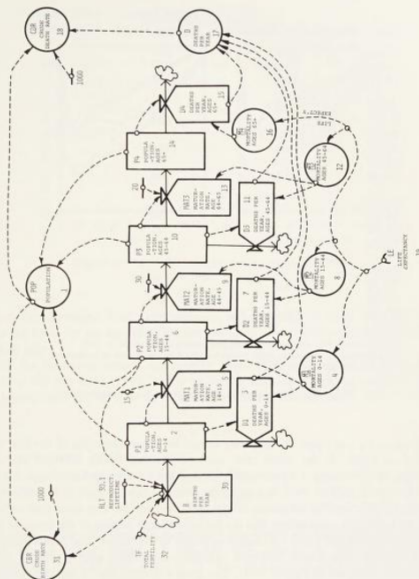


Figure 2-78 DYNAMO flow diagram, four-level age structure