points out, however, that this association may result from the poor health conditions and impaired fecundity of women in those societies. The low fecundity or maximum total fertility may dominate an underlying positive relationship between high mortality and desired total fertility.

Evidence for compensatory childbearing from a population where low fecundity is not a dominant factor has been given by Wyon and Gordon (1971, pp. 196–200). Figure 2-63 shows the child mortality and total fertility in North Indian village families. In this population, larger numbers of surviving children are clearly associated with fewer high-parity births. Figure 2-63 illustrates the two opposing effects of high mortality on the population growth rate: a direct effect on mortality, and an indirect compensatory effect on fertility. In these villages the direct effect of child mortality on the death rate dominates its indirect effect in stimulating more births. Families (generally low caste) that experience high mortality produce more live births but end up with significantly fewer surviving children.

A detailed calculation (Heer and Smith 1968) has determined the theoretical effect on the rate of natural increase (birth rate minus death rate) if populations experiencing varying mortality conditions have a reproductive goal of one son surviving on the father's sixty-fifth birthday. Figure 2-64 illustrates how the rate of increase would vary with increasing life expectancy, assuming that the desired certainty of one-son survival ranges from 50 percent to 95 percent. These hypothetical populations are assumed to have exact, up-to-date survivorship information and perfect birth control. The calculations indicate that the net rate of population increase necessary to ensure one surviving son for each family with a 90 percent or greater degree of certainty is extremely high until the life expectancy rises to 60 years or more. As life expectancy exceeds 60 years, the birth rate necessary to achieve the stated goal finally falls faster than the death rate, and the rate of population increase approaches zero. A scatter plot of actual rates of increase and life expectancies for various nations of the world, also shown in Figure 2-64, does not fit any of the theoretical curves. The lack of agreement is not surprising, because reproductive goals, fecundity, birth control effectiveness, and survivorship information are all variant in real-world populations. A detailed statistical analysis (Repetto 1972) of parity-specific birth rates also indicates that observed fertility patterns in India, Pakistan, and Morocco are much more complicated than would be predicted by the simple model of Heer and Smith (1968).

| | **Survivors from the First 6 Live Births** | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Number of wives | 6 | 22 | 47 | 106 | 116 | 106 | 57 |
| Mean number of live births after parity 6 | 3.5 | 3.1 | 2.9 | 2.5 | 2.4 | 2.2 | 2.0 |
| Mean number of live births, all parities | 9.5 | 9.1 | 8.9 | 8.5 | 8.4 | 8.2 | 8.0 |
| Mean number of surviving children, all parities | 2.5 | 3.1 | 3.6 | 4.9 | 5.7 | 6.5 | 7.3 |
| Percent of children who died, parity 7 or more | 29 | 32 | 44 | 23 | 27 | 33 | 35 |

**Figure 2-63**  Child mortality and total fertility, India, 1959
Source: Wyon and Gordon 1971, p. 199.

Since there are no satisfactory global data on which to base the compensatory multiplier from perceived life expectancy CMPLE, we had to choose among several possible hypotheses. One hypothesis was that used in the Heer and Smith (1968) calculations: parents perceive the probability of child survival correctly, and they immediately adjust their desired number of total births to correct for changing survivorship possibilities. If that were the case, the resulting relationship between life expectancy and CMPLE would approximate the upper dashed curve in Figure 2-65. (The probability of survival until age 15 used to calculate this curve was taken from the model life tables in U.N. 1956.)

Another hypothesis is that parents perceive changing survival possibilities inaccurately and only after some delay. In this case, the horizontal axis in Figure 2-65 would represent perceived rather than actual life expectancy. Perceived life expec-
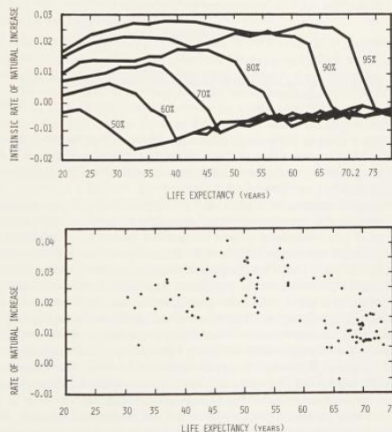




**Figure 2-64**  Rates of natural increase versus life expectancy, theoretical and empirical
Source: Heer and Smith 1968.