

Building a Family: Unplanned Events

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Couples in developed societies are often unsuccessful in achieving precise family building goals despite the widespread use of birth control. Unplanned events that frustrate reproductive intentions to varying degrees include contraceptive failure, sterility, miscarriage, prolonged conception delay, undesired sex combination of offspring, divorce, and the death of a spouse or a child. This paper reviews the probability of the occurrence of these events using US data. It is concluded that the large majority of newlyweds will experience at least one unplanned event during the family building phase of the life cycle.

In contemporary developed societies most newlyweds have a fairly clear set of preferences regarding the size and composition of their future family. The degree of specificity of these preferences varies considerably among couples. Some would be happy if the number of children were to fall within a rather wide range, while others are aiming to have a precise number of offspring. Similarly, desires regarding the spacing and the sex combination of children vary. To achieve their reproductive goals, virtually all couples now practice contraception for at least part of their reproductive years and a growing minority also resort to induced abortion. Despite the widespread use of modern birth control technology, family building plans are often frustrated. Eventual family size may be larger or smaller than desired and spacing and sex composition goals are frequently not reached. It is the objective of this paper to quantify the frequency with which different unwanted outcomes or events occur.

For newlyweds to be completely successful in achieving precise family building goals would require that they do not experience one or more of the following events:

- Contraceptive failure in delaying a desired pregnancy
- Involuntary childlessness (permanent infertility)
- Prolonged conception delay once conception is desired
- Intrauterine death (miscarriage or stillbirth)
- Congenital defect in newborn
- Unwanted sex combination of offspring
- Unwanted birth after the last desired birth
- Divorce
- Death of a spouse or child during the early phases of the family life cycle

Needless to say, the degree to which these different outcomes frustrate reproductive intentions varies enor-

mously. For example, the death of a family member is incomparably more serious than a very prolonged conception delay. Nevertheless, these events can all be considered unplanned.

The probability of occurrence of each of these unplanned events will now be reviewed briefly using US data. Findings related to the biological aspects of the family building process (involuntary childlessness, intrauterine death, congenital defect, and unwanted sex combination) would, with minor variations, also apply in most other societies.

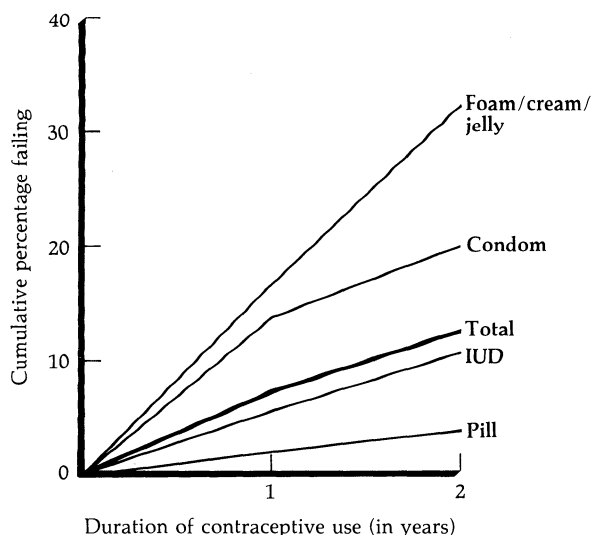
Contraceptive Failure in Delaying a Desired Pregnancy

The chance of an unplanned pregnancy depends on the type of contraception used and on the care with which it is practiced. Figure 1, using US data for 1970–73, presents cumulative proportions of couples who wish to delay their next wanted pregnancy but fail to do so for different methods of contraception.¹ The percentage failing after two years ranges from 3.8 for the pill to 32.4 for foam/cream/jelly. It should be emphasized that these method-specific failure rates are averages for groups of couples with greatly differing individual risks. The most careful contraceptors will approach theoretical failure rates that are much lower than the average use-failure rates in Figure 1. On the other hand, careless users will fail more often than average. The degree of carelessness is presumably closely related to the strength of the desire to delay conception. The average failure rate for all methods combined was 7.3 percent after one year and 12.1 percent after two years.

These findings suggest that a couple desiring a three-year interval between marriage and first birth, on average, would have about a 13 percent chance of a premature conception because contraception would be required for two years and three months (allowing nine months for a full-term gestation). Similar average risks would prevail before higher order births if three-year birth intervals are desired. The above estimates are all

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Figure 1 Cumulative percentage of couples that fail to delay their next wanted pregnancy, by method and duration of use



based on the implicit assumption that contraception is practiced continuously throughout the desired spacing interval. Since in reality contraception is not infrequently interrupted for significant periods of time, for example when switching methods, unprotected intercourse sometimes takes place. As a consequence, the actual average incidence of premature conceptions, including unwanted pregnancies during periods of nonuse, may be even higher than the use-failure rates estimated in Figure 1.

Involuntary Childlessness

Some couples who try to have a child are unable to do so because either the husband or the wife is sterile. In discussions of this topic a distinction is often made between primary sterility, which is measured among couples who have never had a child, and secondary sterility, which occurs among previously fertile couples. Figure 2 plots approximate levels of involuntary infertility by age of the women.² Infertility is measured as the proportion of couples who remain childless after a given age of the woman, despite continuous efforts to conceive. It is assumed that there is a negligible incidence of pathological sterility caused by widespread untreated venereal disease. The risk of experiencing primary infertility ranges from a few percent in the early twenties to about 20 percent between ages 35 and 40. By age 50 all couples may be considered unable to reproduce. The proportion of couples experiencing secondary sterility is lower at all ages because the sterility risk that would have accumulated before the time of the last birth is eliminated. Secondary infertility has only accumulated since the last birth and it therefore varies not only with age but also with duration since last birth. A couple wanting a first

birth when the wife is 28 years old would run a 6 percent risk of primary involuntary infertility; but with a three-year birth interval to the next birth, the risk of secondary infertility would only be about 2 percent.

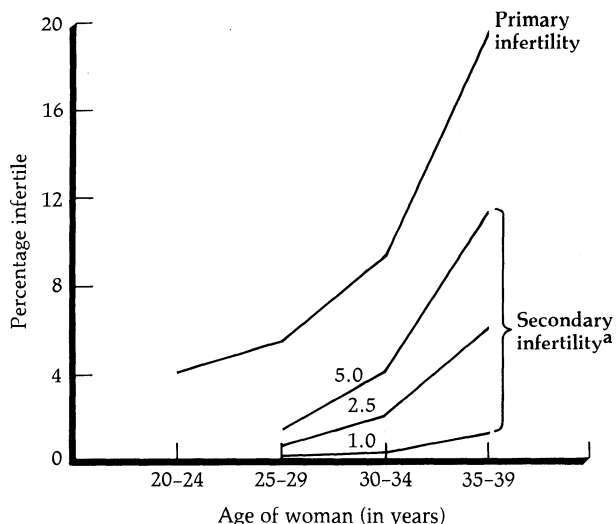
Prolonged Conception Delay

Once conception is desired, many fecund couples experience an unexpected conception delay. The probability of conceiving in a month is about 20 percent for noncontracepting fecund couples engaging in intercourse at a fairly typical rate of twice a week. If this conception risk is maintained in successive months, the average waiting time to conception would be five months. This monthly probability of conceiving is perhaps lower than might have been expected a priori. There are three explanations for this finding:³

- (1) The fertile period (the days in the middle of the cycle during which fertilization can occur) lasts on average only about two days. If intercourse takes place only twice a week, a substantial proportion of cycles would have no insemination during the fertile period.
- (2) In a significant proportion of cycles ovulation does not occur or else ova are defective or are lost in transit to the oviduct.
- (3) Even when fertilization does take place, a large proportion (probably about half) of all fertilized ova do not yield a recognizable conception because of high embryonic mortality in the first two weeks after fertilization.

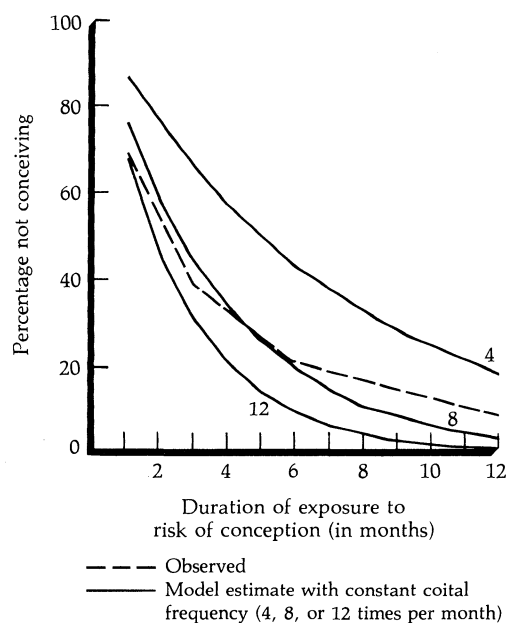
The simplest way for couples to raise their chances of conception is by increasing their frequency of inter-

Figure 2 Percentage of couples experiencing primary and secondary involuntary infertility, by age of the woman and duration since last birth



^aNumbers refer to years since last birth.

Figure 3 Observed and model estimates of percentage of fecund women without a conception, by duration of exposure to conception risk and frequency of intercourse



course. The proportion conceiving in a month would be around 40 percent if coitus takes place daily or at least every other day around the time of ovulation.⁴ If this conception probability of 0.4 were maintained in successive months, the average waiting time would only be 2.5 months. In practice, however, the probability of conception declines in successive months. This decline is due in part to a reduction in the frequency of intercourse and in part to the increasing selection of the subfecund among couples who have not yet conceived. Figure 3 gives the observed proportions of fecund couples without a conception by duration of exposure,⁵ and it compares these observations with model estimates of conception delays for different frequencies of intercourse.⁶ As expected, couples can raise or lower their conception chances substantially by varying their frequency of intercourse. Unless a high coital frequency is maintained, a significant percentage of fecund couples will fail to conceive within a year. The observed incidence of a delay of a year or more is 9 percent among couples who plan their pregnancies.⁷ Of course, very few of these couples expect such a prolonged conception delay.

Intrauterine Death

Approximately one in five conceptions (recognized by the delay of menstruation after fertilization) fails to end in a live birth.⁸ Most of the miscarriages occur in the early months of gestation. Although the cause of an intrauterine death can often not be determined, it is known that genetic and chromosomal abnormalities play a major role because a large proportion of aborted fetuses suffer

from these defects. The risk of an intrauterine death varies significantly with the age of the mother; it rises slowly from the early twenties to the mid-thirties and increases rapidly thereafter.⁹

Congenital Defects

Congenital malformations range widely in severity from trivial to incompatible with life. Excluding the inconsequential, approximately 2 percent of newborns have defects that either result in an early death or are clinically significant because they require intensive or prolonged medical treatment.¹⁰ The risk of a congenital defect rises slightly with the age of the mother. This increase is almost entirely due to the association between age and the incidence of abnormalities of chromosomal origin such as Down's syndrome.¹¹ Since amniocentesis can detect these chromosomal defects, they can be eliminated by parents who are willing to use induced abortion for this purpose.

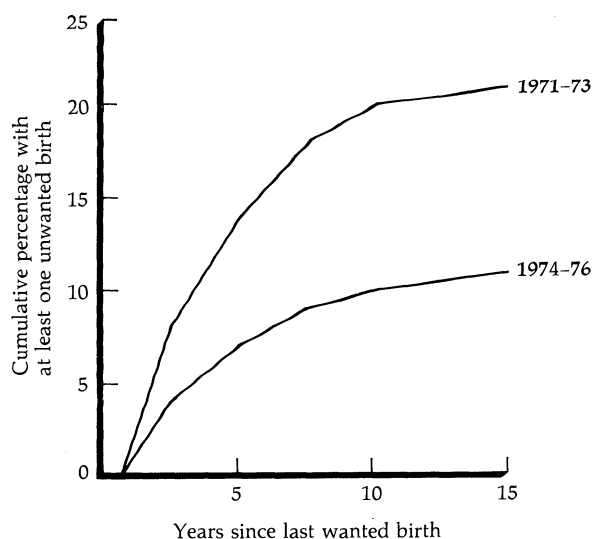
Sex Composition

On average, about 51 of every 100 live births are male and 49 are female. The probability of having a specific sex combination in a two-child family is therefore as follows: Two boys, 26 percent; two girls, 24 percent; boy, first birth, girl, second birth, 25 percent; and girl, first birth, boy, second birth, 25 percent. Only 50 percent of parents who want one boy and one girl will achieve their desired sex combination with two births. The other couples will have to continue childbearing if they want at least one child of each sex: 25 percent will require three births, 12.5 percent four births, and the remaining 12.5 percent five or more children before achieving the objective of at least one boy and one girl.

Unwanted Births

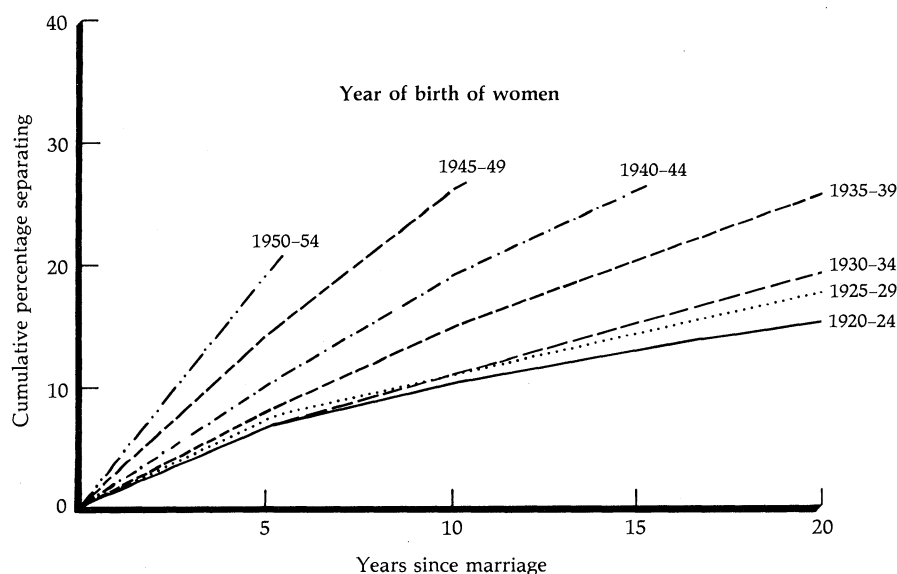
Once a couple has reached its desired family size, it faces a prolonged period (often exceeding ten years) during which further births are to be avoided. Many couples practice contraception for this purpose, but sterilization and induced abortion are increasingly used. The cumulative proportion of US couples with an unwanted birth by duration since last wanted birth are plotted in Figure 4 for two recent periods (these are life-table estimates for synthetic cohorts based on the reported incidence of unwanted births during the two periods).¹² The projected proportion of couples with an unwanted birth 15 years after the last wanted birth has declined from 21 percent in 1971-73 to 11 percent in 1973-76. Three factors have contributed to this decline: (1) an increase in the use of the more effective contraceptives; (2) a rise in the proportion of sterilized couples; and (3) more frequent use of induced abortion. The use of sterilization and induced abortion has seen especially rapid change during the early 1970s. The proportion of couples with a contraceptive sterilization rose from 10.6 to 19.3 percent be-

Figure 4 Cumulative percentages of couples with at least one unwanted birth, by duration since last wanted birth, United States, 1971-73 and 1974-76



tween 1970 and 1976.¹³ Over the same period the annual number of abortions per 1,000 married women aged 15-44 nearly quadrupled—from 1.3 to 5.1—largely due to the legalization of abortion on demand in the early 1970s.¹⁴ It is not possible to accurately estimate what the eventual cumulative probabilities of an unwanted birth in Figure 4 would have been in the absence of sterilization and induced abortion. It would certainly exceed the 21 percent after 15 years since last wanted birth estimated for 1971-73, and perhaps would be as high as 30 percent.

Figure 5 Cumulative probability of separating after first marriage, by years since marriage and birth cohort, United States, Caucasians



Divorce

The US rates of divorce and separation have been rising steadily over the past several decades. This increase has been very substantial, as is evident from the cumulative probability of separation after first marriage given in Figure 5.¹⁵ (The usual delay between separation and divorce makes the former a slightly better indicator of marital disruption.) Among women born from 1920 to 1924, 15 percent experienced a separation in the first 20 years of marriage. In contrast, the cohort born in the early 1950s exceeded this level of separation after only five years of marriage. A recent analysis of US divorce statistics estimates that approximately half of all first marriages will end in divorce if these marriages experience the US divorce rates measured in 1975.¹⁶ After the first 20 years of marriage 42.8 percent of newlyweds will have had a divorce. Unless past trends are reversed these already high probabilities of marital disruption may increase further in the future.

Death of a Spouse or Child

In 1975 the life expectancy of the US population reached 68.7 years for males and 76.5 years for females.¹⁷ These estimates imply a low risk of mortality in the early decades of life. Indeed, the annual probability of dying at any age up to age 50 is only a fraction of a percent, except in the first year after birth when 1.6 percent of newborns die. Females have consistently lower levels of mortality than males. While these mortality risks are impressively small, they do add up to significant cumulative levels over one or more decades of family life. For example, 8.8 percent of newlyweds will experience the death of one of the spouses in the first 20 years of marriage.¹⁸ The

Table 1 Probability of experiencing and avoiding unplanned events during the first two decades of marriage among couples that marry at age 25 of the wife and want two children, one of each sex, at three-year intervals after marriage

Events	Probability of experiencing event	Probability of avoiding event
Contraceptive failure before		
First birth	0.13	0.87
Second birth	0.13	0.87
Involuntary childlessness		
Primary	0.06	0.94
Secondary	0.02	0.98
Conception delay over one year before		
First conception	0.09	0.91
Second conception	0.09	0.91
Intrauterine death after		
First conception	0.20	0.80
Second conception	0.20	0.80
Congenital malformation		
First birth	0.02	0.98
Second birth	0.02	0.98
Undesired sex combination (bb or gg)	0.50	0.50
Unwanted birth (at least one)	0.30	0.70
Divorce	0.43	0.57
Death of		
Parent	0.09	0.91
Child	0.04	0.96
Probability of avoiding all unplanned events		0.062

chance that at least one child dies before age 20 is 5 percent in a two-child family.

Conclusion

The foregoing discussion has indicated the general order of magnitude of the risks of experiencing various unplanned events. These risks often depend on the specific family building plans, including the desired number, spacing, and sex combination of children. The estimation of the probability of encountering at least one of the unplanned events over the course of the family life cycle requires more specific assumptions about the desired family building pattern. By way of illustration, let us take a not atypical couple that marries when the wife is age 25 and wants two children, one of each sex. Let us further assume that the couple uses contraception with average effectiveness to space children at three-year intervals after marriage. After the last birth contraception is used, but sterilization and induced abortion are assumed to be not acceptable. The probabilities of experiencing each of the nine unplanned events during the first 20 years of marriage of this hypothetical couple are presented in Table 1. The estimates in this table are based on the earlier discussion of the different topics and should be considered rough approximations. To find the probability of

avoiding all of these events, one can simply multiply the probabilities of not experiencing each event in the last column of Table 1. The result is surprising: only 6.2 percent of couples subjected to the risks will manage to be completely successful in achieving their exact family building goals. The remaining 93.8 percent will experience at least one unplanned event.

Varying the assumptions that underlie the calculations in Table 1 would of course have an impact on the results. For example, if only one child of a given sex is desired, then the percentage with at least one unplanned event declines slightly from 93.8 to 89.6. A lower age at marriage would not necessarily have an important effect because the declining risk of some events such as spontaneous intrauterine death or childlessness is at least in part compensated for by a rising risk of divorce. Resorting to sterilization or induced abortion after the last wanted birth would eliminate unwanted births, but for the large majority of couples it would still be difficult to avoid at least one other unplanned event. Clearly, achieving a desired family composition is not a simple matter, and most couples will have to accept modified versions of their ideal family.

References and Notes

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- 2 J. Bongaarts, "Infertility after 30: A false alarm," *Family Planning Perspectives* 14, no. 2 (March/April 1982): 75-78. It is assumed here that a couple's risk of becoming sterile is only a function of the age of the wife. If $S(a)$ denotes the proportion sterile at age a of the wife, then this function also equals the probability of experiencing primary sterility at age a . The proportion experiencing secondary sterility at age a among those who had a birth at age a' of the wife equals $1 - (1 - S(a))/(1 - S(a'))$.
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- 5 C. Tietze, "Time required for conception in 1727 planned pregnancies," *Fertility and Sterility* 1, no. 4 (1950):338-346.
- 6 The estimated conception rates for different coital frequencies are based on a model described in Bongaarts and Potter, cited in note 3.
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