Country and Area or Ethnic Group	Year	Percentage of Women Aged 45–49 Years Reported as Never Having Borne a Child Alive	Estimated Gross Reproduction Rate
Angola	1950	14	2.7[a]
Cameroon:			
North Cameroon	1960	12	2.3
Mbalmayo Subdivision	1956	32	1.3
Ebolowa City	1958	51	1.2
Central African Republic:			
Central Ubangi	1959	21	2.4[b]
Congo (Brazzaville)	1960–1961	20[c]	2.8
Congo (Leopoldville)	1955–1957	20[d]	2.4
Ivory Coast:			
First Agricultural Sector	1957–1958	9	3.0
Mali	1957–1958	7	3.4[e]
Mozambique	1950	15	2.6[f]
Senegal:			
Middle Valley	1957		
Rural sedentary population		7	3.1
Rural Maures		9	2.1
Low Valley	1957	7	3.0
Upper Volta	1960–1961	6[g]	2.9
Zanzibar and Pemba:	1958		
Zanzibar town		38[h]	1.3
Zanzibar island, excluding Zanzibar town		25[h]	2.1

[a]1940–1945.
[b]1958–1959.
[c]For women 40–49 years of age.
[d]For women 45 years of age and over.
[e]1960–1961.
[f]1945–1950.
[g]For women 50 years of age and over.
[h]For women 46 years of age and over.

Figure 2-59 Sterility in African populations
Source: U.N. 1965, p. 24.

The relationship of partial infecundity—the impaired production of viable eggs and sperm—to general health, medical care, or nutrition is generally unknown. There is some evidence, however, that reproductive functions may be temporarily impaired under conditions of starvation (Keys et al. 1950 p. 749).

Postpartum infecundity—the absence of ovulation for some time after the birth of a child—can vary greatly from one society to another and can be an important factor in reducing total fertility in societies where it persists for an extended period. There is a clear link between infant survival, the duration and intensity of breast-feeding, and the period of postpartum infecundity in villages of North India (Wyon and Gordon 1971). It has been suggested (Peters, Israel, and Purshottam 1958) that

improved nutrition and better general health decrease the period of postpartum infecundity, even under equivalent habits of lactation. Empirically, it is true that Hutterite women, who practice long lactation, averaged a postpartum infecundity period of 6.1 months and an interval between live births of 26 months (Tietze 1957), whereas less well-fed North Indian women, also practicing long lactation, experienced a postpartum amenorrhea of about 11 months and an average birth interval of about 31 months (Wyon and Gordon 1971). This small difference in birth interval, when sustained over an average 30-year reproductive lifetime, would result in a difference in maximum total fertility of 2 children per woman.

Reproductive lifetime, the period between menarche and menopause, may vary substantially under different conditions of health and nutrition. The age of menarche in the United States and Europe has been declining steadily for the last century; it now occurs at least three years earlier on the average than it did one hundred years ago (Backman 1948). There is evidence from a number of sources that this secular trend may be closely related to improvements in nutrition (Keys et al. 1950; Nag 1968, p. 106). Frisch and Revelle (1967) report a mean age of female adolescent growth spurt (and accompanying menarche) of 12.2 years in areas that supply more than 2,300 calories per person per day, and 13.5 years in areas supplying less than 2,300 calories per person per day. At the same time that the age of menarche seems to be decreasing in industrialized areas, the age of menopause seems to be increasing (Backman 1948; Jaszmann, Van Lith, and Zaat, 1969). This trend may also be related to better nutrition and health. Wyon and Gordon (1971) cite the average age of menarche in the Indian Punjab as 14.5 years and the average age of menopause as 42.6 years, for a total female reproductive period of 28.1 years. In contrast, studies in the United States indicate an average age of menarche of 12.7 years (Zacharias, Wurtman, and Schatzoff 1970) and an average age of menopause of 48 years (MacMahon and Worcester 1966), for an average reproductive period of 35.3 years. The average reproductive lifetime is thus about 27 percent longer in the United States than in India.

There is most probably a relationship between the general health of a population and the frequency of miscarriage or stillbirth, although the available data are not adequate to make a direct comparison between various societies (Nag 1968, p. 138).

The state of nutrition and medical care in a population can have a substantial impact on fecundity through several of the physiological variables that have been mentioned here. However, the numerous physiological processes involved have not been characterized quantitatively, especially in nonindustrial populations where they would be expected to have the greatest impact on total fertility. Again, in the absence of complete information we simply attempted to express the general trend in World3. Life expectancy in the model is a composite measure of the general health of the population. We therefore included a link from life expectancy LE to maximum total fertility MTF through the variable fecundity multiplier FM. This variable expresses a positive relationship between life expectancy and maximum total fertility. The actual causal mechanism is, of course, much more complicated, since each input to life expectancy—food per capita, health services, pollution, and crowding—certainly has