The total number of deaths each year D is a sum of the deaths in each age level. The total population POP is the sum of the population in all the age levels. The fraction of the population in the four age groups of the four-level model is also calculated.

```
A     D.K=D1.JK+D2.JK+D3.JK+D4.JK+D5.JK+D6.JK+D7.JK+D8.JK+D9.JK+D10.JK+
X     D11.JK+D12.JK+D13.JK+D14.JK+D15.JK
A     POP.K=P1.K+P2.K+P3.K+P4.K+P5.K+P6.K+P7.K+P8.K+P9.K+P10.K+P11.K+
X     P12.K+P13.K+P14.K+P15.K
A     PC.K=(P1.K+P2.K+P3.K+P4.K)/POP.K
A     PF.K=(P5.K+P6.K+P7.K+P8.K+P9.K+P10.K)/POP.K
A     PM.K=(P11.K+P12.K+P13.K+P14.K)/POP.K
A     PE.K=P15.K/POP.K
```

The age structure is now represented in enough detail to take into account variations in age-specific fertilities of the female population. Figure 2-83 shows the curve used in the model to account for age-specific fertilities, an aggregate curve averaged from data from seventy-two countries (U. N. 1965). The figure also shows the variations from this average pattern observed in different specific populations. In the fifteen-level model we weighted the number of women in each level P5–P10 by the percentage of total fertility contributed by women of that age, according to the model age-specific fertility curve.

```
A     EXTRA.K=P5.K*.06+P6.K*.25+P7.K*.28+P8.K*.21+P9.K*.13+P10.K*.07
R     B.KL=CLIP(D.K,((TF.K/10)*EXTRA.K),TIME.K,PET)
```

The weighted sum of age levels is multiplied by the total fertility and by a factor of 0.5 (since women make up only half the population in each level), and divided by 5 (since we are interested in *yearly* birth rates and the levels represent five-year aggregations). For example, if the total number of births TF expected by women in the population is 6, an average 0.25 of the total, or 1.5 children, will be born to each woman between the ages of 20 and 25 (P6). Thus women in the P6 age group will produce on the average 1.5/5 or 0.3 children per woman per year. The total number of births expected from the P6 age group each year is then:

$0.5 \times P6$	$\times$	6	$\times$	0.25	$\div$	5
(total number of 20-to 24-year-old women)		(total number of births during each woman's lifetime)		(fraction of those births expected between the ages of 20 and 25)		(number of years in the age interval)

The age-specific fertility curve can of course be adjusted to express possible changes in age-specific fertility patterns, such as postponement of marriage as a deliberate policy to reduce the population growth rate. The effects of such a change are shown in the next section.

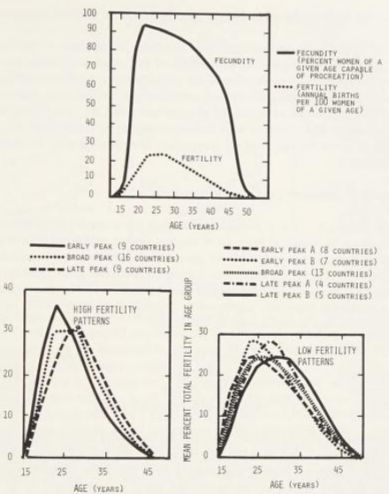

Figure 2-83 Age-specific fertility patterns
Source: U.N. 1965.

2.6 SIMULATION RUNS

We have described each assumption in the population sector of the world model, discussed the rationale behind it in terms of causal factors, and presented data to quantify it if the data were available. The first step in criticizing or extending the model is to examine each assumption separately in the light of the best knowledge available about the real world, keeping in mind the purpose of the model. The second step is to put the assumptions together and examine the dynamic behavior of the postulated system as a whole, compared with the behavior of the real-world system as a whole. Only when both steps have been completed, and when the model system generates a reasonable simulation of the real system under a wide variety of condi-