



Model Fertility Schedules: Variations in The Age Structure of Childbearing in Human Populations

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CURRENT ITEMS

MODEL FERTILITY SCHEDULES: A research project* recently undertaken at the Office of Population Research was an examination of the roots of a basic integral equation in the theory of stable populations:

$$\int_a^\beta e^{-ra} p(a)m(a)da = 1.0$$

The aim was to examine the nature of the roots for a set of net fertility functions expressing the full variety of fertility experience to be found in large human populations. One segment of the project was an attempt to create a family of model fertility schedules encompassing the full range of human experience, an attempt that culminated in the tables presented here.

Several sets of model tables have been developed representing in different ways and in different detail of coverage typical age patterns of mortality found in human populations at every recorded level of mortality (United Nations 1955; Coale and Demeny 1966; Ledermann 1969; Brass 1971). A single model schedule of first marriage frequencies (with a corresponding model schedule of the proportion ever married by age, and also a schedule of person years lived in the ever married state) has been found to fit a wide range of age patterns of nuptiality, given the proper choice of parameters specifying the origin and the appropriate horizontal and vertical scales for the standard nuptiality function (Coale 1971).

In Appendix B are printed a set of model age-specific fertility schedules analogous to the earlier model tables of mortality and nuptiality. These schedules represent age *patterns* of fertility rather than the level of fertility. Since the sum of the tabulated fertility rates, taken over all reproductive ages, is 1.0, age-specific fertility rates can be calculated by multiplying each model rate by an actual population's total fertility rate. In these new tables the fertility in each single year of age is calculated as the product of a number representing the proportion cohabiting at that age and a number representing the age-specific fertility of those who cohabit. By such combinations we have been able to construct schedules that we believe express essentially the full range of age structures of fertility likely to be found in large human populations. The source of this belief is, first of all, the regularity, both in the age pattern of nuptiality, and in the variation of marital fertility with age, noted in an earlier article (Coale 1971). The further and sounder basis for the belief in the validity of the model fertility schedules is their extraordinarily close fit to various accurately recorded fertility schedules of rad-

*This project was conducted as part of a graduate course in mathematical demography at Princeton taught by Donald McNeil, Ansley Coale, and Jane Menken, during the fall semester of 1973-1974. It was a joint research project involving students and faculty, undertaken in lieu of individual research papers.

ically different form in terms of mean age, standard deviation, and symmetry or asymmetry. The fit is described and graphically illustrated at a later point.

The text that precedes the tables includes: 1) a description in general terms of the basis of the model schedules of fertility; 2) the presentation of relevant details of the two constituent functions that are multiplied together to form the schedules; 3) a discussion of the fit of the schedules, including their suitability given the existence of such empirical factors as extramarital fertility, dissolution of marriage, and rapid changes in nuptiality; 4) a brief discussion of the advantages of model schedules based on the combination of two functions; and 5) an indication of some of the applications of the schedules, including instructions for locating, by interpolation, the most appropriate set of age-specific rates.

The Basis for the Model Schedules of Fertility

The basic assumption upon which the model schedules are calculated is that fertility conforms to the structure by age created by multiplying together two model subschedules: a sequence of model proportions ever married at each age and a model schedule of marital fertility. Thus, if the proportion ever married at age a in the model schedule of nuptiality is $G(a)$, and the proportion of married women at age a experiencing a live birth in the model schedule of marital fertility is $r(a)$, age-specific fertility is $f(a) = G(a) \cdot r(a)$. This construction applies exactly to a hypothetical population in which there is no fertility outside marriage, and no dissolution of marriage before the end of the childbearing span of ages. But it also duplicates quite adequately the age structure of fertility in actual populations through the selection of a $G(a)$ that differs slightly from the proportion ever married in the actual population, and of an $r(a)$ that differs slightly from the actual marital fertility schedules.

The representation $f(a) = G(a) \cdot r(a)$ makes possible the calculation of model fertility schedules from three specified parameters—two parameters required to specify a model schedule of proportions ever married, and one parameter required to specify a model schedule of marital fertility.

Age Structure of the Proportion Ever Married, $G(a)$, Specified by Two Parameters

First-marriage frequencies, defined as the number of first marriages in a short age interval divided by the number of persons in that interval, have been shown to conform to a curve of the same shape in different populations (or more precisely in different cohorts). What differs from population to population is the age at which first marriage begins, the duration of the age span within which the majority of the marriages occur, and the proportion of the survivors in the cohort who, at advanced ages, have been married at some time. The similarity in structure of the age distribution of first marriages in different cohorts is analogous to the common shape characterizing different normal (Gaussian) distributions, which are alike only when the mean (location), standard deviation (horizontal scale), and vertical scale (number of cases, or size of population) are specified.

If the effect of differential mortality by marital status on the proportion ever married is neglected, the existence of a standard distribution of first marriage frequencies implies a standard curve describing the proportion ever married in different cohorts. The *form* of the curve is standard, but there are differences, of course, in the starting age of a tangible proportion ever married, in the pace at

which the curve rises and in the ultimate proportion experiencing marriage—the proportion ever married by the age at which first marriage rates have fallen essentially to zero. If the standard proportion ever married x years after first marriages begin is $G_s(x)$, in any cohort $G(a) = C \cdot G_s((a - a_0)/k)$, where C is a factor determined by the ultimate proportion ever married, a_0 is the age at which first marriages begin, and k is the scale factor expressing the number of years of nuptiality in the given population equivalent to one year in the standard population. If k is 1.0, first marriages occur at the same pace as in the nineteenth-century Swedish population that served as the basis of the standard; if k is 0.5, or one-half, first marriages occur at twice the pace of the standard. Specifically, according to the standard schedule half of the population that will ever marry has experienced first marriage ten years after the earliest age at which a consequential number of first marriages occur; if k is equal to 0.5, one-half the cohort has experienced first marriage five years after a_0 .

The standard proportions ever married were published in an earlier article (Coale 1971), but for computational convenience, we have calculated $G(a)$ from a closed-form analytical expression for first marriage frequencies developed by Donald R. McNeil (Coale and McNeil 1972). This expression is:

$$(1) \quad g(a) = (0.19465/k) \exp \{(-0.174/k)(a - a_0 - 6.06k) - \exp [(-0.2881/k)(a - a_0 - 6.06k)]\}$$

No analytical expression for $G(a)$ has been found, but $G(a)$ can be calculated by numerical integration of $g(a)$, since $G(a) = \int_{a_0}^a g(x)dx$. This representation of $G(a)$, with appropriate estimates of a_0 and k , provides an approximation of the proportion ever married in a cohort, if multiplied by a scale factor to allow for the particular proportion ultimately experiencing marriage. However, since the standard schedules of fertility that we have constructed represent only the age pattern of fertility and not the level, the proportion ultimately marrying is omitted here. Only the age of initiation and the pace of first marriages affect the structure of fertility; the proportion remaining celibate influences the level but not the age pattern of fertility.

The Age Structure of Marital Fertility, $r(a)$, Specified By a Single Parameter.

Louis Henry found that there is a characteristic pattern of marital fertility in populations in which there is little or no voluntary control of births. He defined voluntary control as behavior affecting fertility that is modified as parity increases, and the absence of control—natural fertility—as behavior, whether affecting fertility or not, that is the same no matter how many children have been born (Henry 1961). The regularity in marital fertility that makes possible a single-parameter set of schedules is this: marital fertility either follows natural fertility (if deliberate birth control is not practiced), or departs from natural fertility in a way that increases with age according to a typical pattern. In a population in which fertility is voluntarily controlled, the ratio of marital fertility at each age, $r(a)$, to a schedule of natural fertility, $n(a)$, is given by:

$$(2) \quad r(a)/n(a) = M \exp (m \cdot v(a))$$

The factor M is a scale factor expressing the ratio $r(a)/n(a)$ at some arbitrarily chosen age. Since we are concerned only with the age pattern of fertility (not its level), the value of M (like the value of the factor C in the model schedule of proportion ever married) is of no significance for the construction of our fertility schedules. The function $v(a)$ expresses the tendency for older women in populations practicing contraception or abortion to effect particularly large reductions of fertility below the natural level.

Model schedules of $r(a)$ are required at single years of age over the full range at which there is found both 1) a non-zero proportion cohabiting, and 2) non-zero marital fertility. The two functions $n(a)$ and $v(a)$, assumed to be invariant, must therefore be estimated by single years of age; the requisite family of model schedules is then obtained by assigning values to m , from zero, in which case $r(a)$ equals $n(a)$, to a maximum expressing the greatest likely departure of fertility from the age pattern of natural fertility resulting from a very high degree of voluntary control of births.

The functions $n(a)$ and $v(a)$ were derived from empirical data. There were two steps in the derivation: first, the estimation of approximate values of $n(a)$ and $v(a)$ by five-year age intervals above age 20, and second, determination of single-year values by freehand interpolation above age 20 plus extension to ages below 20 on somewhat arbitrary common sense principles.

Seven values of $n(a)$ at ages 20-24 through 45-49 were derived by calculating the arithmetical average of schedules designated by Henry as natural (Henry 1961). Henry's schedules begin at 20 because premarital conceptions have a large and irregular effect on teenage marital fertility. Ten schedules of natural fertility were averaged after discarding schedules known to be based on surveys in which age misreporting was especially prevalent and might have distorted the pattern of fertility. The effect of this selection (compared to the acceptance of all schedules listed by Henry) is minor, since the age pattern of all of those listed is broadly similar.

Seven values of $v(a)$, at ages 20-24 through 45-49, were obtained by calculations employing the marital fertility schedules listed in the United Nations Demographic Yearbook for 1965 (United Nations 1966). Again, schedules known or suspected to be distorted by age misreporting or other forms of faulty data were discarded. Each of the forty-three schedules not eliminated on this basis were provisionally accepted as embodying, each in its own degree, the typical pattern of departure from natural fertility.

For the i^{th} schedule an individual $v_i(a)$ can be calculated by setting $m = 1.0$ in equation (2). For the i^{th} schedule we find

(3)
$$v_i(a) = \log [r_i(a)/(M \cdot n(a))]$$

M is chosen so that $v_i(a)$ is zero for the age interval 20-24. The arithmetical average of the forty-three values of $v_i(a)$ in each of the seven age intervals was then defined as $v(a)$ for each interval. The values of $n(a)$ and $v(a)$ are as follows:

	20-24	25-29	30-34	35-39	40-44	45-49
$n(a)$	0.460	0.431	0.396	0.321	0.167	0.024
$v(a)$	0.000	-0.316	-0.814	-1.048	-1.424	-1.667

The function $v(a)$ calculated in this way can be validated by substituting the tabulated values in equation (2) and seeing how well the result fits each marital fertility schedule. A value of M is chosen that equates $M \cdot n(a)$ with $r(a)$ at ages 20-24. One way of getting a visual impression of how well $v(a)$ fits a given marital fertility schedule is to calculate a separate value of m for each age interval. If equation (1) were fully valid, and $v(a)$ appropriately estimated, the separately determined values of m for age intervals 25-29 through 45-49 would all be the same. The sequence of m 's calculated for the forty-three empirical marital fertility schedules is not in every instance highly uniform. However, the set of m 's for most marital fertility schedules falls on a reasonably level plateau, and the difference in level of m between different populations is quite evident (see Figure 1).

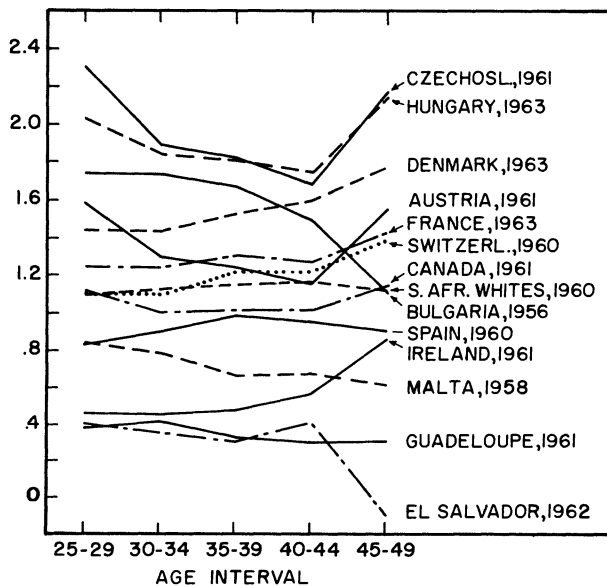


Fig. 1. Values of m , where $m = \log[r(a)/(M \cdot n(a))]/v(a)$, for selected marital fertility schedules

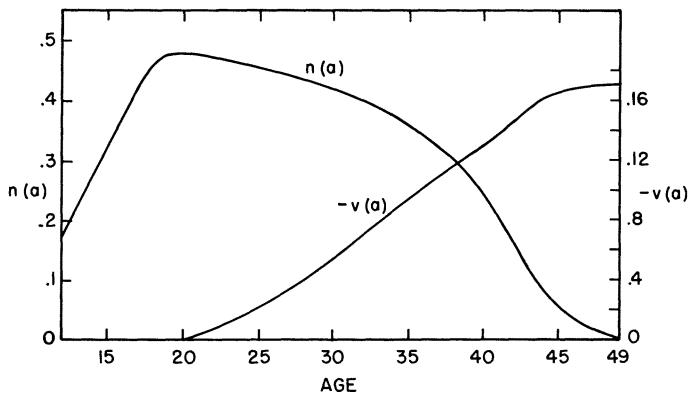


Fig. 2. Values of $n(a)$ (natural fertility), and $v(a)$ (logarithmic departure from $n(a)$)

Single-year values of $n(a)$ and $v(a)$ are shown in Figure 2, and tabulated as part of the FORTRAN program in Appendix A. The hand-fitted values of $n(a)$ above age 20 approximately match, in average value for each five-year interval, the values at five-year intervals listed earlier. The extension of $n(a)$ back to age 12 is based on general biomedical information that full reproductive capacity is reached a few years after menarche, and that the mean age at menarche varies from about 12 to 16 years in different populations. The particular choice of rates to represent $n(a)$ below age 20 is not of major importance because of the dominant role of $G(a)$ in determining the rise of age-specific fertility with age.

Values of $v(a)$ at single ages were chosen so that their sum over five-year age intervals matched (above age 25) the values at five-year intervals given earlier. To avoid a sharp change in the neighborhood of age 25, non-zero values were assumed to begin at age 20.

With single-year values of our three functions, we have the means of calculating a full range of fertility schedules for hypothetical populations in which there is no illegitimacy and no marital dissolution, and in which marriage begins at various initial ages and occurs over various age spans, and in which marital fertility ranges from the gradual decline with age characteristic of natural fertility to the much steeper decline characteristic of populations in which there is extensive control of fertility within marriage. The age pattern is given by equation (4):

$$(4) \quad f(a) = G(a)n(a)e^{m \cdot v(a)}$$

where $f(a)$ is age-specific fertility, $G(a)$ is the proportion ever married (in a population where first marriage occurs according to a schedule characterized by selected values of the parameters a_0 and k), $n(a)$ is natural fertility, $v(a)$ is the characteristic pattern of departure from natural fertility, and m is the extent of that departure.

Model Schedules of Age-Specific Fertility, and Their Similarity to the Age Pattern of Fertility in Actual Populations

In actual populations, of course, births occur outside of marriage as well as within, and the proportion of the population currently married differs from the proportion ever married because of the presence of the widowed and divorced. However, the structure of fertility in an actual population may closely resemble that in a hypothetical population with no marital dissolution or extramarital fertility if the latter population has slightly different parameters of nuptiality and marital fertility from those found in the actual population. The effect of illegitimate births and of premarital conceptions on the age structure of fertility is equivalent to a schedule of first marriages that is slightly different from the observed one at early ages; the effect of illegitimate births at the older ages is equivalent to a slight increase in marital fertility at those ages. The proportion of the ever married population that is widowed and divorced rises monotonically with age, thus reducing fertility toward the end of childbearing in a way that is topographically similar to the effect of $v(a)$ on marital fertility. In other words, it is probable that the standard schedule of first-marriage frequencies, with a suitable choice of initial age and pace of occurrence of first marriages, can serve as a usable surrogate for the age of entry into sexual union (including unions that do not in

fact involve marriage), and that modification of natural fertility by the proper choice of m by which to multiply $\nu(a)$ can serve to approximate the effect both of marital dissolution in reducing the fraction married at higher ages and of control of fertility on marital fertility. On the provisional assumption that such is the case, we have calculated a large array of model fertility schedules by single years of age; each schedule is composed of the product of an estimated proportion ever married and of marital fertility in each single-year age interval. The starting age of nuptiality was allowed to range from 12.5 to 18 years; the pace of marriage from 56 percent of the pace ($k = 1.7$) to five times the pace ($k = 0.2$) in the Swedish standard nuptiality schedule. The value of m was permitted to range from zero (natural fertility) to 3.9, on a scale in which 1.0 is the average value for forty-three schedules in the 1965 Demographic Yearbook. A total of 795 model schedules was tabulated. Each schedule has been normalized so that the sum of the fertility rates at all ages is 1.0; the schedules embody only an *age pattern* of fertility and carry no implication with respect to total fertility.

The tabulated schedules have been selected to produce mean ages at integral values from 24 to 34 years and values of standard deviation (achievable within the stipulated limits of the three underlying parameters) at intervals of half a year. The range of standard deviation is from 4.0 to 7.5, but some combinations (e.g. standard deviations of 7.0 or 7.5 with a mean age of 25) could not be attained within the limits of the three controlling parameters.

When a_0 was 15.0 or more, the single-year rates under age 20 were modified to conform to an observed feature of reliably recorded single-year schedules; non-zero fertility rates typically begin at about age 15 even when marriage begins relatively late. Positive fertility rates at ages 15 and 16 in such populations are probably the result primarily of extramarital conceptions that occur to a small number of adolescents. The requisite modification was achieved as follows: the value of fertility at exact age 20 and the cumulated value of fertility up to age 20 were accepted as initially calculated from equation (3). Values of n and R were found such that $f(a)$ equals $R(a - 15)^n$ matches the calculated value at age 20, and such that $R \int_{15}^{20} (a - 15)^n da$ matches cumulated fertility (as calculated) up to age 20.

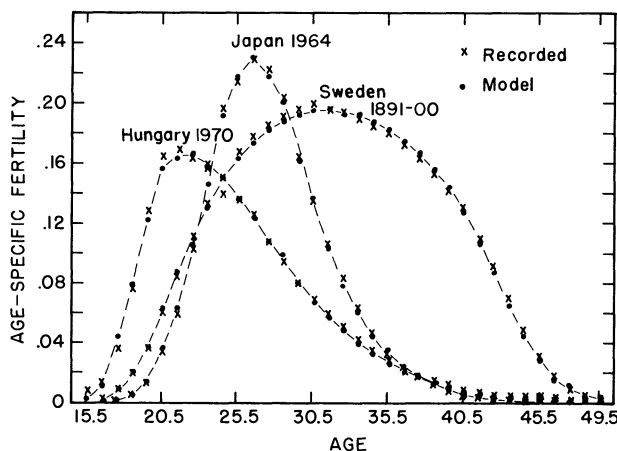


Fig. 3. Age-specific fertility rates of three populations fitted by model fertility schedules

A crucial question is whether this family of model fertility schedules provides a close fit to the fertility of actual populations. We have tried to determine how well the model schedules operate by finding a schedule (through interpolation among the printed values) that matches each of a number of recorded schedules in terms of the mean age and the standard deviation and the ratio of the average value of fertility in the interval from ages 15 to 20 to the average value from ages 20 to 25. Figure 3 shows the goodness of fit for three selected fertility schedules recorded by single years of age.

The schedules were chosen because they had the lowest and highest mean ages (Hungary, 1970, and Sweden, 1891-1900), and the lowest standard deviation (Japan, 1964) among the single-year fertility schedules that we examined; in spite of the fact that the schedules fitted are extreme, the fit in every case is quite close. In fact the absolute value of the area between the model schedule and the recorded rates is in each instance less than 2.5 percent of the total area under either curve. We have fitted a number of other recorded fertility schedules with equal success.

Figure 4 shows the structure of fertility that results when entry into cohabitation is early and rapid or late and gradual, combined with natural fertility, and with fertility that is highly controlled. In interpreting Figure 4 the reader must keep in mind the normalization of each schedule so as to produce an arbitrary total fertility of 1.0. The figure illustrates the distribution of fertility by age, not differences in level of fertility associated with age patterns. Actually, a schedule incorporating natural fertility would be expected to have at least as high fertility at every age as a schedule with the same a_0 and k and positive values of m . In Figure 5 two schedules with the same nuptiality but different values of m are shown, when the final proportion married is set at 1.0, and natural fertility is given a maximum value of 0.477.

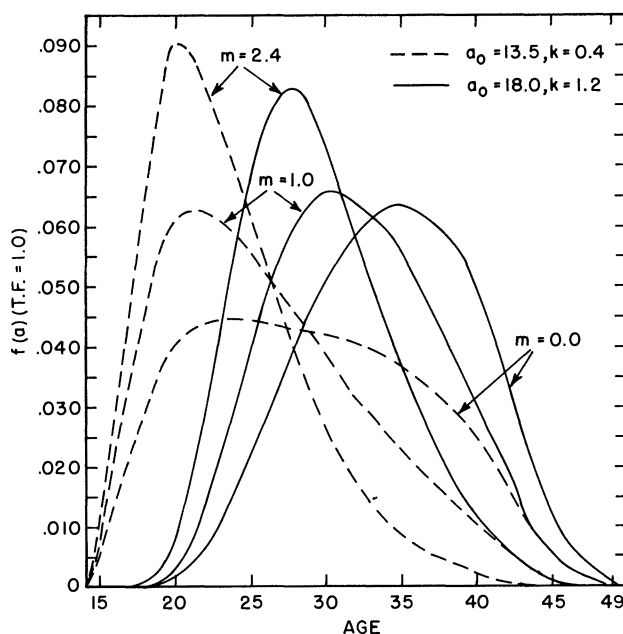


Fig. 4. Model fertility schedules, total fertility = 1.0. Combinations of early marriage with various degrees of fertility control and late marriage with various degrees of control

Suitability of the Model Fertility Schedules when Nuptiality is Changing

One of the two basic components of the model fertility schedules—the standard schedule of first-marriage frequencies—logically fits the experience of a cohort as it moves through life; it cannot match the proportion ever married by age in a cross section during a period of rapid changes in nuptiality. In fact, during such a

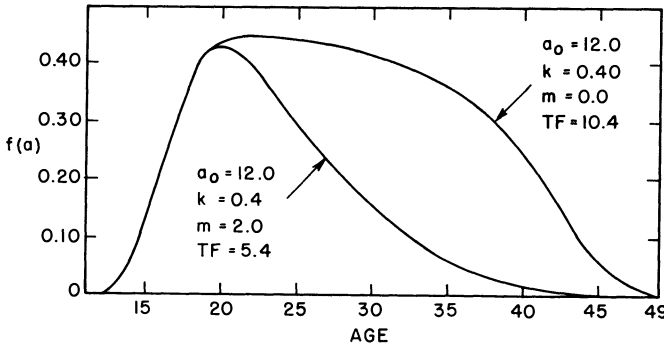


Fig. 5. Age-specific fertility schedules, proportion ultimately ever married 1.0, marital fertility given by $n(a) \cdot \exp(m \cdot v(a))$

period, there may be such peculiarities as a proportion ever married at age 30 higher than at 40. But an examination of long sequences of Swedish and Danish period and cohort marital fertility schedules reveals that the second basic component—a set of model schedules of marital fertility—fits cross-sectional experience better than it fits cohort experience. Thus one of the components is appropriate to the construction of model schedules for periods, and the other component is not. In particular, we can expect difficulties in fitting the model schedules to actual experience when nuptiality is changing rapidly.

The good performance of a model schedule in matching fertility for Japan, 1964 (Figure 3), shows that this logical defect does not necessarily impair the capacity of the model schedules to duplicate real age patterns. However, the fit is achieved with a fertility schedule embodying an implied mean age of first marriages (32.4 years) that bears no relation to the actual mean age at marriage in Japan (about 24 years). In contrast, the model schedule fitted to Hungary, 1970, implies a mean age at first marriage within 0.4 years of the recorded mean. Thus the model schedules fit quite well even when the assumptions they incorporate are violated; however, the parameters (a_0 , k , and m) that in periods of constant nuptiality approximately specify the age pattern of entry into cohabitation and the departure of marital fertility from the “natural” pattern cannot be so interpreted in a period of rapid change.

Advantages of the Model Schedules

A virtue of this set of model schedules as compared to fitted schedules that are based on conventional frequency distributions such as the log normal, or one of the Pearson curves (Tekse 1967; Talwar 1970; Mitra and Romaniuk 1972; Romaniuk 1973; Talwar 1974), is that the model schedules incorporate combinations of intuitively understandable demographic factors. The validity of this basis for

constructing model tables is confirmed by the goodness of fit to a variety of accurately recorded schedules. The model tables have the further advantage of describing in detail age patterns of fertility that are widely experienced but seldom recorded. Early marriage has been combined with natural fertility in many populations, but this combination has usually occurred in the absence of accurate registration of birth by age of mother; consequently few instances of this age pattern of fertility have been observed in detail. The model tables provide a useful tool of estimation for such populations.

Some Possible Uses of Model Fertility Schedules

It is hoped that these model fertility schedules will prove useful in a number of practical, analytical, and heuristic ways, only some of which can be foreseen at this early stage. One practical purpose is to provide estimated single-year fertility rates for populations in which age-specific fertility is tabulated only by five-year age intervals. The tables have been arranged to make it possible to locate a model fertility schedule on the basis of a known mean and standard deviation plus the ratio of fertility at ages 15-19 to fertility at ages 20-24 (labeled R_1 in the model tables). (In calculating the standard deviation from data given by five-year age intervals it is necessary to allow for Shepherd's correction or to subtract 2.083 from the calculated variance.)

Fitting a Model Schedule to an Observed Schedule: England and Wales, 1965

It is usually possible to calculate a model fertility schedule matching observed values of mean age, standard deviation, and R_1 by employing the weighted average of no more than three tabulated schedules. Suppose the given values of mean age and standard deviation lie between $\hat{\bar{x}}$ and $\hat{\bar{x}} + 1.0$, and $\hat{\sigma}$ and $\hat{\sigma} + 0.5$, respectively, as shown in Figure 6. Since model tables are tabulated for integral values of the mean age, and for standard deviations at intervals of 0.5 years, tabulated fertility schedules generally exist at combinations of \bar{x} and σ^2 found at all four corners of the rectangle in Figure 6. These schedules are examined to see if they include

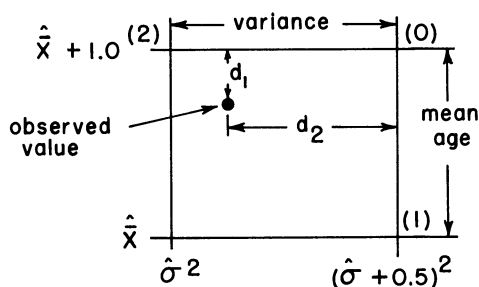


Fig. 6. Guide to interpolation to determine weights for calculating model fertility schedule as weighted average of tabulated schedules

schedules with values of R_1 close to the observed R_1 . Usually at least three of the sets of tabulated schedules at the four corners provide such values of R_1 . Let us designate the three positions at which correct R_1 's occur as positions 0, 1, and 2, employing 0 for the position sharing the standard deviation of position 1 and the mean age of position 2. Let d_1 be the distance from the observed mean to the mean at position 0, and d_2 the distance of the observed variance from the variance at

position 0, as a fraction of the distance 0 to 2. (Cf. Figure 6.) Then if weights $W_1 = d_1$, $W_2 = d_2$, and $W_0 = 1.0 - d_1 - d_2$ are applied to schedules at positions 1, 2, and 0, the resultant weighted average of fertility rates constitutes a schedule that has the observed mean and variance.¹

To match the observed value of R_1 to a very close approximation, it is usually sufficient to choose judiciously from the schedules available at positions 0, 1, and 2, choosing two schedules with R_1 's on one side of the observed R_1 , and one schedule with an R_1 on the other side, paying due attention to the weights W_0 , W_1 , and W_2 . The aim, of course, is to select the schedules so that the weighted average of the R_1 's matches the observed R_1 .² As an example, consider the fertility schedule for England and Wales 1965, with $\bar{x} = 27.269$, $\sigma = 5.672$, and $R_1 = 0.248$. Position 0 is $\bar{x} = 27.0$, $\sigma = 6.0$, position 1 is $\bar{x} = 28.0$, $\sigma = 6.0$, and position 2 is $\bar{x} = 27.0$, $\sigma = 5.5$. The value of d_1 is $0.269/1.0$; the value of d_2 is $[(6.0)^2 - (5.672)^2] / [(6.0)^2 - (5.5)^2] = 0.6658$. The adjustment³ to d_2 is $(2.69) \cdot (.731) / 5.75 = 0.342$. Thus $W_1 = 0.269$, $W_2 = 0.700$, and $W_0 = 0.031$. At position 0 ($\bar{x} = 27.0$, $\sigma = 6.0$) we choose $R_1 = 0.2424$ (too small); at position 1 ($\bar{x} = 28.0$, $\sigma = 6.0$), $R_1 = 0.2494$ (too large); at position 2 ($\bar{x} = 27.0$, $\sigma = 5.5$), $R_1 = 0.2478$ (too small). The weighted average is $(0.031) (0.2424) + (0.269) (0.2494) + (0.700) (0.2478) = 0.2480$. The cover chart shows the resultant fit to the recorded schedule.

Fitting a Model Schedule to Observed Average Parities in a Developing Country: Peru, 1960

Another practical use is to locate a model fertility schedule for a population of a less developed country for which the only information is a sequence of reported average parities by five-year age intervals. Suppose it may be assumed that fertility has been approximately constant in recent years, and that fertility is either natural fertility or subject to only a slight degree of control. It is common knowledge that reported parity falls off with age beyond a certain point and is generally understated for older women. A plausible conjecture about reporting of parity in populations in which the responses are deficient is that younger women give a fairly full and accurate report of the number of children ever born to them, and that older women fail to report all of the births that have occurred to them mainly because of a failure to understand that they should include children who have grown up and left home. In other words the parity reported by women up to about age 30 can be considered relatively accurate.

With the help of Figure 7, it is possible to determine the values of a_0 and k that would yield specified combinations of the ratios $PAR\ 1$ (average parity 15-19)/(average parity 20-24) and $PAR\ 2$ (average parity 20-24)/(average parity 25-29), with $m = 0.0$ (natural fertility), $m = 0.2$ (very moderate control of fertility) and $m = 0.4$ (quite moderate control of fertility). The FORTRAN program in Appendix A can then be used to calculate a model fertility schedule with an age structure that 1) matches the observed sequence of average parities up to age 30, and 2) incorporates either no departure or only a slight departure from natural fertility at the higher ages. The schedule is printed out at single years of age; average parity at ages 15-19, 20-24, and 25-29 is also provided. The model schedule yields a total fertility of 1.0; hence the ratio of average parity at ages 25-29 (or at either of the other tabulated age intervals) recorded for the popula-

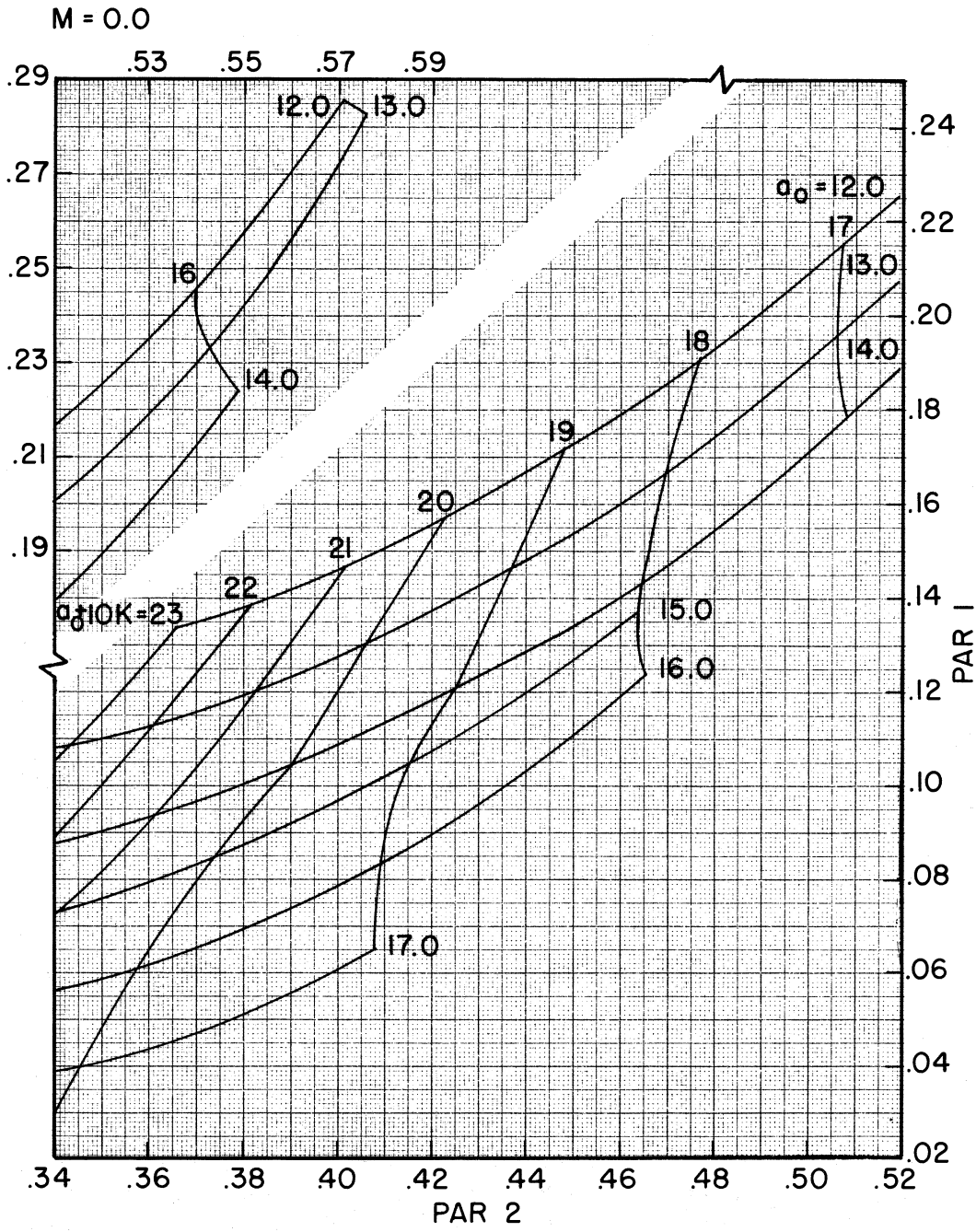


Fig. 7. Locus of combinations of *PAR 1* (average parity 15-19/average parity 20-24) and *PAR 2* (average parity 20-24/average parity 25-29) giving specified values of a_0 and $a_0 + 10k$, for $m = 0.0, 0.2$, and 0.4 .

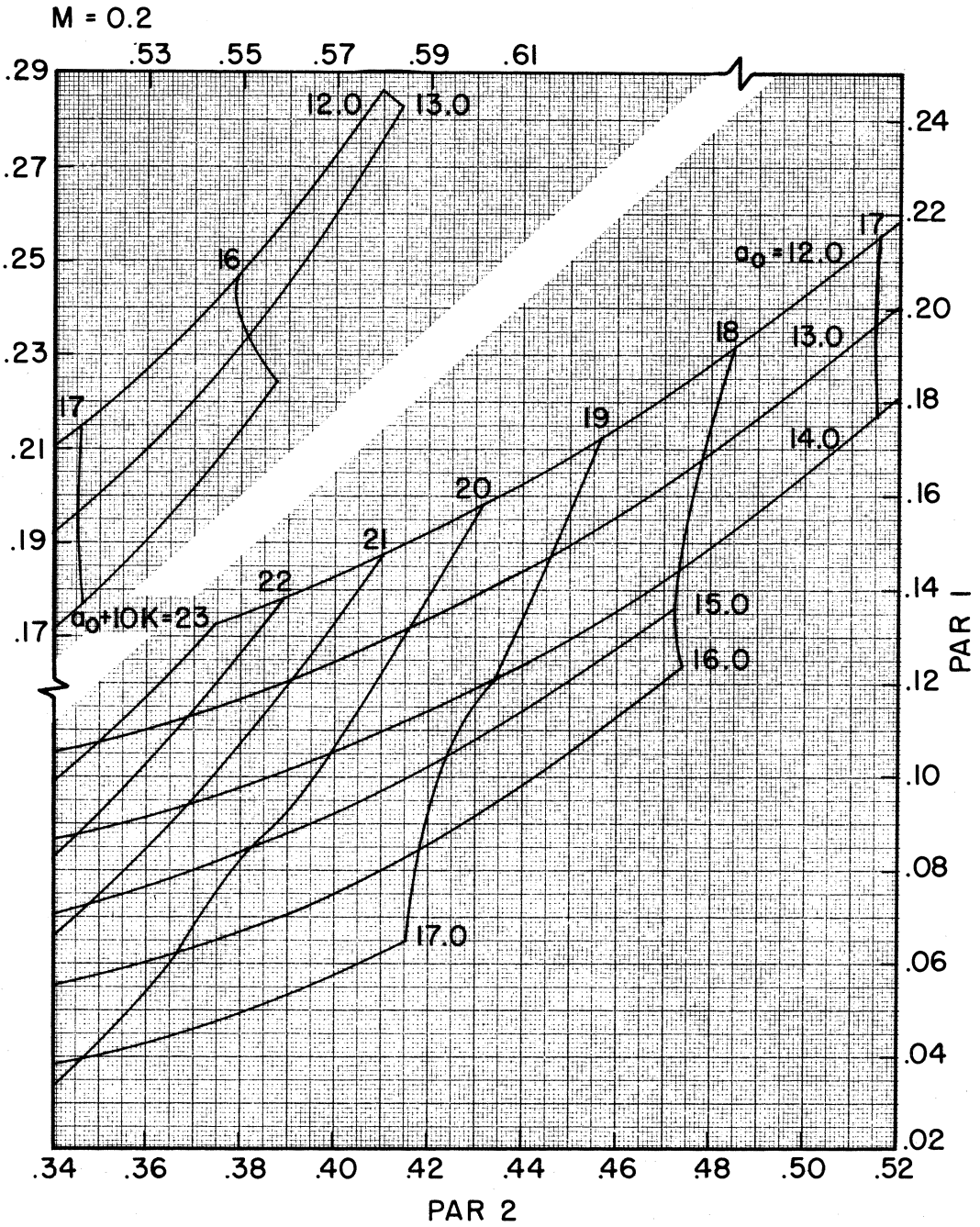


Fig. 7 (cont.)

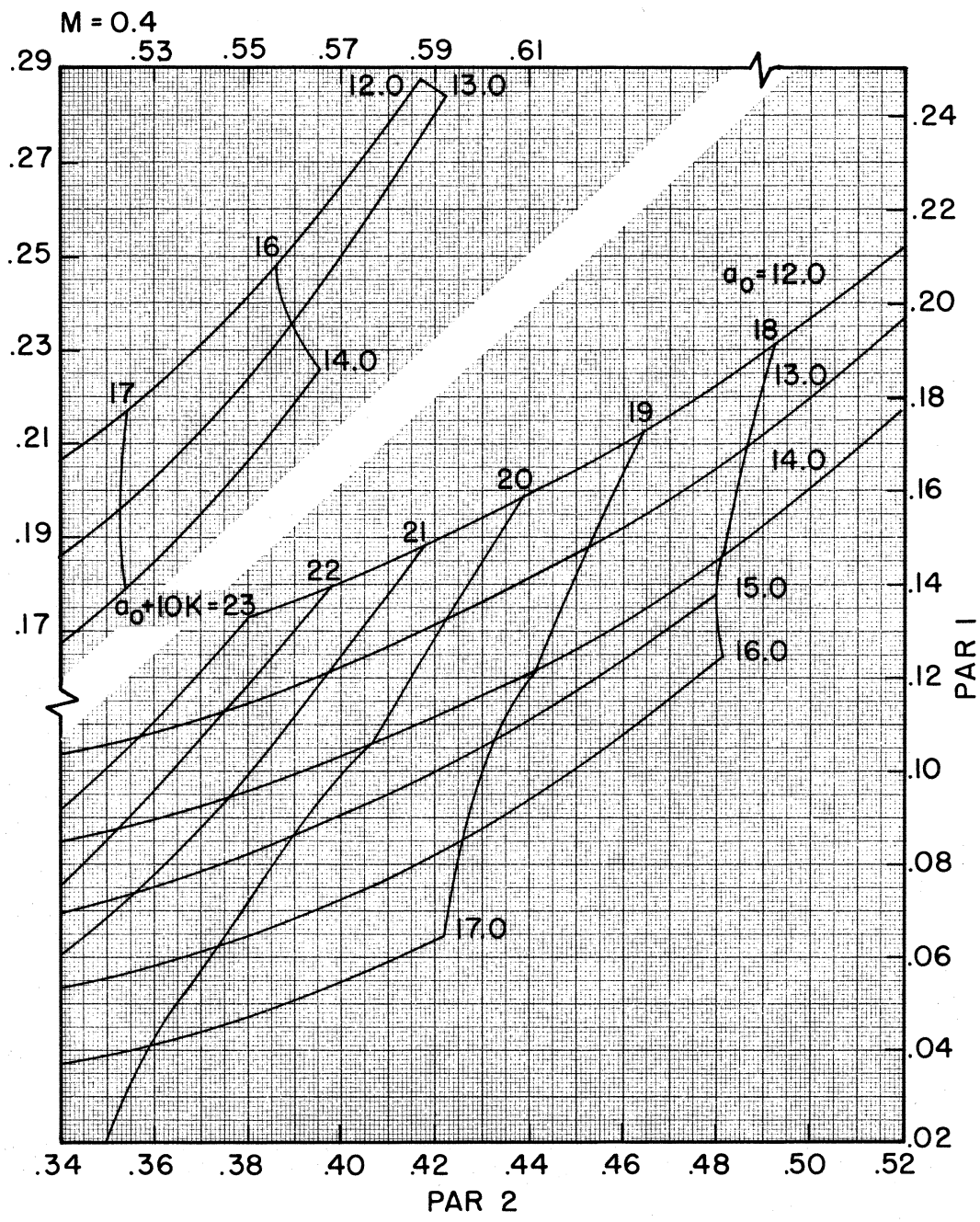


Fig. 7 (cont.)

tion to average parity at that age in the model schedule provides an estimate of total fertility of the population. This ratio is also the multiplier required to convert the model age-specific fertility rates to the level prevailing in the population.

In Figure 7 it is possible to estimate, by visual interpolation, values of a_0 and $a_0 + 10k$ corresponding to specified combinations of *PAR* 1 and *PAR* 2, for $m = 0.0$, $m = 0.2$, and $m = 0.4$. The figure displays $a + 10k$ rather than simply k as the second variable because the loci of constant $a_0 + 10k$ are more nearly orthogonal to the loci of a_0 than are the loci of k itself; this is not surprising, since $a_0 + 10k$ is the median age of first marriage in a first marriage distribution specified by the parameters a_0 , k . To find the values of a_0 and k consistent with given values of *PAR* 1 and *PAR* 2, locate the given *PAR* 1 and *PAR* 2 in one of the panels of Figure 7, and estimate the fractional distance of this position between two values of a_0 , and two values of $a_0 + k$. For example, *PAR* 1 and *PAR* 2 are 0.1424 and 0.4514 for Peru, 1960. When $m = 0.2$, this point lies at about $a_0 = 13.4$, $a_0 + 10k = 18.7$. When $a_0 = 13.4$ and $a_0 + 10k = 18.7$, $k = 0.53$. Hence one combination of parameters that produces a schedule with Peru's *PAR* 1 and *PAR* 2 is a schedule with $a_0 = 13.4$, $k = 0.53$, and $m = 0.2$. Other values of a_0 and k (13.2 and 0.58) would serve if $m = 0.4$ or (13.66) and 0.48) if $m = 0.0$.

These three model schedules, adjusted to yield the average parity at ages 25-29 recorded for Peru, are shown in Figure 8a. The estimates of total fertility implied by the three are 5.94, 6.30, and 6.72. Supplementary information for Peru makes it possible to select one of these schedules as optimal: the mean age of the schedule calculated from Peru's incomplete register of births by age of mother is 29.50 years, closely matching the mean age of the model schedule with $m = 0.20$. Total fertility for this model schedule, adjusted to match recorded parity at 25-29, is 6.30; total fertility according to registered births is 5.09, indicating a completeness of registration of 80.8 percent. The age structure of the model schedule, chosen primarily on the basis of average parities recorded in the census, agrees well with the structure of fertility indicated by registered births (Figure 8b).

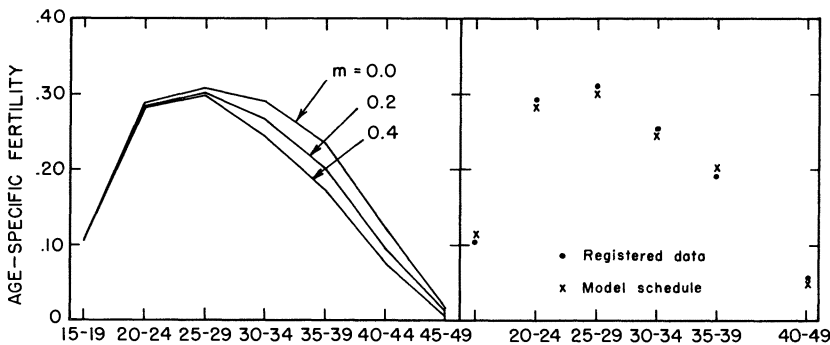


Fig. 8a. Model fertility schedules, by five-year age intervals, matching average parity in Peru, 1960, at ages 15-19, 20-24, and 25-29.

Fig. 8b. Model fertility schedule, $M = 0.20$, compared with registered rates for Peru (adjusted for underregistration)

A similar calculation for Mexico, 1960, produces a similarly close agreement; however, the best fit to the mean age based on registered births is provided by the model schedule with $m = 0.4$; this model schedule adjusted to the recorded average parity at 25-29 yields a total fertility of 6.12, 1 percent *less* than total fertility calculated from registered births. By this test, the registration of births in Mexico is seen to be complete.

In the absence of extensive registration the mean age of the fertility schedule is not available, and it is necessary to guess the appropriate value of m , on the basis of general knowledge. For example, on the basis of the above calculations, a value of 0.2 to 0.4 seems a sensible choice for a Latin American population in which no major decline of fertility has occurred.

Another category of uses of these model tables is analytical. It was really for analytical reasons that we embarked on their construction. The application of these schedules in an exploration of the nature of the complex roots

$$\int_{\alpha}^{\beta} e^{-ra} p(a) \cdot m(a) da = 1$$

will be reported elsewhere in a paper on that topic. In addition, the model fertility schedules by single years of age provide a firmer basis for calculation of adjustment factors to be used in the Brass-Sullivan approach to the estimation of infant and child mortality from data on the proportion dead among children ever born to women of different ages. In Brass's original version of these procedures, adjustment factors for converting proportions dead to ${}_nq_0$'s were derived by assuming a fertility function consisting of a polynomial of fixed structure that varied in its starting point. Sullivan determined the value of adjustment factors by constructing the adjustment required for each of a number of empirical fertility schedules by single years of age, and used regression analysis to determine the relationship between the needed adjustment factor and the parity ratios (*PAR 1* and *PAR 2*) discussed above. Sullivan was hampered by the scarcity of fertility schedules incorporating an early start of fertility, and attempted to remedy this deficiency by using fictitious fertility schedules incorporating a start one year earlier than that recorded in empirical schedules of fertility. The new model tables, which seem to fit empirical experience quite satisfactorily, provide a set of tables for the full range of likely human experience. It must be conceded that their use now in the calculation of Brass-type estimates of infant and child mortality would probably modify such estimates only slightly. However, the tables provide a more satisfactory basis for such calculations than the expedients employed earlier and it is hoped that in the future they will prove convenient for a variety of uses in analytical demography.

Description of Tables

The model fertility tables give age-specific fertility rates (per 1,000,000 women at each age), normalized so that the total fertility in each schedule is 1.0. The tables are arranged in ascending order of mean age, with ascending order of standard deviation with each mean age. For each value \bar{x} and σ , the tables are presented in ascending order of k . The ratio of average fertility at ages 15-19 to average fertility at ages 20-24, R_1 , generally is strictly monotonic increasing, but is

sometimes strictly monotonic decreasing, with increasing k . Also shown for each table are ratios of average parity at 15-19 to average parity at 20-24 (*PAR* 1) and average parity at 20-24 to average parity at 25-29 (*PAR* 2).

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NOTES

¹ The mean age of the weighted average of two schedules is the weighted average of the two means. The variance of the weighted average of two schedules *with the same mean* is the weighted average of the two variances. It is for this reason that the variance rather than the standard deviation is used for interpolation. However, the variance of the weighted average of two schedules with means that differ by 1.0, and the same variance, exceeds the common variance by $(W_1)(1 - W_1)$, where W_1 and $(1 - W_1)$ are the weights employed in interpolating for the mean age. (These statements can be verified by calculating the mean and variance of $Wf_1(x) + (1 - W)f_2(x)$.) Therefore, the variance of the interpolated schedule is slightly too large, and the weight W_2 should be modified by an increment $(W_1)(1 - W_1)/(\hat{\sigma}^2 + 0.25)$ since the difference between $\hat{\sigma}^2$ and $(\hat{\sigma}^2 + 0.5)^2$ is $\hat{\sigma}^2 + 0.25$. W_2 should be increased in this amount if position 2 is associated with the smaller variance; otherwise W_2 should be decreased by this increment. W_0 should also be readjusted so that the weights still add to 1.0.

² It is always possible to match the observed R_1 exactly by employing a weighted average of two schedules at one of the three positions, choosing the weights so that, for example, $W_0(R_1)_0 + W_1(R_1)_1 + W_2(R_1)_2 = R_1$, where $(R_1)_2$ is from a schedule at position 2 that is the weighted average of two schedules at that position. $(R_1)_2$ is chosen to equal $(R_1 - W_0(R_1)_0 - W_1(R_1)_1)/W_2$.

³ See Note 1.

APPENDIX A: Program for Computing a Model Fertility Schedule with Specified Values of a_0 , k , and m

This program in FORTRAN IV is self-contained, incorporating single-year values of $n(a)$ and $v(a)$, and including the calculations of $G(a)$ from a standard schedule of first marriage frequencies. The only data required are values of a_0 , k , and m (designated as AAA, AKK, and AMM in the only READ statement).

The values of $-v(a)$ and $n(a)$, natural fertility, begin at age 12.5 and extend to age 49.5 by simply listing 38 numbers.

No attempt was made to achieve elegance in programming. The program has the virtue that it has been debugged, and for all but expert programmers will save time.

[illegible]

```

W=0.0
DO 24 K=1,10
24 W=W+0.5*(ZSS(II2-K+1)+ZSS(II2-K))
25 EM2(I2)=W/10.0
50 DO 35 I2=1,38
35 F(I2)=EM2(I2)*H(I2)*EXP(AMH *V(I2))

C      THE 15-19 SECTION OF THE AGE SPECIFIC FERTILITY SCHEDULE
C      ESTABLISHED IN STATEMENT 35 IS NOW TRANSFORMED BY FITTING
C      AN EXPONENTIAL HAVING CONTACT WITH THE AGE AXIS AT AGE 15 AND
C      ORDINATE AT AGE 20 AND AREA UNDER THE CURVE FROM 15-19 EQUAL
C      TO THAT OF THE ORIGINAL 15-19 SECTION. THIS TRANSFORMATION IS
C      NOT PERFORMED UNLESS A0 IS GREATER THAN 15

DO 1 IL=1,7
BB=0.0
DO 2 JL=1,5
KL=JL+5*(IL-1)+3
2 BB=BB+F(KL)
1 T(IL)=BB/5.0
FIRST=(F(1)+F(2)+F(3))/5.0
IP(AAA .LT. 15.0) GO TO 289
TT=T(1)*5.0
FR=.476*ZSS(200)
SS=FR*5.0/TT-1.0
CONS=FR/(5.0*SS)
A=1.0
DO 44 ML=1,5
RR(ML)=A**((SS+1.0)/(SS+1.0))*CONS
44 A=A+1.
F(4)=RR(1)
DO 46 M=2,5
L=M+3
46 F(L)=RR(M)-RR(M-1)
289 CONTINUE

C      THE SECTION THROUGH STATEMENT 37 ESTABLISHES THE MEAN, VARIANCE,
C      THE 3 PARITIES, AND R1

SUMF=0.
DO 222 I2=1,38
222 SUMF=F(I2)+SUMF
DO 333 J=1,7
333 T(J)=T(J)/SUMF
FIRST=FIRST/SUMF
SUM=0.
SUMSQ=0.
A=12.5
DO 33 I2=1,38
F(I2)=F(I2)/SUMF
SUM=SUM+A*F(I2)
SUMSQ=SUMSQ+A*A*F(I2)
33 A=A+1.0
SIGMA=(SUMSQ-SUM*SUM)-1.0/12.0
SIGMA=SQRT(SIGMA)
SMEAN=SUM
Q1=(4.5*F(4)+3.5*F(5)+2.5*F(6)+1.5*F(7)+.5*F(8))/5.0+.5*FIRST
Q2=(4.5 * F(9) + 3.5 * F(10) + 2.5 * F(11) + 1.5 * F(12) + .5 *
1 F(13)) / 5.0 + 5.0*(T(1) +FIRST)
Q3=(4.5 * F(14) + 3.5 * F(15) + 2.5 * F(16) + 1.5 * F(17) +
1 .5 * F(18)) / 5.0 + 5.0*(T(1) + T(2) +FIRST)
PAR1=Q1/Q2
PAR2=Q2/Q3
37 R1=T(1)/T(2)
PRINT 97,C(1),SMEAN
PRINT 99,C(2),SIGMA
PRINT 99,C(3),R1
PRINT 99,C(4),AAA
PRINT 99,C(5),AKK
PRINT 99,C(6),AMH
PRINT 99,CQ(4),PAR1
PRINT 99,CQ(5),PAR2
PRINT 99,CQ(1),Q1
PRINT 99,CQ(2),Q2
PRINT 99,CQ(3),Q3
PRINT 95,CQ(6),F(1)
PRINT 95,CQ(7),F(2)
PRINT 98,CQ(8),F(3)
PRINT 98,CQ(9),FIRST
K=3
DO 102 IN=1,7
N=IN*5+3
M=N-4
PRINT 99,((C(J+K),F(J)),J=M,N)
PRINT 99,C(N+K+1),T(IN)
102 K=K+1
GO TO 999
3 STOP
END
FUNCTION G(X,AKK)
CONS=0.19465/AKK
B=0.1740/AKK
W=0.2881/AKK
G =CONS*EXP(-B*(X-6.06*AKK))-EXP(-W*(X-6.06*AKK))
RETURN
END

```

APPENDIX B: Model Fertility Schedules

The model fertility schedules have been normalized so that total fertility equals 1.0. The rates given in each schedule are age-specific rates per million women in each age interval. These rates are cumulated and divided by 5 for each five-year age interval to provide an average fertility rate for each interval. The tables are arranged by groups of ascending means and subgroups of ascending standard deviation. Within each subgroup of a given mean and standard deviation, R_1 is strictly monotonic. The first ten entries for each schedule are defined as follows:

- 1) $MEAN = \sum_{12.5}^{49.5} a f(a)$
- 2) $STDEV = \sqrt{(\sum_{12.5}^{49.5} a^2 f(a)) - MEAN^2 - 1/12}$
- 3) $R1 = \sum_{15.5}^{19.5} f(a) / \sum_{20.5}^{24.5} f(a)$
- 4) $MED = \hat{a}$ such that $\sum_{12.5}^{\hat{a}} f(a) = 0.5$
- 5) $SKEW = \sum_{12.5}^{49.5} (a - MEAN)^3 f(a) / STDEV^3$
- 6) $PAR\ 1 = \text{average parity (15-19)} / \text{average parity (20-24)}$
- 7) $PAR\ 2 = \text{average parity (20-24)} / \text{average parity (25-29)}$
- 8) $AO = \text{first age of marriage in the nuptiality function}$
- 9) $K = \text{a scale factor, or the time interval after AO during which any given proportion of marriages takes place relative to the standard nuptiality schedule, where } K = 1$
- 10) $M = \text{degree of control of fertility relative to the standard fertility schedule (m in equation (4)).}$

[illegible]

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NBA	25-0		25-1		25-2		25-3		25-4		25-5		25-6		25-7		25-8		25-9		25-10		25-11		25-12		25-13		25-14		25-15		25-16		25-17		25-18		25-19		25-20		25-21		25-22		25-23		25-24		25-25		25-26		25-27		25-28		25-29		25-30		25-31		25-32		25-33		25-34		25-35		25-36		25-37		25-38		25-39		25-40		25-41		25-42		25-43		25-44		25-45		25-46		25-47		25-48		25-49		25-50		25-51		25-52		25-53		25-54		25-55		25-56		25-57		25-58		25-59		25-60		25-61		25-62		25-63		25-64		25-65		25-66		25-67		25-68		25-69		25-70		25-71		25-72		25-73		25-74		25-75		25-76		25-77		25-78		25-79		25-80		25-81		25-82		25-83		25-84		25-85		25-86		25-87		25-88		25-89		25-90		25-91		25-92		25-93		25-94		25-95		25-96		25-97		25-98		25-99		25-100		25-101		25-102		25-103		25-104		25-105		25-106		25-107		25-108		25-109		25-110		25-111		25-112		25-113		25-114		25-115		25-116		25-117		25-118		25-119		25-120		25-121		25-122		25-123		25-124		25-125		25-126		25-127		25-128		25-129		25-130		25-131		25-132		25-133		25-134		25-135		25-136		25-137		25-138		25-139		25-140		25-141		25-142		25-143		25-144		25-145		25-146		25-147		25-148		25-149		25-150		25-151		25-152		25-153		25-154		25-155		25-156		25-157		25-158		25-159		25-160		25-161		25-162		25-163		25-164		25-165		25-166		25-167		25-168		25-169		25-170		25-171		25-172		25-173		25-174		25-175		25-176		25-177		25-178		25-179		25-180		25-181		25-182		25-183		25-184		25-185		25-186		25-187		25-188		25-189		25-190		25-191		25-192		25-193		25-194		25-195		25-196		25-197		25-198		25-199		25-200		25-201		25-202		25-203		25-204		25-205		25-206		25-207		25-208		25-209		25-210		25-211		25-212		25-213		25-214		25-215		25-216		25-217		25-218		25-219		25-220		25-221		25-222		25-223		25-224		25-225		25-226		25-227		25-228		25-229		25-230		25-231		25-232		25-233		25-234		25-235		25-236		25-237		25-238		25-239		25-240		25-241		25-242		25-243		25-244		25-245		25-246		25-247		25-248		25-249		25-250		25-251		25-252		25-253		25-254		25-255		25-256		25-257		25-258		25-259		25-260		25-261		25-262		25-263		25-264		25-265		25-266		25-267		25-268		25-269		25-270		25-271		25-272		25-273		25-274		25-275		25-276		25-277		25-278		25-279		25-280		25-281		25-282		25-283		25-284		25-285		25-286		25-287		25-288		25-289		25-290		25-291		25-292		25-293		25-294		25-295		25-296		25-297		25-298		25-299		25-300		25-301		25-302		25-303		25-304		25-305		25-306		25-307		25-308		25-309		25-310		25-311		25-312		25-313		25-314		25-315		25-316		25-317		25-318		25-319		25-320		25-321		25-322		25-323		25-324		25-325		25-326		25-327		25-328		25-329		25-330		25-331		25-332		25-333		25-334		25-335		25-336		25-337		25-338		25-339		25-340		25-341		25-342		25-343		25-344		25-345		25-346		25-347		25-348		25-349		25-350		25-351		25-352		25-353		25-354		25-355		25-356		25-357		25-358		25-359		25-360		25-361		25-362		25-363		25-364		25-365		25-366		25-367		25-368		25-369		25-370		25-371		25-372		25-373		25-374		25-375		25-376		25-377		25-378		25-379		25-380		25-381		25-382		25-383		25-384		25-385		25-386		25-387		25-388		25-389		25-390		25-391		25-392		25-393		25-394		25-395		25-396		25-397		25-398		25-399		25-400		25-401		25-402		25-403		25-404		25-405		25-406		25-407		25-408		25-409		25-410		25-411		25-412		25-413		25-414		25-415		25-416		25-417		25-418		25-419		25-420		25-421		25-422		25-423		25-424		25-425		25-426		25-427		25-428		25-429		25-430		25-431		25-432		25-433		25-434		25-435		25-436		25-437		25-438		25-439		25-440		25-441		25-442		25-443		25-444		25-445		25-446		25-447		25-448		25-449		25-450		25-451		25-452		25-453		25-454		25-455		25-456		25-457		25-458		25-459		25-460		25-461		25-462		25-463		25-464		25-465		25-466		25-467		25-468		25-469		25-470		25-471		25-472		25-473		25-474		25-475		25-476		25-477		25-478		25-479		25-480		25-481		25-482		25-483		25-484		25-485		25-486		25-487		25-488		25-489		25-490		25-491		25-492		25-493		25-494		25-495		25-496		25-497		25-498		25-499		25-500		25-501		25-502		25-503		25-504		25-505		25-506		25-507		25-508		25-509		25-510		25-511		25-512		25-513		25-514		25-515		25-516		25-517		25-518		25-519		25-520		25-521		25-522		25-523		25-524		25-525		25-526		25-527		25-528		25-529		25-530		25-531		25-532		25-533		25-534		25-535		25-536		25-537		25-538		25-539		25-540		25-541		25-542		25-543		25-544		25-545		25-546		25-547		25-548		25-549		25-550		25-551		25-552		25-553		25-554		25-555		25-556		25-557		25-558		25-559		25-560		25-561		25-562		25-563		25-564		25-565		25-566		25-567		25-568		25-569		25-570		25-571		25-572		25-573		25-574		25-575		25-576		25-577		25-578		25-579		25-580		25-581		25-582		25-583		25-584		25-585		25-586		25-587		25-588		25-589		25-590		25-591		25-592		25-593		25-594		25-595		25-596		25-597		25-598		25-599		25-600		25-601		25-602		25-603		25-604		25-605		25-606		25-607		25-608		25-609		25-610		25-611		25-612		25-613		25-614		25-615		25-616		25-617		25-618		25-619		25-620		25-621		25-622		25-623		25-624		25-625		25-626		25-627		25-628		25-629		25-630		25-631		25-632		25-633		25-634		25-635		25-636		25-637		25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27.0	5.0	0.1770	0.1782	0.1799	0.1810	0.1825	0.1838	0.1850	0.1860	0.1870	0.1880	0.1890	0.1900	0.1910	0.1920	0.1930	0.1940	0.1950	0.1960	0.1970	0.1980	0.1990	0.2000	0.2010	0.2020	0.2030	0.2040	0.2050	0.2060	0.2070	0.2080	0.2090	0.2100	0.2110	0.2120	0.2130	0.2140	0.2150	0.2160	0.2170	0.2180	0.2190	0.2200	0.2210	0.2220	0.2230	0.2240	0.2250	0.2260	0.2270	0.2280	0.2290	0.2300	0.2310	0.2320	0.2330	0.2340	0.2350	0.2360	0.2370	0.2380	0.2390	0.2400	0.2410	0.2420	0.2430	0.2440	0.2450	0.2460	0.2470	0.2480	0.2490	0.2500	0.2510	0.2520	0.2530	0.2540	0.2550	0.2560	0.2570	0.2580	0.2590	0.2600	0.2610	0.2620	0.2630	0.2640	0.2650	0.2660	0.2670	0.2680	0.2690	0.2700	0.2710	0.2720	0.2730	0.2740	0.2750	0.2760	0.2770	0.2780	0.2790	0.2800	0.2810	0.2820	0.2830	0.2840	0.2850	0.2860	0.2870	0.2880	0.2890	0.2900	0.2910	0.2920	0.2930	0.2940	0.2950	0.2960	0.2970	0.2980	0.2990	0.3000	0.3010	0.3020	0.3030	0.3040	0.3050	0.3060	0.3070	0.3080	0.3090	0.3100	0.3110	0.3120	0.3130	0.3140	0.3150	0.3160	0.3170	0.3180	0.3190	0.3200	0.3210	0.3220	0.3230	0.3240	0.3250	0.3260	0.3270	0.3280	0.3290	0.3300	0.3310	0.3320	0.3330	0.3340	0.3350	0.3360	0.3370	0.3380	0.3390	0.3400	0.3410	0.3420	0.3430	0.3440	0.3450	0.3460	0.3470	0.3480	0.3490	0.3500	0.3510	0.3520	0.3530	0.3540	0.3550	0.3560	0.3570	0.3580	0.3590	0.3600	0.3610	0.3620	0.3630	0.3640	0.3650	0.3660	0.3670	0.3680	0.3690	0.3700	0.3710	0.3720	0.3730	0.3740	0.3750	0.3760	0.3770	0.3780	0.3790	0.3800	0.3810	0.3820	0.3830	0.3840	0.3850	0.3860	0.3870	0.3880	0.3890	0.3900	0.3910	0.3920	0.3930	0.3940	0.3950	0.3960	0.3970	0.3980	0.3990	0.4000	0.4010	0.4020	0.4030	0.4040	0.4050	0.4060	0.4070	0.4080	0.4090	0.4100	0.4110	0.4120	0.4130	0.4140	0.4150	0.4160	0.4170	0.4180	0.4190	0.4200	0.4210	0.4220	0.4230	0.4240	0.4250	0.4260	0.4270	0.4280	0.4290	0.4300	0.4310	0.4320	0.4330	0.4340	0.4350	0.4360	0.4370	0.4380	0.4390	0.4400	0.4410	0.4420	0.4430	0.4440	0.4450	0.4460	0.4470	0.4480	0.4490	0.4500	0.4510	0.4520	0.4530	0.4540	0.4550	0.4560	0.4570	0.4580	0.4590	0.4600	0.4610	0.4620	0.4630	0.4640	0.4650	0.4660	0.4670	0.4680	0.4690	0.4700	0.4710	0.4720	0.4730	0.4740	0.4750	0.4760	0.4770	0.4780	0.4790	0.4800	0.4810	0.4820	0.4830	0.4840	0.4850	0.4860	0.4870	0.4880	0.4890	0.4900	0.4910	0.4920	0.4930	0.4940	0.4950	0.4960	0.4970	0.4980	0.4990	0.5000	0.5010	0.5020	0.5030	0.5040	0.5050	0.5060	0.5070	0.5080	0.5090	0.5100	0.5110	0.5120	0.5130	0.5140	0.5150	0.5160	0.5170	0.5180	0.5190	0.5200	0.5210	0.5220	0.5230	0.5240	0.5250	0.5260	0.5270	0.5280	0.5290	0.5300	0.5310	0.5320	0.5330	0.5340	0.5350	0.5360	0.5370	0.5380	0.5390	0.5400	0.5410	0.5420	0.5430	0.5440	0.5450	0.5460	0.5470	0.5480	0.5490	0.5500	0.5510	0.5520	0.5530	0.5540	0.5550	0.5560	0.5570	0.5580	0.5590	0.5600	0.5610	0.5620	0.5630	0.5640	0.5650	0.5660	0.5670	0.5680	0.5690	0.5700	0.5710	0.5720	0.5730	0.5740	0.5750	0.5760	0.5770	0.5780	0.5790	0.5800	0.5810	0.5820	0.5830	0.5840	0.5850	0.5860	0.5870	0.5880	0.5890	0.5900	0.5910	0.5920	0.5930	0.5940	0.5950	0.5960	0.5970	0.5980	0.5990	0.6000	0.6010	0.6020	0.6030	0.6040	0.6050	0.6060	0.6070	0.6080	0.6090	0.6100	0.6110	0.6120	0.6130	0.6140	0.6150	0.6160	0.6170	0.6180	0.6190	0.6200	0.6210	0.6220	0.6230	0.6240	0.6250	0.6260	0.6270	0.6280	0.6290	0.6300	0.6310	0.6320	0.6330	0.6340	0.6350	0.6360	0.6370	0.6380	0.6390	0.6400	0.6410	0.6420	0.6430	0.6440	0.6450	0.6460	0.6470	0.6480	0.6490	0.6500	0.6510	0.6520	0.6530	0.6540	0.6550	0.6560	0.6570	0.6580	0.6590	0.6600	0.6610	0.6620	0.6630	0.6640	0.6650	0.6660	0.6670	0.6680	0.6690	0.6700	0.6710	0.6720	0.6730	0.6740	0.6750	0.6760	0.6770	0.6780	0.6790	0.6800	0.6810	0.6820	0.6830	0.6840	0.6850	0.6860	0.6870	0.6880	0.6890	0.6900	0.6910	0.6920	0.6930	0.6940	0.6950	0.6960	0.6970	0.6980	0.6990	0.7000	0.7010	0.7020	0.7030	0.7040	0.7050	0.7060	0.7070	0.7080	0.7090	0.7100	0.7110	0.7120	0.7130	0.7140	0.7150	0.7160	0.7170	0.7180	0.7190	0.7200	0.7210	0.7220	0.7230	0.7240	0.7250	0.7260	0.7270	0.7280	0.7290	0.7300	0.7310	0.7320	0.7330	0.7340	0.7350	0.7360	0.7370	0.7380	0.7390	0.7400	0.7410	0.7420	0.7430	0.7440	0.7450	0.7460	0.7470	0.7480	0.7490	0.7500	0.7510	0.7520	0.7530	0.7540	0.7550	0.7560	0.7570	0.7580	0.7590	0.7600	0.7610	0.7620	0.7630	0.7640	0.7650	0.7660	0.7670	0.7680	0.7690	0.7700	0.7710	0.7720	0.7730	0.7740	0.7750	0.7760	0.7770	0.7780	0.7790	0.7800	0.7810	0.7820	0.7830	0.7840	0.7850	0.7860	0.7870	0.7880	0.7890	0.7900	0.7910	0.7920	0.7930	0.7940	0.7950	0.7960	0.7970	0.7980	0.7990	0.8000	0.8010	0.8020	0.8030	0.8040	0.8050	0.8060	0.8070	0.8080	0.8090	0.8100	0.8110	0.8120	0.8130	0.8140	0.8150	0.8160	0.8170	0.8180	0.8190	0.8200	0.8210	0.8220	0.8230	0.8240	0.8250	0.8260	0.8270	0.8280	0.8290	0.8300	0.8310	0.8320	0.8330	0.8340	0.8350	0.8360	0.8370	0.8380	0.8390	0.8400	0.8410	0.8420	0.8430	0.8440	0.8450	0.8460	0.8470	0.8480	0.8490	0.8500	0.8510	0.8520	0.8530	0.8540	0.8550	0.8560	0.8570	0.8580	0.8590	0.8600	0.8610	0.8620	0.8630	0.8640	0.8650	0.8660	0.8670	0.8680	0.8690	0.8700	0.8710	0.8720	0.8730	0.8740	0.8750	0.8760	0.8770	0.8780	0.8790	0.8800	0.8810	0.8820	0.8830	0.8840	0.8850	0.8860	0.8870	0.8880	0.8890	0.8900	0.8910	0.8920	0.8930	0.8940	0.8950	0.8960	0.8970	0.8980	0.8990	0.9000	0.9010	0.9020	0.9030	0.9040	0.9050	0.9060	0.9070	0.9080	0.9090	0.9100	0.9110	0.9120	0.9130	0.9140	0.9150	0.9160	0.9170	0.9180	0.9190	0.9200	0.9210	0.9220	0.9230	0.9240	0.9250	0.9260	0.9270	0.9280	0.9290	0.9300	0.9310	0.9320	0.9330	0.9340	0.9350	0.9360	0.9370	0.9380	0.9390	0.9400	0.9410	0.9420	0.9430	0.9440	0.9450	0.9460	0.9470	0.9480	0.9490	0.9500	0.9510	0.9520	0.9530	0.9540	0.9550	0.9560	0.9570	0.9580	0.9590	0.9600	0.9610	0.9620	0.9630	0.9640	0.9650	0.9660	0.9670	0.9680	0.9690	0.9700	0.9710	0.9720	0.9730	0.9740	0.9750	0.9760	0.9770	0.9780	0.9790	0.9800	0.9810	0.9820	0.9830	0.9840	0.9850	0.9860	0.9870	0.9880	0.9890	0.9900	0.9910	0.9920	0.9930	0.9940	0.9950	0.9960	0.9970	0.9980	0.9990	1.0000	1.0010	1.0020	1.0030	1.0040	1.0050	1.0060	1.0070	1.0080	1.0090	1.0100	1.0110	1.0120	1.0130	1.0140	1.0150	1.0160	1.0170	1.0180	1.0190	1.0200	1.0210	1.0220	1.0230	1.0240	1.0250	1.0260	1.0270	1.0280	1.0290	1.0300	1.0310	1.0320	1.0330	1.0340	1.0350	1.0360	1.0370	1.0380	1.0390	1.0400	1.0410	1.0420	1.0430	1.0440	1.0450	1.0460	1.0470	1.0480	1.0490	1.0500	1.0510	1.0520	1.0530	1.0540	1.0550	1.0560	1.0570	1.0580	1.0590	1.0600	1.0610	1.0620	1.0630	1.0640	1.0650	1.0660	1.0670	1.0680	1.0690	1.0700	1.0710	1.0720	1.0730	1.0740	1.0750	1.0760	1.0770	1.0780	1.0790	1.0800	1.0810	1.0820	1.0830	1.0840	1.0850	1.0860	1.0870	1.0880	1.0890	1.0900	1.0910	1.0920	1.0930	1.0940	1.0950	1.0960	1.0970	1.0980	1.0990	1.1000	1.1010	1.1020	1.1030	1.1040	1.1050	1.1060	1.1070	1.1080	1.1090	1.1100	1.1110	1.1120	1.1130	1.1140	1.1150	1.1160	1.1170	1.1180	1.1190	1.1200	1.1210	1.1220	1.1230	1.1240	1.1250	1.1260	1.1270	1.1280	1.1290	1.1300	1.1310	1.1320	1.1330	1.1340	1.1350	1.1360	1.1370	1.1380	1.1390	1.1400	1.1410	1.1420	1.1430	1.1440	1.1450	1.1460	1.1470	1.1480	1.1490	1.1500	1.1510	1.1520	1.1530	1.1540	1.1550	1.1560	1.1570	1.1580	1.1590	1.1600	1.1610	1.1620	1.1630	1.1640	1.1650	1.1660	1.1670	1.1680	1.1690	1.1700	1.1710	1.1720	1.1730	1.1740	1.1750	1.1760	1.1770	1.1780	1.1790	1.1800	1.1810	1.1820	1.1830	1.1840	1.1850	1.1860	1.1870	1.1880	1.1890	1.1900	1.1910	1.1920	1.1930	1.1940	1.1950	1.1960	1.1970	1.1980	1.1990	1.2000	1.2010	1.2020	1.2030	1.2040	1.2050	1.2060	1.2070	1.2080	1.2090	1.2100	1.2110	1.2120	1.2130	1.2140	1.2150	1.2160	1.2170	1.2180	1.2190	1.2200	1.2210	1.2220	1.2230	1.2240	1.2250	1.2260	1.2270	1.2280	1.2290	1.2300	1.2310	1.2320	1.2330	1.2340	1.2350	1.2360	1.2370	1.2380	1.2390	1.2400	1.2410	1.2420	1.2430	1.2440	1.2450	1.2460	1.2470	1.2480	1.2490	1.2500	1.2510	1.2520	1.2530	1.2540	1.2550	1.2560	1.2570	1.2580	1.2590	1.2600	1.2610	1.2620	1.2630	1.2640	1.2650	1.2660	1.2670	1.2680	1.2690	1.2700	1.2710	1.2720	1.2730	1.2740	1.2750	1.2760	1.2770	1.2780	1.2790	1.2800	1.2810	1.2820	1.2830	1.2840	1.2850	1.2860	1.2870	1.2880	1.2890	1.2900	1.2910	1.2920	1.2930	1.2940	1.2950	1.2960	1.2970	1.2980	1.2990	1.3000	1.3010	1.3020
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44</						

HEAV STDEV	28-0 5.5	28-0 0.1631	28-0 0.1605	28-0 0.1701	28-0 5.5	28-0 0.1758	28-0 5.5	28-0 0.1808	28-0 5.5	28-0 0.1869	28-0 5.5	28-0 0.1907	28-0 5.5	28-0 0.1951	28-0 5.5	28-0 0.1993	28-0 5.5	28-0 0.2036	28-0 5.5	28-0 0.2078	28-0 5.5	28-0 0.2120	28-0 5.5	28-0 0.2162	28-0 5.5	28-0 0.2204	28-0 5.5	28-0 0.2246	28-0 5.5	28-0 0.2288	28-0 5.5	28-0 0.2330	28-0 5.5	28-0 0.2372	28-0 5.5	28-0 0.2414	28-0 5.5	28-0 0.2456	28-0 5.5	28-0 0.2498	28-0 5.5	28-0 0.2540	28-0 5.5	28-0 0.2582	28-0 5.5	28-0 0.2624	28-0 5.5	28-0 0.2666	28-0 5.5	28-0 0.2708	28-0 5.5	28-0 0.2750	28-0 5.5	28-0 0.2792	28-0 5.5	28-0 0.2834	28-0 5.5	28-0 0.2876	28-0 5.5	28-0 0.2918	28-0 5.5	28-0 0.2960	28-0 5.5	28-0 0.3002	28-0 5.5	28-0 0.3044	28-0 5.5	28-0 0.3086	28-0 5.5	28-0 0.3128	28-0 5.5	28-0 0.3170	28-0 5.5	28-0 0.3212	28-0 5.5	28-0 0.3254	28-0 5.5	28-0 0.3296	28-0 5.5	28-0 0.3338	28-0 5.5	28-0 0.3380	28-0 5.5	28-0 0.3422	28-0 5.5	28-0 0.3464	28-0 5.5	28-0 0.3506	28-0 5.5	28-0 0.3548	28-0 5.5	28-0 0.3590	28-0 5.5	28-0 0.3632	28-0 5.5	28-0 0.3674	28-0 5.5	28-0 0.3716	28-0 5.5	28-0 0.3758	28-0 5.5	28-0 0.3800	28-0 5.5	28-0 0.3842	28-0 5.5	28-0 0.3884	28-0 5.5	28-0 0.3926	28-0 5.5	28-0 0.3968	28-0 5.5	28-0 0.4010	28-0 5.5	28-0 0.4052	28-0 5.5	28-0 0.4094	28-0 5.5	28-0 0.4136	28-0 5.5	28-0 0.4178	28-0 5.5	28-0 0.4220	28-0 5.5	28-0 0.4262	28-0 5.5	28-0 0.4304	28-0 5.5	28-0 0.4346	28-0 5.5	28-0 0.4388	28-0 5.5	28-0 0.4430	28-0 5.5	28-0 0.4472	28-0 5.5	28-0 0.4514	28-0 5.5	28-0 0.4556	28-0 5.5	28-0 0.4598	28-0 5.5	28-0 0.4640	28-0 5.5	28-0 0.4682	28-0 5.5	28-0 0.4724	28-0 5.5	28-0 0.4766	28-0 5.5	28-0 0.4808	28-0 5.5	28-0 0.4850	28-0 5.5	28-0 0.4892	28-0 5.5	28-0 0.4934	28-0 5.5	28-0 0.4976	28-0 5.5	28-0 0.5018	28-0 5.5	28-0 0.5060	28-0 5.5	28-0 0.5102	28-0 5.5	28-0 0.5144	28-0 5.5	28-0 0.5186	28-0 5.5	28-0 0.5228	28-0 5.5	28-0 0.5270	28-0 5.5	28-0 0.5312	28-0 5.5	28-0 0.5354	28-0 5.5	28-0 0.5396	28-0 5.5	28-0 0.5438	28-0 5.5	28-0 0.5480	28-0 5.5	28-0 0.5522	28-0 5.5	28-0 0.5564	28-0 5.5	28-0 0.5606	28-0 5.5	28-0 0.5648	28-0 5.5	28-0 0.5690	28-0 5.5	28-0 0.5732	28-0 5.5	28-0 0.5774	28-0 5.5	28-0 0.5816	28-0 5.5	28-0 0.5858	28-0 5.5	28-0 0.5900	28-0 5.5	28-0 0.5942	28-0 5.5	28-0 0.5984	28-0 5.5	28-0 0.6026	28-0 5.5	28-0 0.6068	28-0 5.5	28-0 0.6110	28-0 5.5	28-0 0.6152	28-0 5.5	28-0 0.6194	28-0 5.5	28-0 0.6236	28-0 5.5	28-0 0.6278	28-0 5.5	28-0 0.6320	28-0 5.5	28-0 0.6362	28-0 5.5	28-0 0.6404	28-0 5.5	28-0 0.6446	28-0 5.5	28-0 0.6488	28-0 5.5	28-0 0.6530	28-0 5.5	28-0 0.6572	28-0 5.5	28-0 0.6614	28-0 5.5	28-0 0.6656	28-0 5.5	28-0 0.6698	28-0 5.5	28-0 0.6740	28-0 5.5	28-0 0.6782	28-0 5.5	28-0 0.6824	28-0 5.5	28-0 0.6866	28-0 5.5	28-0 0.6908	28-0 5.5	28-0 0.6950	28-0 5.5	28-0 0.6992	28-0 5.5	28-0 0.7034	28-0 5.5	28-0 0.7076	28-0 5.5	28-0 0.7118	28-0 5.5	28-0 0.7160	28-0 5.5	28-0 0.7202	28-0 5.5	28-0 0.7244	28-0 5.5	28-0 0.7286	28-0 5.5	28-0 0.7328	28-0 5.5	28-0 0.7370	28-0 5.5	28-0 0.7412	28-0 5.5	28-0 0.7454	28-0 5.5	28-0 0.7496	28-0 5.5	28-0 0.7538	28-0 5.5	28-0 0.7580	28-0 5.5	28-0 0.7622	28-0 5.5	28-0 0.7664	28-0 5.5	28-0 0.7706	28-0 5.5	28-0 0.7748	28-0 5.5	28-0 0.7790	28-0 5.5	28-0 0.7832	28-0 5.5	28-0 0.7874	28-0 5.5	28-0 0.7916	28-0 5.5	28-0 0.7958	28-0 5.5	28-0 0.8000	28-0 5.5	28-0 0.8042	28-0 5.5	28-0 0.8084	28-0 5.5	28-0 0.8126	28-0 5.5	28-0 0.8168	28-0 5.5	28-0 0.8210	28-0 5.5	28-0 0.8252	28-0 5.5	28-0 0.8294	28-0 5.5	28-0 0.8336	28-0 5.5	28-0 0.8378	28-0 5.5	28-0 0.8420	28-0 5.5	28-0 0.8462	28-0 5.5	28-0 0.8504	28-0 5.5	28-0 0.8546	28-0 5.5	28-0 0.8588	28-0 5.5	28-0 0.8630	28-0 5.5	28-0 0.8672	28-0 5.5	28-0 0.8714	28-0 5.5	28-0 0.8756	28-0 5.5	28-0 0.8798	28-0 5.5	28-0 0.8840	28-0 5.5	28-0 0.8882	28-0 5.5	28-0 0.8924	28-0 5.5	28-0 0.8966	28-0 5.5	28-0 0.9008	28-0 5.5	28-0 0.9050	28-0 5.5	28-0 0.9092	28-0 5.5	28-0 0.9134	28-0 5.5	28-0 0.9176	28-0 5.5	28-0 0.9218	28-0 5.5	28-0 0.9260	28-0 5.5	28-0 0.9302	28-0 5.5	28-0 0.9344	28-0 5.5	28-0 0.9386	28-0 5.5	28-0 0.9428	28-0 5.5	28-0 0.9470	28-0 5.5	28-0 0.9512	28-0 5.5	28-0 0.9554	28-0 5.5	28-0 0.9596	28-0 5.5	28-0 0.9638	28-0 5.5	28-0 0.9680	28-0 5.5	28-0 0.9722	28-0 5.5	28-0 0.9764	28-0 5.5	28-0 0.9806	28-0 5.5	28-0 0.9848	28-0 5.5	28-0 0.9890	28-0 5.5	28-0 0.9932	28-0 5.5	28-0 0.9974	28-0 5.5	28-0 1.0016	28-0 5.5	28-0 1.0058	28-0 5.5	28-0 1.0100	28-0 5.5	28-0 1.0142	28-0 5.5	28-0 1.0184	28-0 5.5	28-0 1.0226	28-0 5.5	28-0 1.0268	28-0 5.5	28-0 1.0310	28-0 5.5	28-0 1.0352	28-0 5.5	28-0 1.0394	28-0 5.5	28-0 1.0436	28-0 5.5	28-0 1.0478	28-0 5.5	28-0 1.0520	28-0 5.5	28-0 1.0562	28-0 5.5	28-0 1.0604	28-0 5.5	28-0 1.0646	28-0 5.5	28-0 1.0688	28-0 5.5	28-0 1.0730	28-0 5.5	28-0 1.0772	28-0 5.5	28-0 1.0814	28-0 5.5	28-0 1.0856	28-0 5.5	28-0 1.0898	28-0 5.5	28-0 1.0940	28-0 5.5	28-0 1.0982	28-0 5.5	28-0 1.1024	28-0 5.5	28-0 1.1066	28-0 5.5	28-0 1.1108	28-0 5.5	28-0 1.1150	28-0 5.5	28-0 1.1192	28-0 5.5	28-0 1.1234	28-0 5.5	28-0 1.1276	28-0 5.5	28-0 1.1318	28-0 5.5	28-0 1.1360	28-0 5.5	28-0 1.1402	28-0 5.5	28-0 1.1444	28-0 5.5	28-0 1.1486	28-0 5.5	28-0 1.1528	28-0 5.5	28-0 1.1570	28-0 5.5	28-0 1.1612	28-0 5.5	28-0 1.1654	28-0 5.5	28-0 1.1696	28-0 5.5	28-0 1.1738	28-0 5.5	28-0 1.1780	28-0 5.5	28-0 1.1822	28-0 5.5	28-0 1.1864	28-0 5.5	28-0 1.1906	28-0 5.5	28-0 1.1948	28-0 5.5	28-0 1.1990	28-0 5.5	28-0 1.2032	28-0 5.5	28-0 1.2074	28-0 5.5	28-0 1.2116	28-0 5.5	28-0 1.2158	28-0 5.5	28-0 1.2200	28-0 5.5	28-0 1.2242	28-0 5.5	28-0 1.2284	28-0 5.5	28-0 1.2326	28-0 5.5	28-0 1.2368	28-0 5.5	28-0 1.2410	28-0 5.5	28-0 1.2452	28-0 5.5	28-0 1.2494	28-0 5.5	28-0 1.2536	28-0 5.5	28-0 1.2578	28-0 5.5	28-0 1.2620	28-0 5.5	28-0 1.2662	28-0 5.5	28-0 1.2704	28-0 5.5	28-0 1.2746	28-0 5.5	28-0 1.2788	28-0 5.5	28-0 1.2830	28-0 5.5	28-0 1.2872	28-0 5.5	28-0 1.2914	28-0 5.5	28-0 1.2956	28-0 5.5	28-0 1.3000	28-0 5.5	28-0 1.3042	28-0 5.5	28-0 1.3084	28-0 5.5	28-0 1.3126	28-0 5.5	28-0 1.3168	28-0 5.5	28-0 1.3210	28-0 5.5	28-0 1.3252	28-0 5.5	28-0 1.3294	28-0 5.5	28-0 1.3336	28-0 5.5	28-0 1.3378	28-0 5.5	28-0 1.3420	28-0 5.5	28-0 1.3462	28-0 5.5	28-0 1.3504	28-0 5.5	28-0 1.3546	28-0 5.5	28-0 1.3588	28-0 5.5	28-0 1.3630	28-0 5.5	28-0 1.3672	28-0 5.5	28-0 1.3714	28-0 5.5	28-0 1.3756	28-0 5.5	28-0 1.3798	28-0 5.5	28-0 1.3840	28-0 5.5	28-0 1.3882	28-0 5.5	28-0 1.3924	28-0 5.5	28-0 1.3966	28-0 5.5	28-0 1.4008	28-0 5.5	28-0 1.4050	28-0 5.5	28-0 1.4092	28-0 5.5	28-0 1.4134	28-0 5.5	28-0 1.4176	28-0 5.5	28-0 1.4218	28-0 5.5	28-0 1.4260	28-0 5.5	28-0 1.4302	28-0 5.5	28-0 1.4344	28-0 5.5	28-0 1.4386	28-0 5.5	28-0 1.4428	28-0 5.5	28-0 1.4470	28-0 5.5	28-0 1.4512	28-0 5.5	28-0 1.4554	28-0 5.5	28-0 1.4596	28-0 5.5	28-0 1.4638	28-0 5.5	28-0 1.4680	28-0 5.5	28-0 1.4722	28-0 5.5	28-0 1.4764	28-0 5.5	28-0 1.4806	28-0 5.5	28-0 1.4848	28-0 5.5	28-0 1.4890	28-0 5.5	28-0 1.4932	28-0 5.5	28-0 1.4974	28-0 5.5	28-0 1.5016	28-0 5.5	28-0 1.5058	28-0 5.5	28-0 1.5100	28-0 5.5	28-0 1.5142	28-0 5.5	28-0 1.5184	28-0 5.5	28-0 1.5226	28-0 5.5	28-0 1.5268	28-0 5.5	28-0 1.5310	28-0 5.5	28-0 1.5352	28-0 5.5	28-0 1.5394	28-0 5.5	28-0 1.5436	28-0 5.5	28-0 1.5478	28-0 5.5	28-0 1.5520	28-0 5.5	28-0 1.5562	28-0 5.5	28-0 1.5604	28-0 5.5	28-0 1.5646	28-0 5.5	28-0 1.5688	28-0 5.5	28-0 1.5730	28-0 5.5	28-0 1.5772	28-0 5.5	28-0 1.5814	28-0 5.5	28-0 1.5856	28-0 5.5	28-0 1.5898	28-0 5.5	28-0 1.5940	28-0 5.5	28-0 1.5982	28-0 5.5	28-0 1.6024	28-0 5.5	28-0 1.6066	28-0 5.5	28-0 1.6108	28-0 5.5	28-0 1.6150	28-0 5.5	28-0 1.6192	28-0 5.5	28-0 1.6234	28-0 5.5	28-0 1.6276	28-0 5.5	28-0 1.6318	28-0 5.5	28-0 1.6360	28-0 5.5	28-0 1.6402	28-0 5.5	28-0 1.6444	28-0 5.5	28-0 1.6486	28-0 5.5	28-0 1.6528	28-0 5.5	28-0 1.6570	28-0 5.5	28-0 1.6612	28-0 5.5	28-0 1.6654	28-0 5.5	28-0 1.6696	28-0 5.5	28-0 1.6738	28-0 5.5	28-0 1.6780	28-0 5.5	28-0 1.6822	28-0 5.5	28-0 1.6864	28-0 5.5	28-0 1.6906	28-0 5.5	28-0 1.6948	28-0 5.5	28-0 1.6990	28-0 5.5	28-0 1.7032	28-0 5.5	28-0 1.7074	28-0 5.5	28-0 1.7116	28-0 5.5	28-0 1.7158	28-0 5.5	28-0 1.7200	28-0 5.5	28-0 1.7242	28-0 5.5	28-0 1.7284	28-0 5.5	28-0 1.7326	28-0 5.5	28-0 1.7368	28-0 5.5	28-0 1.7410	28-0 5.5	28-0 1.7452	28-0 5.5	28-0 1.7494	28-0 5.5	28-0 1.7536	28-0 5.5	28-0 1.7578	28-0 5.5	28-0 1.7620	28-0 5.5	28-0 1.7662	28-0 5.5	28-0 1.7704	28-0 5.5	28-0 1.7746	28-0 5.5	28-0 1.7788	28-0 5.5	28-0 1.7830	28-0 5.5	28-0 1.7872	28-0 5.5	28-0 1.7914	28-0 5.5	28-0 1.7956	28-0 5.5	28-0 1.8000	28-0 5.5	28-0 1.8042	28-0 5.5	28-0 1.8084	28-0 5.5	28-0 1.8126	28-0 5.5	28-0 1.8168	28-0 5.5	28-0 1.8210	28-0 5.5	28-0 1.8252	28-0 5.5	28-0 1.8294	28-0 5.5	28-0 1
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0.0701	0.0760	0.0812	0.0867	0.0914	0.0959	0.1001	0.1041	0.1078	0.1116	0.1147	0.1176	0.1206	0.1232	0.1256	0.1278	0.1298	0.1317	0.1335	0.1352	0.1368	0.1383	0.1397	0.1411	0.1424	0.1437	0.1449	0.1461	0.1472	0.1483	0.1493	0.1503	0.1512	0.1521	0.1530	0.1538	0.1546	0.1554	0.1561	0.1568	0.1575	0.1582	0.1589	0.1596	0.1603	0.1610	0.1617	0.1624	0.1631	0.1638	0.1645	0.1652	0.1659	0.1666	0.1673	0.1680	0.1687	0.1694	0.1701	0.1708	0.1715	0.1722	0.1729	0.1736	0.1743	0.1750	0.1757	0.1764	0.1771	0.1778	0.1785	0.1792	0.1799	0.1806	0.1813	0.1820	0.1827	0.1834	0.1841	0.1848	0.1855	0.1862	0.1869	0.1876	0.1883	0.1890	0.1897	0.1904	0.1911	0.1918	0.1925	0.1932	0.1939	0.1946	0.1953	0.1960	0.1967	0.1974	0.1981	0.1988	0.1995	0.2002	0.2009	0.2016	0.2023	0.2030	0.2037	0.2044	0.2051	0.2058	0.2065	0.2072	0.2079	0.2086	0.2093	0.2100	0.2107	0.2114	0.2121	0.2128	0.2135	0.2142	0.2149	0.2156	0.2163	0.2170	0.2177	0.2184	0.2191	0.2198	0.2205	0.2212	0.2219	0.2226	0.2233	0.2240	0.2247	0.2254	0.2261	0.2268	0.2275	0.2282	0.2289	0.2296	0.2303	0.2310	0.2317	0.2324	0.2331	0.2338	0.2345	0.2352	0.2359	0.2366	0.2373	0.2380	0.2387	0.2394	0.2401	0.2408	0.2415	0.2422	0.2429	0.2436	0.2443	0.2450	0.2457	0.2464	0.2471	0.2478	0.2485	0.2492	0.2499	0.2506	0.2513	0.2520	0.2527	0.2534	0.2541	0.2548	0.2555	0.2562	0.2569	0.2576	0.2583	0.2590	0.2597	0.2604	0.2611	0.2618	0.2625	0.2632	0.2639	0.2646	0.2653	0.2660	0.2667	0.2674	0.2681	0.2688	0.2695	0.2702	0.2709	0.2716	0.2723	0.2730	0.2737	0.2744	0.2751	0.2758	0.2765	0.2772	0.2779	0.2786	0.2793	0.2800	0.2807	0.2814	0.2821	0.2828	0.2835	0.2842	0.2849	0.2856	0.2863	0.2870	0.2877	0.2884	0.2891	0.2898	0.2905	0.2912	0.2919	0.2926	0.2933	0.2940	0.2947	0.2954	0.2961	0.2968	0.2975	0.2982	0.2989	0.2996	0.3003	0.3010	0.3017	0.3024	0.3031	0.3038	0.3045	0.3052	0.3059	0.3066	0.3073	0.3080	0.3087	0.3094	0.3101	0.3108	0.3115	0.3122	0.3129	0.3136	0.3143	0.3150	0.3157	0.3164	0.3171	0.3178	0.3185	0.3192	0.3199	0.3206	0.3213	0.3220	0.3227	0.3234	0.3241	0.3248	0.3255	0.3262	0.3269	0.3276	0.3283	0.3290	0.3297	0.3304	0.3311	0.3318	0.3325	0.3332	0.3339	0.3346	0.3353	0.3360	0.3367	0.3374	0.3381	0.3388	0.3395	0.3402	0.3409	0.3416	0.3423	0.3430	0.3437	0.3444	0.3451	0.3458	0.3465	0.3472	0.3479	0.3486	0.3493	0.3500	0.3507	0.3514	0.3521	0.3528	0.3535	0.3542	0.3549	0.3556	0.3563	0.3570	0.3577	0.3584	0.3591	0.3598	0.3605	0.3612	0.3619	0.3626	0.3633	0.3640	0.3647	0.3654	0.3661	0.3668	0.3675	0.3682	0.3689	0.3696	0.3703	0.3710	0.3717</

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RED	30.50	30.51	30.52	30.53	30.54	30.55	30.56	30.57	30.58	30.59	30.60	30.61	30.62	30.63	30.64	30.65	30.66	30.67	30.68	30.69	30.70	30.71	30.72	30.73	30.74	30.75	30.76	30.77	30.78	30.79	30.80	30.81	30.82	30.83	30.84	30.85	30.86	30.87	30.88	30.89	30.90	30.91	30.92	30.93	30.94	30.95	30.96	30.97	30.98	30.99	31.00	31.01	31.02	31.03	31.04	31.05	31.06	31.07	31.08	31.09	31.10	31.11	31.12	31.13	31.14	31.15	31.16	31.17	31.18	31.19	31.20	31.21	31.22	31.23	31.24	31.25	31.26	31.27	31.28	31.29	31.30	31.31	31.32	31.33	31.34	31.35	31.36	31.37	31.38	31.39	31.40	31.41	31.42	31.43	31.44	31.45	31.46	31.47	31.48	31.49	31.50	31.51	31.52	31.53	31.54	31.55	31.56	31.57	31.58	31.59	31.60	31.61	31.62	31.63	31.64	31.65	31.66	31.67	31.68	31.69	31.70	31.71	31.72	31.73	31.74	31.75	31.76	31.77	31.78	31.79	31.80	31.81	31.82	31.83	31.84	31.85	31.86	31.87	31.88	31.89	31.90	31.91	31.92	31.93	31.94	31.95	31.96	31.97	31.98	31.99	32.00	32.01	32.02	32.03	32.04	32.05	32.06	32.07	32.08	32.09	32.10	32.11	32.12	32.13	32.14	32.15	32.16	32.17	32.18	32.19	32.20	32.21	32.22	32.23	32.24	32.25	32.26	32.27	32.28	32.29	32.30	32.31	32.32	32.33	32.34	32.35	32.36	32.37	32.38	32.39	32.40	32.41	32.42	32.43	32.44	32.45	32.46	32.47	32.48	32.49	32.50	32.51	32.52	32.53	32.54	32.55	32.56	32.57	32.58	32.59	32.60	32.61	32.62	32.63	32.64	32.65	32.66	32.67	32.68	32.69	32.70	32.71	32.72	32.73	32.74	32.75	32.76	32.77	32.78	32.79	32.80	32.81	32.82	32.83	32.84	32.85	32.86	32.87	32.88	32.89	32.90	32.91	32.92	32.93	32.94	32.95	32.96	32.97	32.98	32.99	33.00	33.01	33.02	33.03	33.04	33.05	33.06	33.07	33.08	33.09	33.10	33.11	33.12	33.13	33.14	33.15	33.16	33.17	33.18	33.19	33.20	33.21	33.22	33.23	33.24	33.25	33.26	33.27	33.28	33.29	33.30	33.31	33.32	33.33	33.34	33.35	33.36	33.37	33.38	33.39	33.40	33.41	33.42	33.43	33.44	33.45	33.46	33.47	33.48	33.49	33.50	33.51	33.52	33.53	33.54	33.55	33.56	33.57	33.58	33.59	33.60	33.61	33.62	33.63	33.64	33.65	33.66	33.67	33.68	33.69	33.70	33.71	33.72	33.73	33.74	33.75	33.76	33.77	33.78	33.79	33.80	33.81	33.82	33.83	33.84	33.85	33.86	33.87	33.88	33.89	33.90	33.91	33.92	33.93	33.94	33.95	33.96	33.97	33.98	33.99	34.00	34.01	34.02	34.03	34.04	34.05	34.06	34.07	34.08	34.09	34.10	34.11	34.12	34.13	34.14	34.15	34.16	34.17	34.18	34.19	34.20	34.21	34.22	34.23	34.24	34.25	34.26	34.27	34.28	34.29	34.30	34.31	34.32	34.33	34.34	34.35	34.36	34.37	34.38	34.39	34.40	34.41	34.42	34.43	34.44	34.45	34.46	34.47	34.48	34.49	34.50	34.51	34.52	34.53	34.54	34.55	34.56	34.57	34.5
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REFERENCES

- Brass, William. 1971. On the scale of mortality. In *Biological aspects of demography*, edited by William Brass et al., pp. 69-110. London: Taylor and Francis.
- Coale, Ansley J. 1971. Age pattern of marriage. *Population Studies* 25(2):193-214.
- Coale, Ansley J., and Demeny, Paul. 1966. *Regional model life tables and stable populations*. Princeton: Princeton University Press.
- Coale, Ansley J., and McNeil, Donald R. 1972. The distribution by age of the frequency of first marriage in a female cohort. *Journal of the American Statistical Association* 67(340):743-749.
- Henry, Louis. 1961. Some data on natural fertility. *Eugenics Quarterly* 8(2):81-91.
- Ledermann, Sully. 1969. *Nouvelles tables-types de mortalité*. Institut National d'Etudes Démographiques, Travaux et Documents, Cahier 53. Paris: Presses Universitaires de France.
- Mitra, S., and Romaniuk, A. 1972. Pearsonian Type I curve and its fertility projection potentials. *Demography* 10(3): 351-365.
- Romaniuk, A. 1973. A three-parameter model for birth projections. *Population Studies* 27(3):467-470.
- Talwar, P. P. 1970. *Age patterns of fertility*. Institute of Statistics Mimeo Series, No. 656. Chapel Hill: University of North Carolina.
- _____. 1974. Model fertility patterns for population projections. Presented at the Annual Meeting of the Population Association of America, New York.
- Tekse, K. 1967. On demographic models of age-specific fertility rates. *Statistisk Tidskrift* 5(3):189-207.
- United Nations. Population Branch. 1955. *Age and sex patterns of mortality: model life-tables for under-developed countries*. Population Studies, No. 22. ST/SOA.Ser.A/22. Sales No.: 55.XIII.9. New York.
- United Nations. Department of Economic and Social Affairs. 1966. *Demographic Yearbook 1965*. Sales No.: 66.XIII.1. New York.

POPULATION COUNCIL
DEMOGRAPHIC DIVISION GRANTS

The Population Council has published a new description of its Demographic Division grants program, including detailed information concerning the topics on which applicants are encouraged to focus in 1974 and 1975.

Under the Demographic Division grants program support is available for research, institutional development, and fellowships. In each of these categories, the subject matter may fall in one or more of the following fields of interest:

- Demographic processes and structure—in particular, levels and trends of population growth, fertility, mortality, migration, and the composition and spatial distribution of populations.
- The antecedents of demographic processes—in particular, the economic, social, and psychological determinants of demographic behavior.
- The effects of population processes—in particular, their economic, social, and environmental consequences, and their nature, incidence, and timing.
- Population policy—in particular, social and political responses to the effects of population processes and the analysis of possible policy choices that seek