PATTERNS AND DETERMINANTS OF FERTILITY IN MELBOURNE

by

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ABSTRACT

Period fertility has fluctuated markedly in Australia over the last fifty years. The last peak occurred in 1971, and in that year the Department of Demography of the Australian National University carried out in Melbourne the first major fertility survey ever conducted in Australia. This research is based on data from the Melbourne Family Survey, which has proved to be an excellent vehicle for the analysis of many aspects of Australian family formation.

The thesis first establishes the physiological setting in which the childbearing of the Melbourne respondents took place, and then goes on to discuss patterns of contraceptive use both within marriage cohorts and within different social groups. This is followed by analyses of cohort fertility patterns and the timing of childbearing. The effect on current fertility of age at marriage is examined both through cumulative marital fertility rates and through multivariate analyses, the latter simultaneously providing indications of social characteristics that influence current family size. A simple model based on the birth intervals of non-contraceptors is next developed, and applied to examine the effects of both volitional and non-volitional fecundity depressants on reproductive performance; contraceptive effectiveness; and parity-specific patterns of family formation.

While average completed family size was found to vary little between marriage cohorts and, within marriage cohorts, to vary little between women with different social characteristics, the tempo of childbearing was found to have been far from stable in the recent past. Changes in family building patterns can be summarized as a compression of the childbearing span of women married in the 1950s and, among women married after 1960, a return to the longer spacing patterns which characterized women who married during the

Depression and the Second World War. Such changes have been largely responsible for fluctuations in period marital fertility rates in the recent past: only if the tendency to postpone childbearing is accompanied by some dramatic attitudinal changes (of which we have no evidence) can we expect the average completed family size of the most recently married women in the sample to decline significantly.

TABLE OF CONTENTS

TABLE OF CONTENTS cont. Page

LIST OF TABLES

LIST OF TABLES cont.

LIST OF TABLES cont. page

LIST OF TABLES cont.

LIST OF TABLES cont.

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

"This is indeed a mystery," I remarked. "What do you imagine that it means?'

"I have no data yet. It is a capital mistake to theorize before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts."

Arthur Conan Doyle - "A Scandal in Bohemia" (1891)

1.1 RECENT AUSTRALIAN FERTILITY TRENDS

Writing during the economic depression that preceded the Second World War, Wolstenholme (1936) observed that:

> "The reproduction of the Australian population is at present so low that, given a continuation of present reproduction rates and the absence of immigration, ultimate decline in the population can be predicted with assurance." (p.195)

Wolstenholme was perturbed by the decline in the Australian crude birth rate, which had slumped from around 23 per thousand in the mid 1920s to below 17 per thousand by the mid 1930s. The crude birth rate subsequently rose, exceeding 23 per thousand in 1946, and thereafter remained consistently above 22 per thousand until 1961. This year heralded a decline in the birth rate from 22.9 to 19.3 in 1966, and a recovery to 21.6 per thousand in 1971.

Basavarajappa (1971) considered that changes in fertility, as well as marriage, rates during the twenty year period preceding the War were associated with changes in economic conditions. The stability of the crude birth rate during the fifteen year period following the War masks two important demographic revolutions. The first was the "marriage boom", a move to younger ages at marriage and higher proportions of women marrying, that commenced in Australia in 1940 and continued "against all expectation" until 1951 (Ruzicka and Caldwell, 1977, p.84). The second was the post-War "baby boom", which initially involved a "catching-up" of fertility deferred during the War and then sustained increases in period marital fertility rates until 1961 (National Population Inquiry, 1975).

That the crude birth rate fluctuated hardly at all in the presence of the "marriage" and "baby booms" was due to changes in the age structure of the population: had the age structure not changed after 1945, the crude birth rates of 1954 and the peak year of 1961 would have been 25.4 and 28.3 per thousand respectively, rather than the observed values of 22.5 and 22.9.

The age structure of the Australian population would have been even less favourable to the birth rate but for the influx of young immigrants which occurred after the War. The new feature of post-War immigration was that, for the first time, Australia drew settlers from countries other than Britain and Ireland.

The decline in the birth rate between 1961 and 1966 was caused entirely by declines in age-specific fertility, while the recovery between 1966 and 1971 was due primarily to an increasingly favourable age structure and increases in proportions married. Borrie (1969) speculated that if net migration were constant the birth rate would decline until 1970 and rise rapidly thereafter as the daughters of the baby boom reached maturity, even if the proportions married declined. Instead, the crude birth rate has been declining steadily since 1971, and it has been suggested that the early 1970s mark:

> "... the end of an era [of high fertility] which was ushered in after World War II ... and the beginning of the new demographic cycle which seems to be pointing towards growth patterns and demographic structures markedly different from the recent past, though not dissimilar in many respects to the patterns created forty years ago." (National Population Inquiry, _op.cit_., p.746)

1.2 THE MELBOURNE SURVEY

Most of our knowledge of Australian fertility is drawn from census and vital registration data. It has been suggested that, from surveys, "much is known, but it is known of too few persons" (Day, 1971, p.2043); but it could also be argued that, from census and vital registration data, little is known, although it is known of many. While official statistics provide a skeletal outline of fertility patterns that cannot be derived from a survey, they do not provide detailed reconstructions of the reproductive lives of individuals. For example, official statistics can be used to chart the exact course of Australian fertility since the introduction of the contraceptive pill, but they cannot be used to link one with the other. To fill this sort of gap, the Department of Demography of the Australian National University conducted the 1971 Melbourne Family Survey, the first major survey of the Australian Family Formation Project and, indeed, the first large-scale fertility survey to be conducted in Australia.

After a pilot study in Queanbeyan, a New South Wales country town, the fieldwork of the survey was carried out between August and December 1971. Given the highly urbanized nature of the Australian population and the prohibitive expense of surveying in other than metropolitan areas, a large city, Melbourne, was chosen as the site of the survey.[1] The survey was timed to follow closely the 1971 Census of Australia in the belief that this would assist in evaluating the survey data (Caldwell and Ware, 1973).

The Commonwealth Bureau of Census and Statistics designed the three-stage areally stratified sample employed in the survey. The sample yielded

1. In 1971, two-thirds of the population of Australia (8.2 of 12.8 million) was located in cities of at least 100,000 inhabitants and almost half was located in Sydney, Melbourne or their satellite areas. Of these, more than two-fifths (2.5 million) lived in Melbourne (National Population Inquiry, op.cit.).

a total of 5,398 dwellings and, in these, 3,271 women met the eligibility criteria for interview: once-married women under the age of 60 with marriage still intact at the time of the survey. Completed interviews were obtained from 2,652 women, or 81 per cent of the target population. Of the 619 eligible women not included in the final sample, 204 proved to be inaccessible after repeated "call-backs", 393 refused to be interviewed and 22 failed to complete the questionnaire (Caldwell et al., 1973). Details of manual and machine editing procedures for the data can be found in Young (1973 and 1977a).

The survey questionnaire took between two and three hours to administer and sought factual and attitudinal information on a host of topics, ranging from the respondents' social, economic and demographic characteristics to their pregnancy, contraceptive and labour force histories to their opinions about family formation, contraception and current population issues. Initial fears that it would be difficult to obtain information on some "sensitive" topics, such as sexual practices, proved to be groundless: 16 per cent of respondents registered embarrassment to questions on sex, contraception and abortion but 40 per cent were embarrassed by their ignorance of the size of Australia's population (Caldwell and Ware, op.cit.).

The decision to interview once- and currently married women was taken to ensure a definable period of largely uninterrupted exposure to the risk of childbearing. Moreover, the principal researchers thought that the Australian divorce rate had been so low that "the omission of women with broken marriages ... [would have] more technical advantages than disadvantages" (Caldwell et al., op.cit., p.50). Bearing in mind that the census seeks marital status rather than marital history, this decision, as well as the decision to concentrate on urban dwellers,[2] ensures that the Melbourne sample is not even strictly comparable with the 1971 census population of currently married women under the age of 60 years in Melbourne. Given the rationale for the Melbourne survey, that is, to collect information valuable for an understanding of *Australian*, as opposed to Melbourne, fertility; and given the quite natural temptation to extrapolate from a specialized sample to a larger population, it is therefore worthwhile to examine the degree to which the sample differs from the closest definable group in the 1971 Australian census.

Unfortunately, no attempt at a systematic comparison between the Melbourne sample and the 1971 census has been made. Moreover, such comparisons are difficult given the paucity of published census tabulations and the contents of census matrix tapes requested by various private researchers from the Australian Bureau of Statistics. For example, in the former case no information on fertility has been published from the 1971 census and in the latter it is impossible to link marital status and fertility in specific geographic regions.

Table 1.2.1 presents the proportionate age distributions of Australian and Victorian women in 1971, the percentages of the totals who had ever been married, the percentages of the ever-married who were currently married and the age distributions of the currently married. The final column of the table shows the age distribution of the Melbourne respondents. (Census data for Melbourne itself were unobtainable.) The contents of the table illustrate the way in which the selection criteria of the Melbourne survey related to marriage successively shift the sample away from the base population of all women aged 15 to 59.

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2. Findings of the pilot survey, however, "confirmed that the society was sufficiently homogeneous and that urban-rural differentials in behavioral patterns were slight enough for the Melbourne survey findings to be representative of the country." (Caldwell et al., op. cit., p.50).

TABLE 1.2.1: AGE DISTRIBUTIONS OF AUSTRALIAN AND VICTORIAN WOMEN IN 1971, BY MARITAL STATUS, AND MELBOURNE RESPONDENTS BY AGE

	AUSTRALIA†				VICTORIA†				MELBOURNE SURVEY
Age	Total	Percentage of total ever-married	Percentage of ever-married currently married	Currently married	Total	Percentage of total ever-married	Percentage of ever-married currently married	Currently married	
15-19	14.7	8.8	97.9	1.8	14.7	7.6	97.8	1.6	1.4
20-24	14.6	64.3	96.5	13.1	14.6	62.5	96.8	12.7	13.8
25-29	12.3	88.4	95.4	14.9	12.3	88.5	95.8	15.0	16.4
30-34	10.6	93.5	94.8	13.5	10.6	93.6	95.1	13.5	14.7
35-39	9.8	95.0	93.5	12.5	9.9	95.1	93.9	12.7	13.6
40-44	10.3	95.2	91.4	12.9	10.4	95.3	91.8	13.2	14.2
45-49	10.4	95.1	88.4	12.5	10.5	95.1	88.7	12.7	11.5
50-54	9.0	94.5	83.8	10.2	8.8	94.3	84.3	10.1	8.4
55-59	8.3	93.5	77.3	8.6	8.2	92.9	77.8	8.5	6.0
Total	100.0	76.7	90.7	100.0	100.0	76.3	91.1	100.0	100.0
(N)	(3,677,494)	(2,820,333)	(2,559,348)	(2,559,348)	(1,013,528)	(773,299)	(704,691)	(704,691)	(2652)

† Sources: Commonwealth Bureau of Census and Statistics, <u>1971 Census of Population and Housing</u> 3(9) and 3(2).

The 1971 census results for Australia and Victoria are almost identical. In each case, the proportions of women in each age-group tend to decline slowly with age while the proportions of ever-married women rise markedly between ages 15-19 and 30-34 and then decrease slightly thereafter. A different pattern emerges in the percentages of ever-married women who were married at the time of the census: these percentages decline slowly between the 15-19 and 35-39 year age-groups and then fall more sharply between each subsequent pair of age-groups. The declines between ages 15-19 and 45-49 in the proportions of ever-married women who were currently married are caused principally by marital dissolution through separation and divorce and secondarily by widowhood; the relative importance of these two disruptive factors is reversed in the two oldest age-groups.

The proportionate age distribution of the members of the Melbourne sample proves to be similar to the age distributions of currently married Australian and Victorian women, the closest groups definable in the census. Nevertheless, relative to those of the census populations, the Melbourne age distribution shows a slight shift toward younger women. The major explanation for this shift is that the likelihoods of marriage dissolution and subsequent remarriage and, consequently, that current marriages are not first marriages increase with age, while only once- and continuosuly married women were eligible for interview in Melbourne.

Table 1.2.2 presents currently married Australian and Victorian women and Melbourne survey respondents according to age and country of birth. While the census and survey age distributions proved to be similar (despite minor differences in definitions of marriage), in each broad age-group the Melbourne respondents differ greatly from currently married Victorian and Australian women with respect to their countries of birth.

TABLE 1.2.2: CURRENTLY MARRIED AUSTRALIAN AND VICTORIAN WOMEN IN 1971, AND MELBOURNE RESPONDENTS, BY AGE AND COUNTRY OF BIRTH

	COUNTRY OF BIRTH					
Age	Australia	United Kingdom and Eire	Italy or Greece	Other	Total	(N)
15-24						
Australia†	75.7	8.2	5.3	10.8	100.0	(381,148)
Victoria†	69.5	7.8	9.6	13.1	100.0	(100,799)
Melbourne	64.9	9.5	12.2	13.4	100.0	(402)
25-34						
Australia	71.3	10.2	7.2	11.3	100.0	(726,269)
Victoria	64.8	9.2	12.5	13.5	100.0	(201,162)
Melbourne	56.6	9.5	18.2	15.7	100.0	(823)
35-44						
Australia	71.8	10.0	7.1	11.1	100.0	(649,537)
Victoria	65.6	9.4	11.4	13.6	100.0	(182,018)
Melbourne	59.2	7.4	16.2	17.2	100.0	(739)
45-59						
Australia	76.7	10.2	3.5	9.6	100.0	(802,394)
Victoria	73.4	9.9	5.2	11.5	100.0	(220,722)
Melbourne	68.1	10.6	8.4	12.9	100.0	(688)
Total						
Australia	73.8	9.8	5.7	10.7	100.0	(2,559,348)
Victoria	68.4	9.3	9.5	12.8	100.0	(704,701)
Melbourne	61.6	9.2	14.2	15.0	100.0	(2,652)

† Sources: Commonwealth Bureau of Census and Statistics, 1971 Census of Population and Housing 4(9) and 4(2).

In particular, the sample contains proportionately fewer native-born women than Victoria or Australia as a whole. For example, the smallest differences in the proportions of Australian-born women in Melbourne and Victoria (five per cent) and in Melbourne and Australia (nine per cent) occur at ages 35-44; the largest differences (eight and 15 per cent respectively) occur at ages 25-34. These differences result mainly from a preponderance of non-British and, in particular, Greek- and Italian-born migrants in Melbourne and reflect both large-scale immigration from Southern Europe after 1950 and the concentration of migrants in metropolitan areas (Tsounis, 1975). (Indeed, by 1971 Melbourne boasted the largest urban Greek population outside Athens.) That the Melbourne respondents differ greatly from the currently married women enumerated in the 1971 census with respect to their countries of origin does not necessarily entail that they will differ greatly with respect to other characteristics and behaviour; it is clear, however, that caution must be exercised in extrapolating from the experiences of the members of the Melbourne sample to the experiences of the members of a wider population.

1.3 SCOPE OF THE THESIS

Many aspects of the Melbourne survey data have already been analysed. Knowledge about and use of contraception have been studied by Caldwell et al. (op.cit.) and Caldwell and Ware (op.cit.). Lavis (1975) devoted an entire thesis to the study of the use of oral contraceptives. Ware (1973) and Young (1974) have examined fertility desires and expectations. Ware (1975 and 1976) studied the fertility attitudes and family sizes of immigrants in the sample and the relation between completed family size and labour force participation. Young's extensive analyses of the family life cycle now form a monograph, and a complete list of studies up to 1977 based on the Melbourne data can be found therein (Young, 1977a, op.cit.). Rather than discussing these and other studies at this point, we shall introduce them as they impinge upon the present study.

Although most studies based on the Melbourne data have touched on fertility, it is surprising for a fertility survey that only one (Young, 1977b) deals principally with patterns of childbearing. The present study attempts first a systematic examination of physiological determinants of fertility. Thus, Chapter Two examines reported or inferred physiological characteristics such as fecundability, foetal wastage and sterility. The body of the thesis then seeks to identify fertility patterns and the determinants of these patterns over time.

Although the Melbourne sample is relatively large for a comprehensive fertility survey, the upper age limit for entry into the sample (59 years) ensures a broad range of ages and, consequently, a broad range of experiences of the respondents. Indeed, some members of the sample may have completed their childbearing before others had even been born. Any analysis must therefore compromise between defining sub-groups whose members experienced similar influences at critical junctures in their lives, and ensuring that the sub-groups defined are sufficiently large to permit analysis. Analyses based on a small number of large but heterogeneous sub-groups may prove misleading: analyses based on a large number of small but homogeneous sub-groups may prove difficult or even uninterpretable. Given the requirement that the members of the sample be married, analyses will be performed in terms of marriage cohorts.[1] The exact definition of the cohorts will be dictated both by the aims of the analyses undertaken, and by the constraints of sample size.

Chapter Three reviews the value of data on fertility desires and expectations as indicators of attitudes toward actual childbearing. It then examines parity- and method-specific patterns of contraceptive use at different periods, and among women of different backgrounds and of different years of marriage.

Chapter Four analyses the cumulative fertility rates, the lengths of birth intervals and the distributions of current family size of the members of various marriage cohorts. This is followed in Chapter Five by a study of the effects of age at marriage on fertility and by multivariate analyses of the influence on current family size of a battery of social characteristics.

Chapter Six develops a simple model based on birth intervals unprotected by contraception that maximizes use of the data but minimizes formal structure. Comparison of model and reported birth intervals allows an estimation of the separate effects of delayed marriage, fecundity impairments and use of birth control on fertility. The model is applied in Chapter Seven, first to estimate the relative contributions of each of these factors at different ages, and then to link contraceptive experiences at one parity to contraceptive experiences at the next.

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1. Problems associated with the selection of cohorts will be discussed in greater detail in Chapter Four.

CHAPTER TWO

PHYSIOLOGICAL DETERMINANTS OF FERTILITY

It was Laura who gave me my first lesson in biology. She lived just next door to us, and I found myself observing her closely.

I would notice her belly rising for months.

Then I would miss her for a short time.

And the next time I saw her she would be quite flat.

And the leavening process would begin again in a few months.

To me this was one of the wonders of the world in which I lived, and I always observed Laura. She herself was quite gay about what was happening to her. She used to point to it, and say, "This thing happening again, but you get use to it after the first three four times. Is a damn nuisance, though."

She used to blame God, and speak about the wickedness of men.

V.S. Naipaul - "Miguel Street" (1959)

2.1 INTRODUCTION

The ability of a fecund non-contracepting woman to bear a child when she wishes depends upon a number of physiological characteristics that govern not only the timing but the very occurrence of births. After waiting to conceive and then becoming pregnant, the woman risks losing her foetus. If her pregnancy ends in a miscarriage or stillbirth she enters a period of temporary infecundity before she is again able to conceive. If she carries her pregnancy successfully to term she also enters a period of post partum infecundity. The average length of time between marriage and first birth, therefore, is composed of a waiting time to conception, the live birth gestation period and a small component due to possible foetal death. The average intervals between first and subsequent births have the additional component of post partum infecundity. Moreover, since the onset of sterility is inevitable, at some stage of childbearing it becomes impossible for the woman to conceive.

In comparison with social aspects of fertility, the physiological determinants of childbearing have been afforded sketchy treatment in the demographic literature. This stems from the fact that the intervening variables that determine fecundity are, for the most part, only indirectly observable. Some women are reluctant to discuss sexual matters and personal health with interviewers. Many women, even if willing to discuss such matters, may not recognize the existence of subfecundity, the occurrence of early foetal death or the gradual onset of secondary sterility. In retrospective surveys fertility histories may be further distorted by faulty recollections. Indeed, some data can be obtained reliably only from prospective studies or clinical trials. Notwithstanding difficulties in identifying the components of fecundity from survey data, failure to consider fecundity may confound the interpretation of the relations between fertility and its other, largely volitional determinants.

Whatever the society we examine; whether women marry in their teens or late twenties; whether they breastfeed for years after each birth or use contraception to space births; whether they are sterilized when they want no more children or abstain from sexual relations when they become grandmothers; the number of children they ultimately bear is determined primarily by fairly inflexible physiological mechanisms and only secondarily by culturally superimposed forms of behaviour. This chapter identifies various physiological characteristics of the Melbourne respondents as an introduction to an analysis of the way their fertility has been determined by non-physiological factors as well. An analysis of the lengths of first birth intervals provides estimates of fecundability, the probability of conception within one menstrual cycle. This is followed by estimations of the incidence of foetal deaths, of fecundity impairments of various kinds and of the ages of women at the end of the fecund span.

2.2 THE ESTIMATION OF FECUNDABILITY

There are three major approaches to the estimation of fecundability. The first involves a forward disaggregation of its components - for example, coital frequency, lengths of menstrual cycles, length of the susceptible period within cycles, viability of the sperm and the probability of implantation.[1] The difficulty in this approach is that as little is known about these factors as about fecundability itself. The second approach uses the distribution of completed family size of a group of women to estimate their average fecundability over the entire reproductive span.[2] This method cannot be used on a population (like that of Australia) in which a large proportion of women adopt contraception at some time in their lives to control either the spacing or the number of births, or both. The third approach entails an indirect, backward examination of the birth intervals of non-contraceptors. The first birth interval is most commonly used for this purpose as it does not contain a component of post partum amenorrhoea following a live birth, and this approach will be followed here.

Two things should be noted. First, although fecundability is usually ascribed to women, it is actually a "couple parameter" since it depends on the frequency of intercourse as well as the physiological condition of each spouse (Santow, 1978, op cit.). Secondly, we will be dealing with "effective fecundability", or the probability of a conception that ends in a live birth rather than an abortion or stillbirth.

Each member of the Melbourne sample was asked to give the exact dates of her marriage and her first birth as well as the year in which she initiated contraception. The estimated lengths of the first birth intervals

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1. See Santow (1978) for an excellent compendium of research into the biological aspects of human fertility.
2. For an example of the first approach, see Bongaarts (1976), and for examples of the second, Brass (1958) and James (1963).

of non-contraceptors is the difference between these dates, and exposure times before conception can be inferred by subtracting an allowance for gestation. Twenty-seven cases containing only the year of marriage or of first birth were excluded from the analysis in this section. A further 157 records contained only the year and month of marriage or first birth. There were no significant differences between the distributions of first birth intervals (measured in calendar months) of these women and those for whom information was complete. Consequently, these cases have been retained, with missing days assigned a value of 15 to minimize the error.

The distribution of inferred first conceptive delays of non-contraceptors, coded in 28 day (lunar) months, is shown in Table 2.2.1, together with that reported by the first round of the Princeton Fertility Study (Westoff et al., 1961). Care was taken to duplicate the classification procedure of the American study in an attempt to make the distributions strictly comparable. Conceptive delays were estimated as the interval between marriage and first birth less an average gestation period of 270 days.[3] Births occurring within 242 days of marriage have been eliminated as the result of premarital conceptions; delays of 243 to 270, 271 to 298, 299 to 326, ... days were treated as the outcomes of conceptions occurring in the first, second, third, ... month of marriage.

The table shows that the distribution of conceptive delays of the Melbourne women relative to that of their American counterparts is skewed toward the longer intervals. The differences between the distributions, although statistically significant,[4] may be partly artifactual. In the first place, the Princeton data were adjusted for first pregnancies that

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3. Clinical studies discussed later in this chapter suggest a slightly longer live birth gestation period than employed by Westoff and his colleagues.

4. Application of the Kolmogorov-Smirnov two-sample test (Siegel, 1965) yielded a test statistic that was significant at the 0.001 level.

TABLE 2.2.1: INFERRED TIMES BETWEEN MARRIAGE AND CONCEPTION FOR NON-CONTRACEPTORS

Conceptive delays, in lunar months	Melbourne a	Melbourne b	Westoff et al. (1961) a	Westoff et al. (1961) b	Cumulative percentage difference
0	5.5	5.5	6.2	6.2	-0.7
1	13.2	18.7	11.5	17.7	+1.1
2	9.2	27.9	17.8	35.5	-7.6
3	7.5	35.4	9.1	44.6	-9.2
4-6	13.7	49.1	17.0	61.6	-12.6
7-12	17.3	66.4	17.0	78.6	-12.2
13-24	16.5	82.9	9.9	88.5	-5.6
25-48	10.3	93.2	6.0	94.5	-1.3
49 or more	6.8	100.0	5.5	100.0	0.0
(N)	(975)		(453)		
Suspected premarital conceptions	181		56		

a percentage distribution.

b cumulative percentage distribution.

ended in foetal loss - a refinement that Melbourne data do not allow. Secondly, the Princeton sample was limited to women who had had at least two live births and a maximum of one miscarriage. Although Westoff and his associates discount the possibility, the strict selection criteria for their sample may have resulted in a bias toward women with higher than average fecundity. The American women might also tend toward shorter conceptive delays if their mean age at marriage were lower than that of the Melbourne women, since fecundability is known to decline with maternal age (Jain, 1969a; Léridon, 1975). Unfortunately, the Princeton study does not report ages at marriage so that a comparison of ages at marriage cannot be made.

Suspected premarital conceptions (i.e., those occurring within 242 days of marriage) account for almost 16 per cent of the reported first pregnancies of non-contraceptors in Melbourne as compared with eleven per cent in the Princeton study.[5] Whelpton and Kiser (1948) and Westoff _et al_. (_op. cit_.) conjectured that the exclusion of women suspected of premarital pregnancies gives an upward bias to the distribution of inferred first conceptive delays of non-contraceptors. The reason for this is that in the absence of contraception the more fecund in a group of sexually active women will be "selected out" by pregnancy, leaving behind a less fecund residual group whose members are still at risk of conception (Tietze, 1959). If this were the case then, everything else being equal, we should expect the resulting positive bias in the distribution of inferred conceptive delays to be greater for the Melbourne than for the American sample.

Reported first birth intervals may also contain a number of different types of errors. Some women may be reluctant to admit using contraception

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5. Ruzicka (1975a) estimated that the proportion of ex-nuptially conceived to total first births rose from 10 to 18 per cent in Australia between 1947 and 1972. In an examination of the Melbourne data (1977), he reported that premarital conceptions bore a strong inverse relation to the ages of brides but, with the exception of the Southern European-born, varied only slightly between social groups.

or the occurrence of premarital conceptions or foetal deaths. Others may fail to recognize culturally-sanctioned practices, such as withdrawal and periodic abstinence, as forms of birth control while others may not recognize early foetal loss. Or, the interviewer may fail to elicit or record some important item of information. Before proceeding, therefore, the first birth intervals of non-contraceptors not suspected of premarital conceptions will be examined for systematic variation in the light of various demographic and social characteristics.

Cross-tabulations are unsuited to this purpose given the large number of potential sources of variation relative to the number of observations. Instead, sets of dichotomous, or "dummy", variables (Johnston, 1972; Wonnacott and Wonnacott, 1970) were created from nine factors and their relations with the lengths of first birth intervals analysed with the aid of multiple regression. The dummy variables and their means are shown in Table 2.2.2, together with the variables from which they were created.

The means of the dummy variables in each set correspond to the proportionate distribution of the original variable.[6] Thus, in a set containing n dummy variables, the n^{th} variable is in perfect linear dependence with the n-1 variables that precede it. Unless one dummy variable is omitted from each set, therefore, the variance-covariance matrix will be singular and the regression procedure will degenerate. The excluded variables, which serve as a reference category for the dummy variables remaining in the set, are marked with asterisks.

The above scheme assumes the effect of any pair of dummy variables to be the sum of the two separate effects. Joint effects can be allowed for by

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6. For instance, the dummy variable "less than 20 years" created from the variable "age at marriage" takes the value one for each teenage bride, and zero otherwise.

TABLE 2.2.2: DUMMY VARIABLES INCLUDED IN THE REGRESSION ANALYSIS OF THE FIRST BIRTH INTERVALS OF NON-CONTRACEPTORS

Original Variable	Dummy Variables	Mean
Age at Marriage	Younger than 20 years	0.285
	*20-24 years	0.508
	25-29 years	0.164
	30 years or older	0.043
Time of Marriage	During Second World War	0.126
	*Before or after Second World War	0.874
Marriage Duration	Less than two years	0.019
	2-4 years	0.091
	*5-14 years	0.316
	15-24 years	0.351
	25 years or more	0.223
Parity	One	0.171
	*Two	0.305
	Three	0.249
	Four or higher	0.275
Foetal Wastage	*No miscarriage, stillbirth or induced abortion	0.712
	At least one miscarriage, stillbirth or induced abortion	0.288
Birthplace of First Child	*Australia	0.795
	Abroad	0.205
Country of Birth	*Australia	0.537
	Britain, New Zealand, North America or Northern Europe	0.146
	Italy	0.123
	Other Southern Europe	0.149
	Other	0.045
Religion	*Church of England	0.210
	Protestant	0.157
	Roman Catholic	0.434
	Orthodox	0.107
	Other	0.061
	None	0.031
Education	0-4 years	0.094
	5-8 years	0.371
	*9-12 years	0.470
	13 years or more	0.065
Number of Women		975

creating first- and higher-order interaction terms from different combinations of dummy variables (for example, the subset of individuals with the same country of birth and marriage duration). These terms, numbering 77 in all, are shown schematically in Table 2.2.3.

The dummy variables and interaction terms were regressed on the first birth intervals of non-contraceptors, measured in calendar months,[7] using a forward stepwise algorithm (Draper and Smith, 1966). The explanatory variable most highly correlated with the regressant was entered initially into the regression equation. The variable with the highest partial correlation with the regressant was added next, and an F-test was performed to determine whether the first variable that entered should remain. This procedure of addition and possible elimination of variables was repeated until every variable accounting for a significant (α=0.05) proportion of the variance of first birth intervals, after controlling for the effects of the other variables in the regression, had been included.

The results of the analysis are shown in Table 2.2.4 with the significant variables ranked in order of decreasing standardized regression coefficients. Thus, the variable with the greatest positive effect on the lengths of first birth intervals appears first in the table while that with a negative effect appears last.

The predicted first birth interval for a woman with no significant characteristic is simply the intercept (19.0 months). For those with one or more significant characteristics, expected birth intervals equal the sum of the intercept and the appropriate unstandardized regression coefficients. Thus, if a woman had borne only one child and had experienced foetal wastage,

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7. Analyses in terms of calendar months are more readily interpretable than those in terms of lunar months. When physiological determinants are under examination, the unit of measurement is the lunar month as this is a better approximation to the menstrual cycle than is the calendar month.

TABLE 2.2.3: INTERACTION TERMS INCLUDED IN THE REGRESSION ANALYSIS OF THE FIRST BIRTH INTERVALS OF NON-CONTRACEPTORS

	Age at Marriage	Marriage Duration	Time of Marriage	Parity	Birthplace of First Child	Religion	Education
Marriage Duration	*			*		*	*
Foetal Wastage	*	*		*			
Country of Birth	*	*	*		*		*
Country of Birth x Marriage Duration	*					*	
Country of Birth x Birthplace of First Child		*	*				
Country of Birth x Religion		*					
Country of Birth x Religion x Marriage Duration	*						
Country of Birth x Age at Marriage x Marriage Duration						*	

* Interaction terms.

TABLE 2.2.4: REGRESSION ANALYSIS OF THE FIRST BIRTH INTERVALS OF NON-CONTRACEPTORS

	Mean	Standard Deviation		
First Birth Interval	21.42	18.68		
Variable	Mean	Standardized Regression Coefficient	Unstandardized Regression Coefficient (B)	95% Confidence Limits of B
(1) Some foetal wastage x Parity one	0.044	0.162	14.75	±5.53
(2) Born in Britain, New Zealand, North America or Northern Europe x Married during Second World War	0.029	0.127	14.25	±6.80
(3) Australian-born x Married during Second World War	0.086	0.117	7.79	±4.05
(4) Age at marriage 25-29 years	0.164	0.109	5.52	±3.06
(5) Marriage duration less than two years	0.019	-0.067	-9.08	±8.11
Intercept			18.97	±1.13
Multiple correlation coefficient (R)		0.268		
R squared		0.072		
Standard error of estimate		18.03		
Determinant		0.989		
F-test statistic		15.028		

we would predict her first birth interval to be 33.7 months. Were she also Australian-born and married during the Second World War, her predicted birth interval would rise to 41.5 months.

The variables in the regression reflect systematic variation in the lengths of first birth intervals arising from physiological factors, marital disruptions and censoring bias. Two variables (1 and 4) illustrate the importance of physiological factors. The first suggests that women who reported foetal wastage and at most one live birth tended to have had at least one conception that failed to result in a live birth before successfully carrying a pregnancy to term. The second demonstrates the effect of increasing age on fecundability, as women who married between ages 25 and 29 can be expected to have, in the absence of other significant characteristics, birth intervals that are 5.5 months longer than the average.

Variables 2 and 3 illustrate the disruptions to the early child-bearing of women who were born in Australia, Britain or other belligerent states and who married during the Second World War. The predicted birth interval for those born in Britain, Northern Europe, North America or New Zealand is 33.2 months. In contrast, the expected interval for Australian war brides is, at 26.8 months, six and half months shorter. A statistical explanation for this difference is impossible given the small numbers to which the results refer (28 and 84 women respectively). One might speculate, however, that not all the marriages of the Australian-born women were affected by the War, while temporary separations of spouses associated with migration to Australia further disrupted the childbearing of post-War immigrants.

Censoring bias is evidenced by the negative regression coefficient for women married less than two years (variable 5). To be included these women had to have borne a child within a relatively short exposure time.

Thus, the selection criteria introduce a bias toward "rapid conceivers" at this short marriage duration. Indeed, their predicted first birth interval is just short of ten months.

With the exception of the longer birth intervals associated either with higher ages at marriage or with difficulties in producing live births, the significant variables detected in the regression analysis indicate non-physiological sources of variation in first birth intervals. Women with significant characteristics other than "married at ages 25-29" will therefore be eliminated.[8] The inferred conceptive delays of the remaining 804 women are used to estimate effective fecundability.

Sheps (1964) has shown that, if conception is a random event, in a population whose members are homogeneous with respect to fecundability the proportion of women becoming pregnant in each month of marriage in the absence of contraception follows a geometric distribution. In other words, given fecundability p, a proportion p will conceive in the first month, $p(1-p)$ will conceive in the second month and, in general, $p(1-p)^{n-1}$ will conceive in the n^{th} month of marriage.

Henry (1961a) suggested that if fecundability is assumed to vary among couples but to remain constant for each couple from one month to the next until conception occurs, the fecundabilities of couples in a population can be characterized by a Beta distribution. Under this model, the proportion of couples, f(p), with fecundability equal to p is

$$f(p) = \frac{p^{a-1}(1-p)^{b-1}}{B(a,b)} \qquad (1)$$

where

$$B(a,b) = \int_0^1 p^{a-1}(1-p)^{b-1}dp \qquad (2)$$

---

8. Women who reported foetal losses and at most one live birth are excluded since the inclusion of a foetal wastage component in the first birth interval violates assumptions of the model to be employed.

and $0<p\leq 1$ and $a,b>0$.

The mean, $\bar{p}$, variance, σ_p^2, and mode, $\dot{p}$, of the distribution of fecundabilities are

$$\bar{p} = \frac{a}{a+b} \tag{3}$$

$$\sigma_p^2 = \frac{ab}{(a+b)^2(a+b+1)} \tag{4}$$

and

$$\dot{p} = \frac{a-1}{a+b-2} \tag{5}$$

The expected proportion of women in the population conceiving during the first month of marriage, P(1), equals the mean of the fecundabilities, $\bar{p}$. The proportion becoming pregnant in the second month is

$$P(2) = \int_0^1 f(p)(1-p)pdp \tag{6}$$

and, in general, the proportion of women conceiving during the j^{th} month of marriage is given by

$$P(j) = \int_0^1 f(p)(1-p)^{j-1}pdp$$

$$= \frac{(a)(b)(b+1)\ldots(b+j-2)}{(a+b)(a+b+1)\ldots(a+b+j-1)} \quad \text{where } j>1 \tag{7}$$

Fecundability can then be estimated by equating equations (3) and (4) with the observed mean m and variance s^2 of the distribution of inferred conceptive delays, and solving[9] for a and b to get

$$\hat{a} = \frac{s^2}{s^2 - m^2 + m} \tag{8}$$

---

9. For derivations of the model and the fitting procedure, see Henry (1964) and for an abridged version Léridon (1975 op.cit.). A complete English-language exposition, from which the above results are largely taken, is available in Potter and Parker (1964).

and $$\hat{b} = (m-1)(\hat{a}-1) \qquad (9)$$

Henry (1964 op.cit.) himself used the model to estimate fecundabilities for a modern French sample and the historical populations of Crulai, Thelle, Geneva, French-Canada and Tunis. The model has also been applied, with varying degrees of success, to the Princeton data (Potter and Parker, op.cit.) and to a sample of Taiwanese women (Jain, 1968).

Before applying the model to the Melbourne data, the method of classifying conceptive delays will be adjusted. In Table 2.2.1 inferred delays were based on a mean gestation interval of 270 days so as to allow comparison with the Princeton Fertility Study. A body of evidence suggests, however, that gestation periods ending in live births average longer than the 9.6 lunar months assumed by Westoff and his associates. For example, clinical studies conducted in Australia (Sutton, 1945), England (Gibson and McKeown, 1950) and the United States (Hammes and Treloar, 1970) consistently yielded mean gestation intervals for live births of between 10 and 10.5 lunar months from the last menstrual cycle before conception occurred.[10] The fecundability estimates presented here will assume a mean interval of 285 days. Although a foetus may be viable after a gestation period shorter than the lower limit of 257 days which this implies for children conceived within marriage, the largest study cited above (Hammes and Treloar, ibid.) found such cases to account for only about five per cent of approximately 200,000 live birth gestation intervals observed.

The upward adjustment to the mean gestation interval results in the classification of a further four pregnancies as suspected premarital conceptions. The distribution of inferred first conceptive delays for the remaining 800 women and the theoretical distribution obtained by fitting

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10. For example, see Figure 1 in Hammes and Treloar (ibid.).

the Beta model are shown in Table 2.2.5. The overall fit of the model is excellent. The majority of the predicted proportions fall within one per cent of the observed and none deviates by more than two per cent. A chi-square test statistic was calculated from the observed and predicted cell frequencies. A comparison of the calculated test statistic and chi-square with 15 degrees of freedom (two degrees of freedom being lost when estimating the parameters of the Beta function from the sample data) indicates no significant difference between the distribution at the 0.05 level.

The estimated mean, standard deviation and mode of fecundability for the Melbourne non-contraceptors are 0.121, 0.062 and 0.090. The theoretical probability distribution of fecundability, estimated by applying Simpson's Rule (Courant and John, 1965) to evaluate the Beta function at intervals of 0.01, is shown in Figure 2.2.1. While the distribution has a positive skew, the graph shows the fecundabilities to be tightly clustered. Indeed, more than 70 per cent of the fecundabilities fall within one standard deviation of the mean. This clustering could result if the exclusion of women suspected of premarital conceptions selects for slower than average conceivers. The comparatively low average fecundability reflects, in part, the fact that we have been dealing only with conceptions ending in live births.[11]

Figure 2.2.2 shows the percentages of women conceiving within given marital durations as observed and predicted by the model. The average and standard deviation of the conceptive delays (11.5 and 17.6 lunar months) are, by definition, the same for the observed and the theoretical populations.

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11. For example, Jain (1968, op.cit.), basing his calculations on all conceptions, estimated the mean and standard deviation of fecundability at marriage to be 0.163 and 0.078 for Taiwanese women.

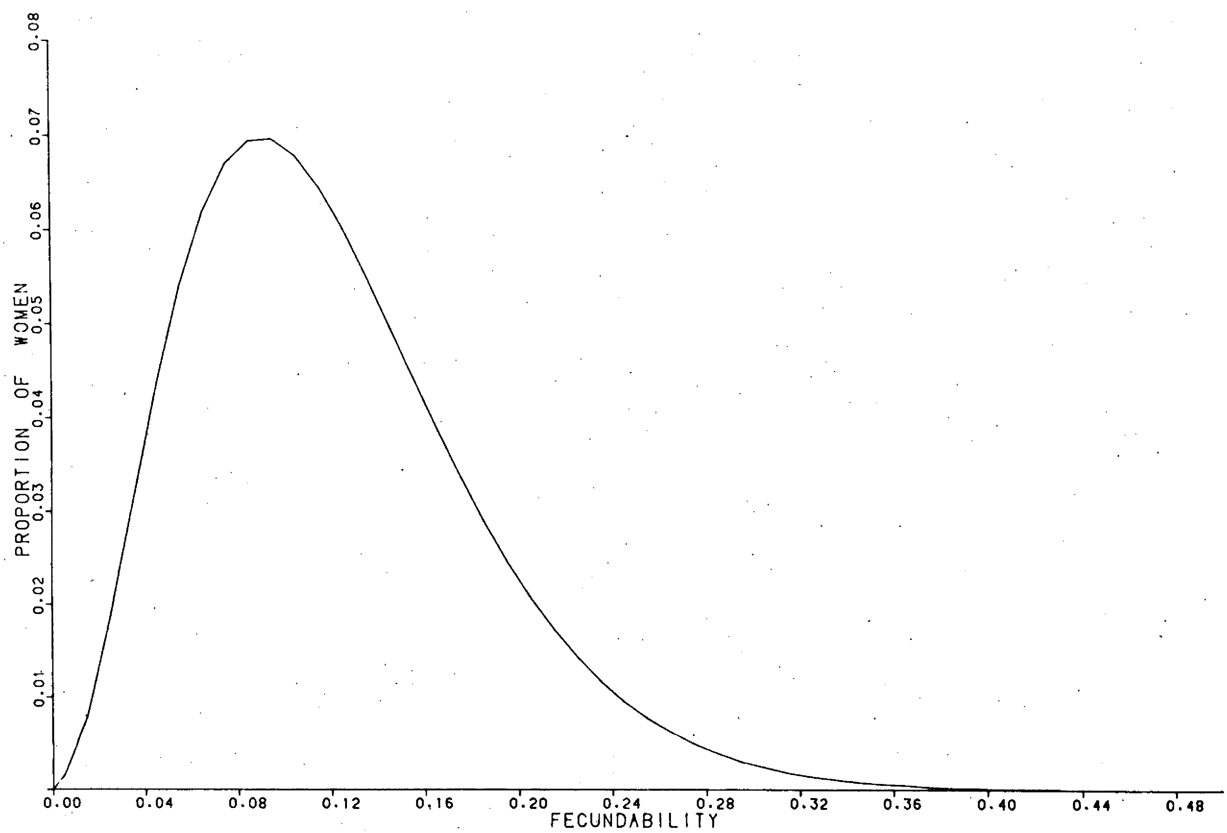
TABLE 2.2.5: OBSERVED AND PREDICTED CONCEPTIVE DELAYS FOR NON-CONTRACEPTORS

Conception delays, in lunar months	Observed a	Observed b	Predicted a	Predicted b
0	12.4	12.4	12.1	12.1
1	10.9	23.3	10.2	22.3
2	8.7	32.0	8.7	31.0
3	7.5	39.5	7.5	38.5
4	5.3	44.8	6.5	45.0
5	4.0	48.8	5.6	50.6
6	3.3	52.1	4.9	55.5
7	4.0	56.1	4.3	59.8
8	4.0	60.1	3.8	63.6
9	2.8	62.9	3.3	66.9
10	3.1	66.0	2.9	69.8
11	2.6	68.6	2.6	72.4
12	1.6	70.2	2.3	74.7
13-19	12.4	82.6	10.7	85.4
20-26	6.5	89.1	5.5	90.9
27-39	4.9	94.0	4.7	95.6
40-52	2.2	96.2	2.0	97.6
53 or more	3.8	100.0	2.4	100.0
(N)	(800)			
Mean	11.51			
Variance	311.17			
$\hat{a}$	3.27			
$\hat{b}$	23.88			
X^2	21.28			

a percentage distribution.

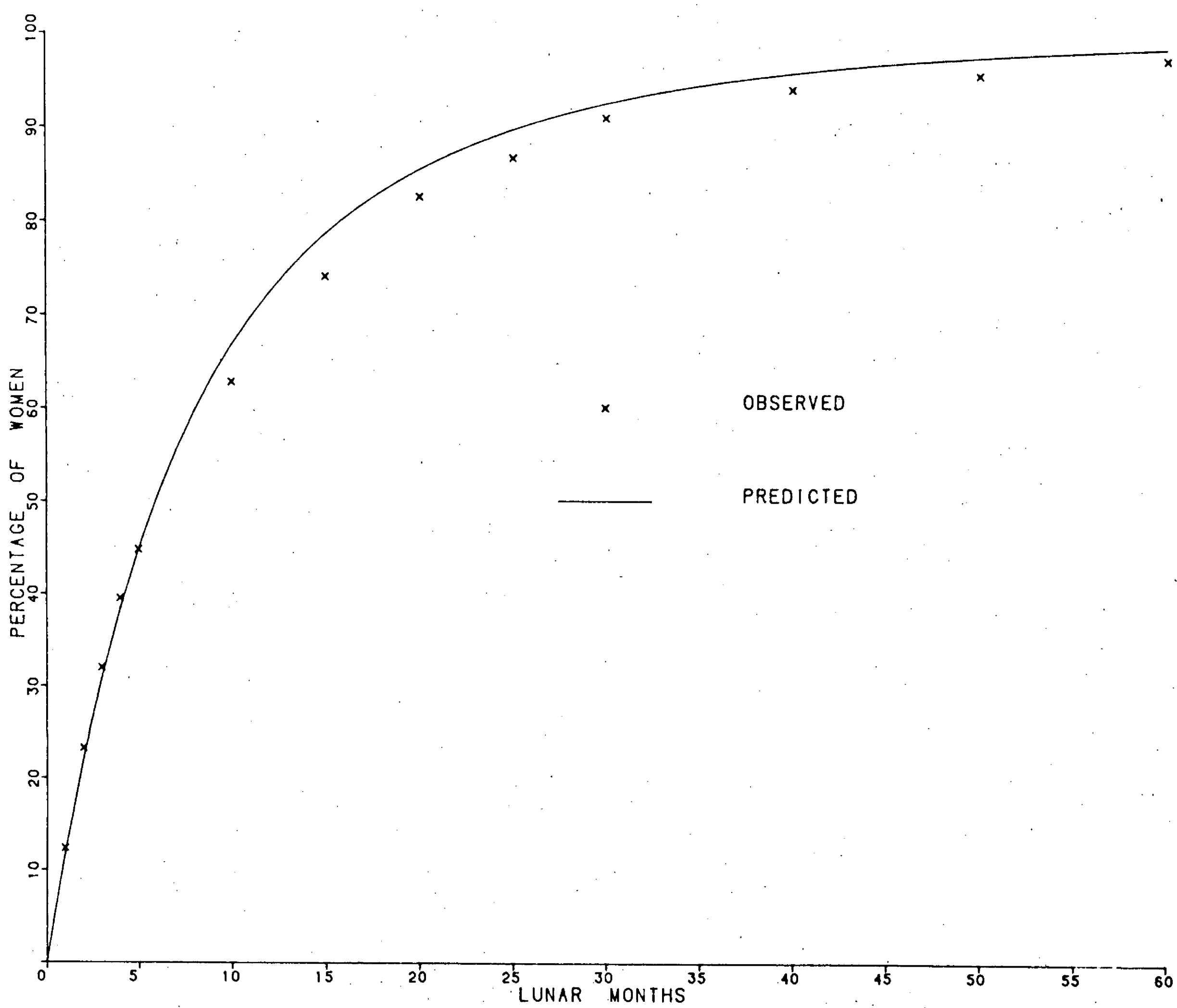
b cumulative percentage distribution.

FIGURE 2.2.1: THEORETICAL DISTRIBUTION OF FECUNDABILITY



Half the women can be expected to become pregnant within six months and three-quarters within one year of marriage. Beyond one year, the curve converges slowly to its upper limit because the time to conception for those who have not conceived "... depends upon their fecundability composition at the end of the period" (Potter and Parker, op.cit., p.105). That is, since women with higher fecundabilities require shorter exposure times to become pregnant, the mean fecundability of those who did not conceive within a given time declines, with consequent increases in their additional average conceptive delays. For example, the additional expected time required for conception for women who have not conceived after six months is 14.2, and rises to 17.2, 23.0 and 28.7 lunar months after one, two and three years of marriage.

FIGURE 2.2.2: OBSERVED AND PREDICTED PERCENTAGES OF NON-CONTRACEPTORS CONCEIVING WITHIN GIVEN MARRIAGE DURATIONS, IN LUNAR MONTHS



The model, of course, offers only a rough representation of the fecundabilities of the members of the sample. The assumption that fecundability remains constant for each couple during each month of exposure during the first pregnancy interval may not be entirely justified. Jain (1968, op.cit.) opined that anovulatory cycles generally occur after termination of a pregnancy. Potter and Parker (op.cit.) noted, however that even among healthy, regularly menstruating women, anovulatory cycles may be interspersed among cycles with non-zero fecundabilities. Variations in fecundability could also stem from variations in the lengths of menstrual cycles or from attempts to hasten conception if couples were to increase their rates of coital frequency during the most fecund part of the menstrual cycle.

Women suspected of unreported contraceptive usage or of foetal losses or marital separations before the first birth were excluded from the analysis. Failure to detect other members of the sub-sample who had delayed their first births, as well as the inclusion of a disproportionate number of subfecund women, would increase the mean and variance of the distribution of inferred conceptive delays and bias the fecundability estimates for non-contraceptors. The possibility that biases and errors do exist is suggested by the fact that conceptive delays coded as 53 or more months constitute only four per cent of the total but contribute 30 per cent of the value of the chi-square test statistic shown in Table 2.2.5.

2.3 FOETAL DEATHS

The World Health Organization (1970) defines foetal death as the death of the product of conception prior to its complete expulsion from the mother, regardless of the duration of pregnancy. It recommends that foetal losses be divided into early, intermediate and late foetal deaths depending upon whether they occur within 20, between 20 and 28, or at 28 or more completed weeks of gestation. Late foetal deaths are termed stillbirths. In popular usage, early and intermediate foetal deaths are usually combined into one category, miscarriages.

The Melbourne respondents were asked to give the numbers of pregnancies terminating in foetal death that they had experienced but, unfortunately, were not asked for the timing of foetal losses relative to age and to the timing of pregnancies carried successfully to term. In all, 27 per cent of the 2,652 women interviewed, and 31 per cent of those who had ever been pregnant, reported foetal losses accounting for 16.1 per cent of their total pregnancies.

In all, 112 women admitted to a total of 141 induced abortions, or 2.3 per 100 live births. In an analysis of the effects of liberalized abortion laws in South Australia, Ruzicka (1975b) found that legal abortions increased from six to 14 per cent of live births between 1970 and 1973, mainly because "... during the first four years following the passage of the Act the legal abortions largely represented replacements for illegal abortions." (p.21) In light of the conservative legislation still in force in the State of Victoria and increasing public debate about illegal abortions at the time of the survey, it is likely that the induced abortions admitted by members of the sample seriously underrepresent the true number.

Excluding those terminated by induced abortions, 14.4 per cent of all reported pregnancies ended in foetal loss, with a ratio of miscarriages to stillbirths of ten to one. This is higher than the United Nations' (1954) estimate, based on twenty statistical series, of about ten foetal deaths per 100 pregnancies. More recent evidence (French and Bierman, 1962;

TABLE 2.3.1: RATES OF MISCARRIAGES, STILLBIRTHS AND LIVE BIRTHS PER 100 PREGNANCIES BY GRAVIDITY

Pregnancy outcome	Gravidity						Total
	1	2	3	4	5	6 or more	
Miscarriages	6.4	4.8	10.7	13.5	15.2	22.9	13.1
Stillbirths	0.8	0.8	0.8	1.5	0.8	2.5	1.3
Live births	92.8	94.4	88.5	85.0	84.1	74.6	85.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of pregnancies	374	1330	1716	1364	910	1580	7274

Freedman *et al*., 1966) suggests, however, that foetal death rates may be of the order of 15 to 20 per cent of all recognized pregnancies. The proportion of losses among all conceptions is even greater. For example, James (1970) has put the incidence of fertilized ova spontaneously aborted before the first missed menstrual period as high as 35 per cent.

Estimated rates of miscarriages, stillbirths and live births per 100 pregnancies are shown by pregnancy order of mother in Table 2.3.1. Foetal death rates are low at gravidities one and two and then rise, reaching a maximum of 25 per 100 pregnancies among women who have been pregnant at least six times. Studies that have taken the previous issue of mother into account (for example, Freedman *et al*., *op.cit*.; Coombs *et al*., 1969) suggest that this pattern may reflect a combination of increasing maternal age and number of previous foetal losses. Resseguie (1974) speculated that some women have a higher than average propensity for foetal loss but considered the increased risk of foetal death among healthy women to be unimportant before age 35.

Table 2.3.2 shows foetal deaths from miscarriages and stillbirths per 100 pregnancies controlling for parity and, in the absence of data on the

TABLE 2.3.2: FOETAL DEATH RATES PER 100 PREGNANCIES BY BIRTH ORDER AND AGE AT INTERVIEW

	Age (years)				
Birth Order	Less than 30	30-39	40-49	50-59	Total
1	17.3 (307)*	35.3 (139)	41.3 (92)	31.5 (73)	26.7 (611)
2	10.9 (534)	13.7 (561)	15.9 (464)	17.7 (248)	14.0 (1807)
3	9.3 (281)	13.1 (708)	15.4 (617)	11.7 (360)	13.0 (1966)
4 or more	9.9 (131)	10.4 (894)	10.6 (1257)	11.2 (527)	10.6 (2809)
Total	12.0 (1253)	13.6 (2302)	14.0 (2430)	13.9 (1208)	13.5 (7193)

* Number of pregnancies.

ages of women at the time of foetal losses, age at the time of interview. Despite this deficiency, the contents of the table are generally consistent with Resseguie's findings. Among women of the same parity, foetal mortality tends to rise with age. It is reasonable to assume that women aged 30 years or older had approximately the same levels of pregnancy wastage below age 30 as the women currently in this age group. Then, their excess foetal wastage would reflect greater risks of spontaneous abortions at the higher maternal ages.

Both Resseguie (ibid.) and the authors of the W.H.O. Technical Report on Spontaneous and Induced Abortions (op.cit.) have reported declines in foetal death rates with increasing parity. Table 2.3.2. clearly demonstrates that foetal mortality among Melbourne mothers of the same age at the time of interview declines markedly between parities one and two. This suggests a compensation effect whereby women who have experienced foetal losses undertake additional pregnancies in an attempt to achieve the number of children they want. Indeed, among women aged 30 or older in the sample, the nulliparous averaged 2.1 foetal deaths each as compared with 0.6 and 0.4 among those at parity one and parity two or above.[1]

1. Only two per cent of Melbourne respondents would have chosen to bear fewer than two children while 71 per cent would have regarded childlessness as a disaster (Ware, 1973, op.cit.).

2.4 FECUNDITY STATUS

Each woman interviewed in the Melbourne survey was asked whether she thought she would have difficulty conceiving or bearing a child; whether a physician had been consulted and his diagnosis, if any; whether she or her husband had had an operation, accident or illness that would make pregnancy unlikely or impossible; and, if aged between 40 and 50 years, whether she had reached menopause and whether her menstrual periods had stopped. Scrutiny of the responses to these questions together with an examination of long, unprotected intervals with no successful pregnancies yields an outline of the fecundity conditions obtaining among the members of the sample.

From the available information respondents have been strictly classified into the following five mutually exclusive fecundity categories:[1]

(1) Operatively sterile - if either partner had undergone an operation causing sterility, regardless of whether that operation was performed with the intention of limiting family size.

(2) Sterile - if a physician had confirmed that the woman or her husband was sterile, or if the woman reported having used no contraception for at least ten years without becoming pregnant.

(3) Probably sterile - if the women reported a fecundity impairment that had not been confirmed by a physician's diagnosis, or if she had not become pregnant having used no contraception for a period of three to ten years.

(4) Subfecund - if the woman expressed uncertainty about her ability to conceive or carry a pregnancy to term.

(5) Fecund - a residual category comprising all those who were either

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1. A similar scheme was used in the 1960 Growth of American Families Study (Whelpton et al., 1966). Lavis (1975, op.cit.) classified Melbourne respondents under 45 years of age as being sterile, probably sterile, possibly sterile or fecund.

pregnant at the time of the interview or reported no medical condition that would inhibit pregnancy.

It should be emphasized that classifications have been made on the basis of couples rather than wives, since in some cases impaired fecundity can be traced to the husband's physical condition. Indeed, Wallace (1946) reported that even though a man "... may be capable of performing the act of sexual intercourse perfectly" (p.125), defects of the male genital tract are the

TABLE 2.4.1: DISTRIBUTIONS OF COUPLES BY FECUNDITY STATUS AND AGE OF WIFE

Fecundity Status	Age of Wife							Total
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	
Operatively sterile	2.7	0.5	2.1	6.4	11.4	13.8	18.3	8.2
Sterile	0.0	1.4	2.3	4.9	9.4	10.1	12.7	6.4
Probably sterile	2.7	2.7	5.8	4.4	7.5	16.9	36.7	11.3
Subfecund	2.7	0.3	1.2	2.6	3.0	3.2	4.2	2.3
Fecund	91.9	95.1	88.6	81.7	68.7	56.0	28.1	71.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(N)	(37)	(365)	(434)	(389)	(361)	(378)	(306)	(2270)

cause of 20 to 25 per cent of couple sterility.

The distributions of couples in each of the fecundity categories are shown by age of wife in Table 2.4.1. For couples classified as operatively sterile and sterile the likelihood of conceiving is close, if not equal, to zero. Couples classified as subfecund and probably sterile range from those with a slightly less than average capacity to reproduce to those for whom the onset of menopause or a severe pathological disorder has made reproduction impossible. A total of 28 per cent of wives aged younger than

50 years reported a condition that would lessen to some degree their capacity to bear a child in the future. With the exception of the youngest age group (which is small), the proportion of fecund couples declines slowly with age until ages 30 to 34 and thereafter falls rapidly. If the probabilities of implantation failure, spontaneous abortion and stillbirth increase with age,[2] then the probability that a couple - whether classified as fecund, subfecund or probably sterile - is effectively sterile would increase with the age of the wife.

Reported or inferred causes of sterility for sterile and probably sterile couples with the wife younger than 50 years are shown in Table 2.4.2. Fifty-six per cent of the sterile couples cited a clinical condition, accident or illness which, in a doctor's opinion, rendered them infecund (causes 1-6, 10). The majority of the remainder (28 per cent) had had no pregnancy for at least ten years with no reported contraceptive use (cause 11). Fifty-three per cent of those classified as probably sterile gave menopause as the reason for sterility (cause 7). For at least some of the 50 women who gave a pathological cause for infecundity unsupported by medical diagnosis (causes 1-6, 10) the reporting of sterility may reflect a psychological rather than a physiological disposition. Thirty-two per cent of the sterile couples had produced no live birth and 81 per cent had produced fewer than three; the corresponding proportions for the probably sterile are 14 and 58. These differences suggest that couples are more likely to seek medical advice if doubtful of having children or for complications of menopause rather than for menopause alone.

Slightly more than half the 52 respondents whose marriages were

2. See for example, Jain (1969b) and Léridon (1973).

TABLE 2.4.2: DISTRIBUTIONS OF STERILE AND PROBABLY STERILE COUPLES BY CAUSE OF STERILITY

Cause of Sterility	Sterile†	Probably† Sterile	Total
1. Defect in uterus or fallopian tubes	20.0	1.6	8.2
2. No menstruation but not menopause	1.4	0.0	0.5
3. After accident or illness - wife	20.7	5.1	10.8
4. After accident or illness - husband	6.2	7.0	6.7
5. General ill-health of wife	4.1	4.3	4.2
6. Husband sterile	1.4	0.8	1.0
7. Menopause	6.2	52.7	36.0
8. Never became pregnant without birth control	5.5	7.4	6.7
9. Has been pregnant but now trying unsuccessfully	4.8	11.7	9.2
10. Miscellaneous medical conditions	2.1	0.8	1.2
11. No pregnancy after 10+ years without birth control	27.6	-	10.0
12. No pregnancy after 3-10 years without birth control	-	8.6	5.5
Total	100.0	100.0	100.0
(N)	(145)	(256)	(401)

† See classification scheme at the beginning of this section.

TABLE 2.4.3: DISTRIBUTIONS OF OPERATIVELY STERILE COUPLES BY TYPES OF OPERATION AND AGE OF WIFE

Type of Operation	Age of Wife 15-29	30-34	35-39	40-44	45-49	Total
Hysterectomy	16.7	44.0	36.6	50.0	64.3	48.4
Tubal Ligation	41.7	40.0	46.3	32.7	19.6	33.3
Oophorectomy	8.3	4.0	4.9	5.8	5.4	5.4
Vasectomy	8.3	0.0	2.4	1.9	0.0	1.6
General Operation - Wife	16.7	12.0	9.8	5.8	8.9	9.1
General Operation - Husband	8.3	0.0	0.0	3.8	1.8	2.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
(N)	(12)	(25)	(41)	(52)	(56)	(186)
Percentage of Operations Reportedly Performed as a Contraceptive Measure	66.7	72.0	61.0	46.2	30.4	49.5

classified as subfecund reported that they would have difficulty conceiving. Thirty-four per cent were 40 years of age or older and suspected that they were undergoing menopause. The remaining 11 per cent, although they reported that they were able to conceive, were uncertain of their abilities to carry a pregnancy to term.

When classifying couples by their reported fecundity, errors are inevitable. The fecund category includes couples who had used contraception since marriage or for long periods since the last birth. Such couples, not having recently tested their fecundity, could not know for certain whether they would be able to have a child should they wish. Some of the women who suspected themselves subfecund or who were certain that they were sterile may, in fact, have been fully fecund.

Eight per cent of women younger than 50 years reported that they or their husbands had undergone an operation rendering them sterile. The distributions of operatively sterile couples by age of wife and type of operation are presented in Table 2.4.3. Although operations performed to remedy disorders of the reproductive organs or for general medical pathologies predominate, tubal ligations account for a sizeable proportion of all sterilizations, especially in the age groups under 40 years. Fertility control may pose a problem for some couples, either because they want no more children but take no precautions or because the measures they do take are inadequate. Indeed, 60 per cent of the women younger than age 35 who reported tubal ligations had borne at least four children. For these women, who had completed their families, sterilization may have served as a simple, effective alternative to temporary methods of contraception.

The percentage of women reporting that an operation was performed at least partly to curtail fertility exceeds at each age the combined percentages of tubal ligations and vasectomies. For example, 46 per cent of the women under age 40 whose marriages were classified as operatively sterile had undergone tubal ligation (or their husbands vasectomy), but 65 per cent reported that the operation was at least partly for contraceptive reasons. Comparable figures for operatively sterile women aged 40-49 are 27 and 38 per cent. Indeed, half the women under age 40 who had undergone a hysterectomy or an oophorectomy mentioned the operation's contraceptive effect. While the knowledge of infecundity may be a cause of relief for some, such operations are typically performed only when deemed necessary by clinical symptoms.[3]

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3. The history of medical action in Australia is, of course, more complicated than this. In the past many doctors may have been willing to sterilize a woman only under the guise of a pathological condition requiring radical surgery such as hysterectomy. Some surgeons may still favour hysterectomy as a contraceptive measure (De Lee, 1970) or even perform hysterectomies for non-physiological reasons, not excluding "sheer neuroticism" on the part of their patients (Santow, 1976).

Differences between the relative frequencies of voluntary sterilizations (i.e. tubal ligations and vasectomies) and remedial sterilization reportedly performed with contraceptive intent may partly reflect, therefore, a rationalization of the disappointment that couples will inevitably feel if unable to have as many children as they would like.

In 1971 the incidence of contraceptive sterilization in Melbourne was lower than that reported by various North American studies. For example, the 1970 United States National Fertility Study (Bumpass and Presser, 1972) and a 1972 Canadian survey (Pool et al., 1973) indicate that nearly 20 per cent of contracepting couples with the wife younger than 45 years had chosen contraceptive sterilization, as compared with only four per cent of the similarly defined contracepting couples in Melbourne. Differences in the relative frequencies of male and female operations are also apparent. The North American studies found voluntary sterilizations to be divided fairly evenly between tubal ligations and vasectomies; only three Melbourne respondents younger than 45 years reported that their husbands had undergone a vasectomy.[4]

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4. The incidence of contraceptive sterilization has increased rapidly over the last fifteen years in the United States. See Westoff and Ryder (1977a). A 1977 follow-up study of women who were younger than 32 years when originally interviewed in 1971 indicates that the incidence of sterilization has risen dramatically in Melbourne. In all, one-third of the contracepting couples had opted for sterilization; yet, the ratio of male to female operations stood at only one-to-five (Young and Ware, 1979).

2.5 THE FECUND SPAN

The cross-sectional approach of the preceding section ignores the ages of women at the end of the fecund span. The timing of sterility can be examined through a model that subjects a hypothetical cohort to the estimated age-specific rates of natural and operative sterility experienced by the members of the sample. Such a model, a multiple decrement table,[1] is shown in Table 2.5.1.

In the table the incidence of primary sterility has been estimated as the proportion of couples classified as sterile or probably sterile since marriage and wed when the wife was younger than 25 years (54 couples, or two per cent of the total). Omitting these couples, a synthetic cohort of the population at risk of becoming sterile at each age of wife was constructed by starting at exact age 15 and following each woman through every year of life (up to a maximum age of 50 years) until her marriage was adjudged infecund. Schedules of age-specific rates of natural and operative sterility were then calculated by relating the estimated numbers of couples becoming naturally sterile or undergoing sterilization at each age of wife to the estimated population at risk.

The expected fecund span for a couple married when the wife was aged 15 is 25.3 years and the median age at sterility is approximately 42 years. These results compare favourably with the mean and median ages at the onset of sterility of 40.5 and 41.5 years that Pittenger (1973) obtained by fitting an exponential curve to six sets of female age-specific sterility proportions, but fall well short of estimated ages at menopause. For example, MacMahon and Worcester (1966) reported the median age at menopause for a sample of

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1. See Mertens (1965) and Pollard _et al_. (1974) for discussions of multiple decrement tables.

TABLE 2.5.1: FECUNDITY DECREMENT TABLE

Age	${}_5q_x$	${}_5q'_x$	f_x	${}_5s_x$	${}_5s'_x$	${}_5F_x$	T_x	e_x
15	0.0016	0.0004	97960	152	38	489325	2477995	25.30
20	0.0154	0.0056	97770	1506	545	483723	1988670	20.34
25	0.0763	0.0212	95719	7303	2029	455265	1504948	15.72
30	0.1168	0.0394	86387	10093	3406	398188	1049683	12.51
35	0.1397	0.0568	72888	10179	4141	328640	651495	8.94
40	0.3435	0.0540	58568	20119	3162	234638	322855	5.51
45	0.9524	0.0476	35287	33607	1680	88218	88218	2.50

${}_5q_x$ = dependent probability of natural sterility between ages x and x+4

${}_5q'_x$ = dependent probability of operative sterility between ages x and x+4

f_x = number of fecund couples at exact age x

${}_5s_x$ = number of couples becoming naturally sterile between ages x and x+4

${}_5s'_x$ = number of couples becoming operatively sterile between ages x and x+4

${}_5F_x$ = number of fecund couple-years lived between ages x and x+4

T_x = total number of fecund couple-years lived after age x

e_x = expected fecund couple-years lived after age x.

American women as 49.6 years while Jaszmann et al. (1969), in a Dutch clinical study, found a mean of 51.4 years. Ages at menopause, however, are bound to be well above estimates that take into account both infecundity due to all causes (including male sterility) and fecundability which is depressed to an extent indistinguishable from true infecundity.[2]

The expected proportions of naturally and operatively sterile couples at single year ages of wives have been derived from the decrement table by applying Karup-King multiplier coefficients (Shryock and Siegel, 1973) to the estimated numbers of couples becoming sterile during each five-year period. These are shown in Figure 2.5.1, together with estimated proportions of sterile women at exact ages which Bogue et al. (1973) interpolated from Henry's (1961a op.cit.) observations of five historical European populations.

Of the two factors causing attrition to the cohort of fecund couples, natural sterility should remain the more stable over time while operative sterility may be subject to temporal changes in contraceptive and medical fashions. One would expect Henry's estimates, therefore, to coincide more closely with the natural sterility curve, which they do between ages 20 and 40. The differences below age 20 are largely artifactual since, when constructing the population at risk at each age, the assumption that couples fecund at marriage were also fecund earlier ignores the possibility of adolescent temporary infecundity. Henry's estimates depart markedly from the estimated proportions of naturally sterile couples in Melbourne at the ages above 40 years. While these differences may stem, in part, fron an underreporting of fecundity impairments by Melbourne women, they may indicate a higher standard of living and effective medical intervention such that childbearing is not the hazard to fecundity that it once was. The Melbourne

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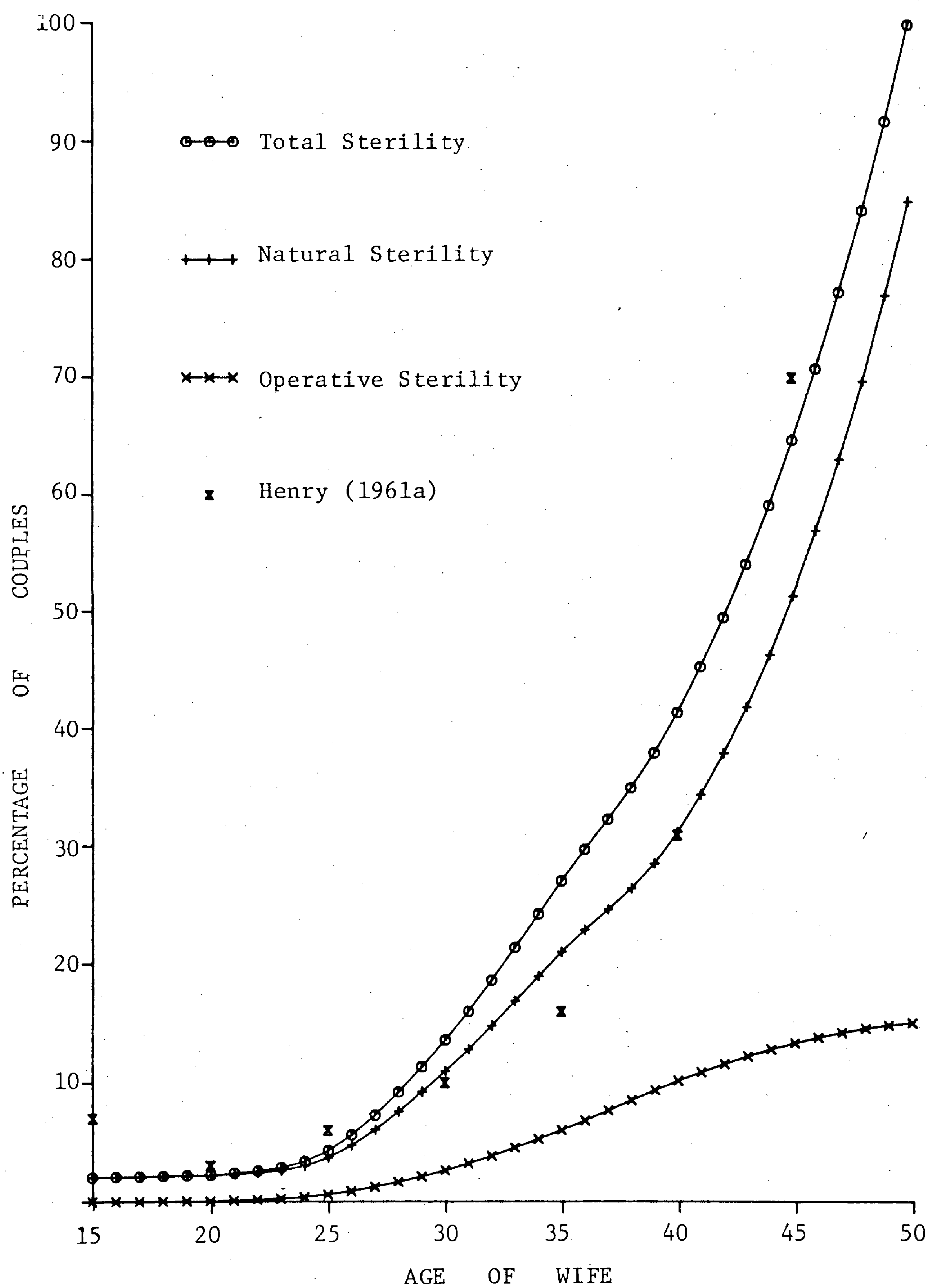
2. See Gray (1977).

FIGURE 2.5.1: CUMULATIVE PERCENTAGES OF STERILE COUPLES BY AGE OF WIFE



sample, however, comprises once-married women whose marriages were intact at the time of the interview. If childless couples have higher rates of marital dissolution, the sample will overrepresent the more fertile, and presumably more fecund, couples in the population.

The model is not definitive because of errors in the reporting of fecundity impairments and the personal judgement exercised when editing the responses. While sterilization may be sufficiently dramatic to leave an indelible imprint on the memory of the person undergoing it, the timing of secondary sterility is more difficult to determine. For example, the passage from the initial symptoms of menopause to the final cessation of menstruation can take several years, during which a large proportion of a woman's menstrual cycles may be anovulatory or her fecundability depressed but still above zero.[3] In any case, the exact distribution of secondary sterility is not overly critical in relation to the study of fertility since, at the ages it typically occurs, few women would still be trying to bear children and the probability of a fecund woman's conceiving is low (Henry, 1966).

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3. Gray (op.cit.) and Metcalf (1979) use the term "peri-menopausal" for women who have irregular or protracted cycles.

CHAPTER THREE

FERTILITY PREFERENCES AND CONTRACEPTIVE USE

Spiro, exhausted by the dance, was sitting on the sofa nearby, fanning himself.

'Whats?'he roared at Androuchelli, scowling ferociously. 'You gets another babys?'

'Yes, Spiro, a boy,' said Androuchelli, beaming.

'How manys you gets now?' asked Spiro.

'Six, only six,' said the doctor in surprise. 'Why?'

'You oughts to be ashames of yourself,' said Spiro in disgust. 'Six ... Gollys! Carrying on like cats and dogses.'

'When I gots married I asks my wifes how many she wants,' said Spiro in a loud voice, 'and she says twos, so I gives her twos and then I gets her sewed ups ....'

Gerald Durrell - "My Family and Other Animals" (1956)

3.1 INTRODUCTION

Several physiological aspects of fertility were examined in Chapter Two. In non-contracepting societies non-volitional factors contribute substantially to variations in the timing of childbearing and the ultimate family sizes of individual couples. In Melbourne, however, 87 per cent of the women interviewed had practised family planning in the past and 93 per cent of fecund couples were using birth control at the time of the survey In such a population, where most couples attempt to space their children or limit their completed families, volitional factors can be expected to play by far the more important role in determining fertility levels.

Given the contraceptive methods widely used before the 1960s, family planning was for most couples what Ruzicka (1976a) described as a "negative process" involving the avoidance of conception and the coming to terms with unwanted pregnancies. The introduction of oral anovulants and the proliferation and diffusion of older efficient contraceptive methods, such as the IUD, in the 1960s weakened in a way never before possible the link between coitus and conception. In doing so, modern contraceptives transformed birth control into a pattern of behaviour that couples must discontinue deliberately in order to have children if and when they desire.

In this chapter we shall review briefly a number of studies of fertility desires and expectations in order to assess the usefulness of such attitudinal data for understanding actual patterns of childbearing. We shall then examine patterns of contraceptive use exhibited at each parity by members of selected marriage cohorts and social groups in Melbourne.

3.2 FERTILITY DESIRES AND EXPECTATIONS

Ware (1973, op.cit.) made extensive use of the reported ideal family sizes of the Melbourne women to assess how a stationary population might be achieved in Australia. Overall, fertility ideals were found to be fairly elastic: four-fifths of the women saw two children as an acceptable minimum but little consensus was reached on an acceptable maximum family size. As Ware noted, however, the limits of acceptability did not necessarily coincide with the behaviour that "... the respondents themselves have exhibited or would want to exhibit" (p.310).

Young (1974, op.cit.) analysed the fertility plans, preferences and expectations of the Melbourne respondents in relation to their current family sizes. Two-thirds of the women interviewed stated that they had planned the ultimate sizes of their families at some point within marriage, with slightly more than half reaching a decision before the birth of the first child and the remainder falling evenly among those who decided after one, two or three or more births. Forty per cent of the members of the sample had had or expected to have the number of children they originally intended. It was apparent, however, that discrepancies between planned and actual family sizes increased with the number of children planned and how soon after marriage the decision was taken. In fact, one-quarter of the women whom Young termed "successful planners" made their first decision only after reaching their stated goals. Overall, preferred family sizes were closer to the numbers of children the women had planned originally than to their actual or expected completed family sizes, but among those who had borne fewer, or more, children than originally planned, sizeable proportions (36 and 40 per cent) adjusted their preferences to coincide with the number of children they had actually borne.

Young concluded that expected family size is the most reliable indicator of future fertility except, possibly, "... for the members of the youngest cohorts who have not yet, or only just, begun their childbearing, and whose expectations ... may overstate their ultimate family size" (p.303). In doing so she considered that downward shifts which she observed in fertility expectations mainly reflect ill-health or financial difficulties that were unforeseen when a decision was first made. This is reasonable if couples revise their fertility expectations and, perhaps, desires in response to financial pressures alone. It is unlikely, however, that ill-health or infecundity could constitute a serious impediment to the fulfilment of the modest fertility desires expressed by the majority of the Melbourne women.[1] Certainly, there is little evidence to support Ware's contention that "the fact that there are always some women who are physically incapable of having as many children as they want is the chief reason why expected family size is a better predictor than ideal family size? (1973, op.cit., p.311).

Many studies conducted in the United States have revealed discrepancies between stated fertility desires, expectations and actual family sizes. For example, in one of the earliest investigations of the relation between desired and actual fertility, Pratt and Whelpton (1955) showed that among couples interviewed in the 1941 Indianapolis Survey the number of children desired, whether at marriage or if married life could be relived, tended to exceed the number of children actually born. Similarly, in an analysis based on the third round of the Princeton Fertility Study, Bumpass and Westoff (1969) found that only 41 per cent of respondents had borne the

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1. Sixty per cent of the sample, and 90 per cent of the respondents who reported a desired family size, expressed a wish for fewer than five children. See Young (1979) for a discussion of the role of medical factors in the failure to achieve desired family size.

number of children they desired when interviewed eight years earlier and that 14 per cent had borne two children more or fewer than originally wanted.

As Muhsam and Kiser (1956) noted, few researchers would expect fertility desires to remain unchanged by time and circumstance; but many researchers have considered that fertility expectations can serve as useful indicators of future fertility because they reflect past family-building experiences and current and anticipated financial situations as well as family size preferences. Whelpton et al. (1966 op.cit.), for example, found considerable stability in the distributions of expected family sizes of comparable groups of married women interviewed by the 1955 and 1960 Growth of the American Families studies. Moreover, the numbers of children expected by the wives interviewed in 1955 proved to be remarkably accurate aggregate predictors of the fertility experienced by the members of the 1960 sample during the 1955-60 period.

Longitudinal sample studies have indicated, however, that the predictive accuracy of fertility expectations at the aggregate level depends to a large extent on many counterbalancing changes on the part of individuals. Indeed, individuals' fertility expectations may be unstable even over short periods of time. For example, Goldberg et al. (1959) reported that while most of the women interviewed in the 1955 Detroit Area Survey appeared to be acting in accordance with their original expectations, 30 per cent had adjusted their expectations by 1958. A subsequent study in Detroit (Freedman et al., 1965), in which women were interviewed in 1961-62, in 1963 and again in 1964, found that half the sample had changed their expected family sizes.

Instability in measures of family size preferences and expectations and discrepancies between these and actual fertility could arise in a number of ways. In the first place, while notions of desired, intended, ideal and expected family sizes may be clear to those who frame survey questionnaires, the persons interviewed may not always grasp what Goldberg called "the element of fantasy" inherent in questions about hypothetical behaviour. That is, the responses may indicate in part the extent to which different people use language differently. Even if the respondents do interpret a question correctly, their responses may be influenced by their emotional states (for example, post-marital euphoria) at the time they were interviewed.

Unstable fertility preferences and expectations could also be an artifact of the decisiveness demanded by interviewers in forcing people to choose a single preferred or expected family size, or of the recoding of multiple responses to single numbers during the editing stage of a survey. Indeed, despite implied pressure to choose a single number, nearly one-quarter of the members of the Melbourne sample gave a range in response to a question about the ideal size of the Australian family. In addition, if pressed some survey respondents may give a plausible answer to a question on which they think they are expected to have a considered opinion or judgement. An English study (Cartwright and Prince, 1975), in which twelve per cent of mothers interviewed during March-August 1973 gave different intended family sizes when re-interviewed in September 1973, suggests that this could have occurred.

Blake (1974) speculated on the degree to which reported birth expectations reflect current public opinion. Noting inconsistencies between the convergence of the birth expectations of American couples on two children in the late 1960s and their aversion to zero and one child families and tolerance of large families, she concluded that expectations might have been influenced "... on a short-term and relatively superficial basis, by anti-natalist propaganda concerning family size - an influence that has not permeated to other relevant attitudes" (p.42).

In retrospective surveys the reliability of responses may be compromised further by inability to recall long past desires and expectations. Difficulty in remembering past family size preferences, as well as the inability of initial desires to predict eventual family sizes, are exemplified by a study of 145 American couples who were interviewed shortly before marriage and again 20 years later (Westoff et al., 1957). In all, 25 per cent of the wives and 35 per cent of the husbands could not recall correctly whether they had originally wanted a large or a small family, and the correlation between the initial fertility preferences of the wives and their ultimate family sizes was only 0.27. Similarly, Bumpass and Westoff (1970) reported that in the third round of the Princeton Study nearly half the respondents could not recall accurately the number of children they had desired when first interviewed eight years earlier. Moreover, intervening fertility was found to have influenced the number of children that women thought they had initially wanted.

Muhsam and Kiser (op.cit.) considered the correlation they found between fertility performance and family sizes reportedly desired at the beginning of marriage among the members of the Indianapolis Survey (0.40) to be unduly high because of the ex post facto nature of the data on fertility desires. The longitudinal Detroit Area Surveys provide other evidence of rationalization after the fact: over the four year period of the study, women whose preferred and expected family sizes differed tended to change their expectations to reduce the discrepancy. Those who became pregnant were likely to raise their expectations regardless of whether the pregnancy was wanted, while those who had not become pregnant tended to reduce or curtail additional birth expectations (Freedman et al., 1965, op.cit.).

Ryder and Westoff (1967), analysing data from the 1955 and 1960 Growth of the American Families studies and the 1965 National Fertility Study, argued that the usefulness of information about expected parity for fertility forecasts is limited. In particular, attempts at forecasting fertility were found to have been hampered by a "considerable and highly variable" tendency for birth expectations to increase with age within the same marriage cohorts. Westoff and Ryder (1977b) later used data from the 1975 National Fertility Study, in which the same continuously married women were interviewed in 1970 and 1975, to assess the predictive power of fertility intentions. When first interviewed 41 per cent of the women expected to have additional children, but only 34 per cent had more in the subsequent five year period. Overall, it was estimated that "... acceptance of the 1970 intentions at face value would have led to a substantial over-shooting of the ultimate outcome (perhaps by some 15 percent)" (p.449). They concluded that fertility intentions, though affording greater predictive validity than other indices of future childbearing, are subject to sources of variation similar to those that affect period fertility measures.

Much of the instability in the responses may stem from real changes in fertility expectations and preferences. Indeed, there is no reason to believe that women's estimates of their long-term fertility should remain static in the face of changing social and economic conditions, changing community attitudes, changes in familial situations, unanticipated fecundity impairments and experiences with childbearing and children themselves. This calls into question whether the majority of couples do set realistic family size goals at all. Day (1977), ruminating on the failure of both economic and normative models to describe adequately human fertility, considered the setting of rigid fertility goals to be unlikely:

> "It is one thing to note that people do make conscious choices, and that they make them within a broad normative framework that establishes limits and guidelines with respect to both the goals to be sought and the means appropriate to the attainment of these goals; but it is quite another to declare that conscious choosing is the characteristic form of human behaviour ... with respect to the frequency and timing of childbearing."(p.495)

This is not to assert that fertility results totally from the operation of non-rational, chance factors. Rather, it may be difficult, if not impossible, to separate couples' reproductive intentions from their actual behaviour.

At the outset of marriage many people simply may have no idea of how many children they want. The number of children they eventually have will be conditioned by their experiences of marriage and children and the responsibilities of parenthood as well as by financial expectations and fecundity at each stage of family formation. Couples who do set themselves fixed and realistic family size goals might be forced to modify their strategies for attaining these goals in response to short-term social and economic pressures.[2] In either case, because of infecundity and progressive postponement of childbearing until it is too late and because of contraceptive failure, some couples will have fewer, and some more, children than they might otherwise wish.

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2. Goldberg et al. (op.cit.) reported that, apart from fecundity impairments, financial strain was the only reason cited by their respondents for lowering estimated completed family size. However, no one gave economic improvement as a reason for raising fertility expectations.

3.3 PATTERNS OF CONTRACEPTIVE USE

The discussion in the preceding section suggests that it is difficult to distinguish between reproductive goals and expectations, at whatever point within marriage they are measured, and eventual fertility. A woman interviewed toward the end of her reproductive life may be either unable to imagine or unwilling to admit that she ever wanted fewer, or more, children than she actually bore; a woman interviewed shortly after marriage, even if she has strong opinions on her future fertility, cannot anticipate circumstances in which she would readjust her goals. Another indication of attitudes toward family formation can be gained by examining the means through which couples control their fertility.

Caldwell and Ware (op.cit.) used the Melbourne data to analyse changes in family planning practice in Australia since the 1930s. The level of contraceptive use among married fecund women was found to have increased rapidly through the 1940s to a plateau of about 80 per cent during the 1950s and then to have risen again during the 1960s, surpassing 90 per cent among fecund couples by the end of the decade. They inferred from this that "... by 1960 saturation had been reached with the methods of contraception then available, both with respect to the technical ability to employ existing methods and also to the religious, social and aesthetic acceptibility of available methods." (p.15)

Until the late 1960s, "natural" contraceptive methods, such as rhythm and withdrawal, accounted for at least 40 per cent of all birth control, although this figure would have declined but for the influx of Southern European migrants in the 1950s and 1960s. By the late 1940s the diaphragm had begun to supplant other "artificial" methods, such as spermicides and condoms, and by the early 1960s the diaphragm itself had been supplanted by the "essentially more democratic" innovations of the contraceptive pill and the IUD (ibid., p.31).

Indeed, by the late 1960s the incidence of pill usage in Australia was among the highest in the world. Piotrow and Lee (1974) estimated from sales reports that a minimum of 24 per cent of Australian women aged 15-44 were using orals in 1971. Lavis (op.cit.) derived an identical estimate for Melbourne respondents in the same age group in that year.

While such global measures provide indications of overall levels of contraceptive use, they do not indicate at what stages in the childbearing span contraception was used. The Melbourne respondents were asked the year in which they first used contraception and the main family planning methods they used in the seven five-year periods between 1925 and 1959, the four-year period between 1960 and 1963, and the four two-year periods between 1964 and 1971. A contraceptive history can be constructed for each woman by relating her responses to these questions to her dates of marriage and subsequent confinements.

Table 3.3.1 presents the percentages of couples who used selected family planning methods at different parities controlling for year of marriage. The three broad marriage cohorts shown were chosen after some experimentation and with a view to the availability of different contraceptive methods at the beginning of marriage, overall similarities in parity-specific patterns of contraceptive use in finer groupings within each of the broad marriage cohorts, and the constraints imposed by sample size. 1950 was selected as the upper limit for the earliest marriage cohort in the table principally because the early 1950s marked a decisive shift in favour of the diaphragm relative to other artificial contraceptive methods. Similarly, 1961 was chosen as the earliest year of marriage for the last marriage cohort so as

TABLE 3.3.1: MAIN FAMILY PLANNING METHODS USED BY YEAR OF MARRIAGE AND PARITY

	YEAR OF MARRIAGE											
	1929-50				1951-60				1961-71			
	Parity				Parity				Parity			
Birth control method	0	1	2	3	0	1	2	3	0	1	2	3
No birth control	56.4	38.0	27.4	25.8	52.8	35.2	22.5	17.2	40.6	22.4	13.1	9.8
Infecund†	3.7	1.9	2.1	0.9	4.8	1.3	0.8	1.2	4.5	0.3	0.3	0.0
Sterilization	0.1	0.4	0.7	1.1	0.0	0.0	0.7	0.9	0.0	0.1	0.8	1.7
Oral anovulant	0.0	0.0	0.3	1.1	0.6	1.9	7.0	13.4	26.3	26.2	24.8	24.7
IUD††	1.1	2.1	2.7	3.6	1.2	1.3	1.3	3.5	0.9	2.5	6.4	8.0
Diaphragm	5.1	7.2	10.9	10.5	9.1	11.6	9.5	6.7	0.8	1.4	0.9	1.1
Spermicides	7.4	8.9	10.0	9.8	4.5	4.7	5.8	6.0	1.2	1.3	2.4	0.6
Condom	8.4	11.0	12.1	10.1	6.0	7.2	9.8	9.7	3.0	5.1	6.2	5.2
Rhythm	5.5	9.2	11.4	15.0	7.1	10.7	12.3	14.9	6.2	10.8	14.8	20.8
Traditional†††	8.6	13.9	16.5	16.8	9.1	15.3	20.3	15.4	8.1	17.8	18.8	19.5
Two or more methods	3.1	6.6	5.3	5.1	4.7	10.4	9.5	11.1	8.3	11.7	11.1	8.6
Method not specified	0.6	0.8	0.6	0.2	0.1	0.4	0.5	0.0	0.1	0.4	0.4	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(N)	(783)	(754)	(677)	(447)	(748)	(704)	(640)	(434)	(1118)	(844)	(533)	(174)

† Includes husband sterile.
†† Includes Gräfenberg ring.
††† Withdrawal, abstinence and douching.

to coincide with the release of oral contraceptives on the Australian market.[1]

The partitioning of the sample into three broad marriage cohorts is, of course, somewhat arbitrary. Changes in both the availability of contraceptive methods and the levels of use of these methods occurred along a continuum rather than in a closely defined period, such as a particular year. In addition, whatever the contraceptive methods easily available to couples at the beginning of marriage, the range of methods available to them would have widened as their marriage durations increased.

Appendix 3A presents parity-specific patterns of contraceptive use in sub-cohorts of each of the broad marriage cohorts shown in Table 3.3.1. While differences do exist in patterns of contraceptive use between sub-cohorts within the same broad marriage cohort, these broad cohorts are yet reasonably homogeneous. For example, separation of women married between 1951 and 1960 into two five-year cohorts reveals no sizeable differences in the distributions of birth control methods used at the lower parities, albeit with shifts to oral contraceptives at parities two and three among women married during 1955-60. A similar breakdown of the 1961-71 marriage cohort yields no large differences except for the proportions of women who used orals before the first birth (18 per cent of those married during 1961-65 as compared with 32 per cent of those married after 1965). If for no other reason than its width, one would expect the 1929-50 marriage cohort to be less homogeneous than the two later cohorts. The greatest differences between the parity-specific distributions of the sub-cohorts within the 1929-50 cohort appear in the decline from 33 per cent to 19 per cent and the subsequent rise to 27 per cent in the proportions of women who used no

1. Although available in Australia on a limited, trial basis as early as 1956, oral contraceptives were not marketed nationally until January 1961 (Lavis, op.cit.).

contraception at parity three. Almost all other differences are considerably smaller than these. Moreover, the members of the 1929-50 cohort tended to share the experience of marrying during an unsettled period, whether it be caused by the Depression or the War.

In the 1929-50 marriage cohort, the proportion of fecund couples using no birth control declined from 56 per cent at parity zero to 38 per cent at parity one and then levelled off at just above 25 per cent at parities two and three. Traditional methods, - withdrawal, douching and, to a very minor extent, abstinence - prove to have been the most frequently used, accounting for between one-fifth and one-quarter of all contraceptive use at each parity. Of the four other most common methods - diaphragm, spermicides, condom and rhythm - none emerges as consistently most popular; the condom was marginally the most popular among these four methods at parities zero, one and two, but was overtaken by rhythm at parity three.

The proportions of couples in the 1951-60 marriage cohort who used no birth control at parities zero and one are very similar to those in the earlier cohort. Similarities also exist between these two marriage cohorts with respect to the proportions of couples who used rhythm or traditional methods at each parity. On balance, however, the members of the 1951-60 cohort were more likely to have used the diaphragm at parities zero and one, and were substantially more likely to have used birth control at parities two and three. Perhaps the most significant difference between these two cohorts is the proportion of women in the 1951-60 cohort who adopted oral contraception when it became available, and which appears from the table to be mainly after they had borne at least two children. Relative both to the earlier cohort and to the lower parities in the 1951-60 cohort, the adoption of orals was accompanied by slight declines in the use of the diaphragm. The proportions of women in the 1951-60 cohort who used the pill after reaching parity two or parity three were actually larger than shown in the table but have been damped by the sizeable percentages of women who used more than one method. When these women were reclassified according to whether they used specific birth control methods for at least some of the time at each parity, the proportions who used the pill rose from seven to twelve per cent at parity two and from 13 to 19 per cent at parity three.

The full impact of oral contraceptives is evidenced by the family planning experience of couples who married after 1960. Oral anovulants rapidly eclipsed all other methods of birth control at each parity. In this cohort, not only were contraceptors most likely to be using orals but women were substantially more likely to be using contraception. For example, the proportions of couples in the 1961-71 cohort who used contraception at parities zero and one are 55 and 77 per cent respectively; corresponding figures for the 1951-60 cohort are 42 and 64 per cent. Relative to the two earlier marriage cohorts, the popularity of the condom, diaphragm and spermicides declined, while the proportions of couples who used rhythm or traditional methods (principally withdrawal) are very similar except at parity three. It appears, therefore, that the decline in the proportions of couples using no birth control in the 1961-71 cohort can be related mainly to the large proportions using the pill. Indeed, when those classified as using more than one contraceptive method were taken into account, the proportions of women at each parity who used oral contraception for at least some of the time reached between 30 and 35 per cent.

Although the members of the 1929-50 marriage cohort had been married longer and, thus, had more time to adopt contraception than women who married later, only 79 per cent of those adjudged fecund at parity zero later used birth control, as compared with 88 per cent of fecund couples in the 1951-60 cohort and 86 per cent in the 1961-71 cohort. The probabilities that fecund couples at each parity initiated contraception, and the proportions of couples at each parity initiated contraception, and the proportions of couples who had used contraception by the time they attained various parities are shown in Table 3.3.2, controlling for year of marriage.

Because the proportions of women reaching parities one, two and three in the 1929-50 and 1951-60 marriage cohorts are very similar[2], comparison of the initiation of contraception is not confounded by differences in parity-progression ratios, at least before parity three. In each cohort slightly more than two-fifths of the women at risk of pregnancy employed contraception at parity zero and slightly more than one-third of those who bore at least one child and who had not already used contraception adopted it after the first birth (Column B). The nine per cent difference in the overall levels of usage between the cohorts results mainly from divergences in the likelihoods that birth control was initiated after parity one. In particular, the probabilities declined from 0.35 at parity one to 0.23 at parity three for women at risk in the 1929-50 cohort but varied only between 0.38 and 0.41 for those who married between 1951 and 1960.

Couples who married after 1960, though only marginally less likely ever to have practised family planning than the members of the 1951-60 cohort, were much more likely to have used birth control early in marriage. Fifty-seven per cent of the fecund cohort initiated contraception at parity zero (Column B) and 79 per cent had done so before bearing a second child (Column C). Indeed, more than 90 per cent of those who ultimately employed

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2. In the 1929-50 cohort, 96 per cent of women reached parity one, 86 per cent reached parity two and 57 per cent reached parity three; corresponding proportions for the members of the 1951-60 cohort are 94, 86 and 58 per cent.

TABLE 3.3.2 : INITIATION OF CONTRACEPTION, CONTROLLING FOR PARITY AND YEAR OF MARRIAGE

	YEAR OF MARRIAGE								
	1929-50			1951-60			1961-71		
Parity i	A	B	C	A	B	C	A	B	C
0	96.3	0.42	41.5	95.2	0.45	44.5	95.5	0.57	57.5
1	55.0	0.35	61.3	51.6	0.38	65.2	36.0	0.57	79.0
2	31.8	0.30	71.1	28.7	0.37	76.3	10.1	0.49	84.2
3	17.8	0.23	75.3	15.5	0.41	82.9	2.7	0.63	86.0
Percentage of ever-users among women who were fecund at parity 0			78.6			87.9			86.1
(N)	783			748			1118		

A - Percentage of women in marriage cohort who were still fecund at parity i and had not previously used contraception.

B - Probability that fecund women initiated contraception at parity i.

C - Percentage of women fecund at parity zero who initiated contraception before parity i+1.

contraception has used it before reaching parity two. Thus, although the probabilities of initiating birth control at parities two and three remained high, the numbers of women at risk (i.e. fecund women who had never before used contraception) were small. This may also reflect the relatively short marriage durations of the members of the 1961-71 cohort, since a woman who had never used contraception had less time to progress from one parity to the next than women in the previous cohorts.

The probabilities of women at risk of childbearing initiating "efficient" reversible contraception[3] or choosing contraceptive sterilization are shown by parity and marriage cohort in Table 3.3.3. This table is similar in format to the previous one but is based on the use of efficient contraception, rather than all contraception, and includes a column showing the proportions of women initiating efficient contraception who had previously used methods deemed less reliable in the terms of this analysis.

The three marriage cohorts differ with respect to both the relative frequencies of couples who ultimately used efficient contraceptive methods and the parities attained when these methods were first used. In the 1929-50 cohort the overall level of use was low (30 per cent) and the probabilities of women at risk initiating efficient contraceptive methods were largely

3. In the discussion that follows the diaphragm, pill and IUD (including the Gräfenberg ring) will be termed "efficient" contraceptives. Admittedly, distinctions between efficient and inefficient family planning methods are somewhat arbitrary since the practical effectiveness of any method depends on the way in which it is employed. The effectiveness with which a couple uses a relatively inefficient method, such as rhythm, can actually be very high; conversely, the effectiveness with which a couple uses a theoretically highly efficient method, such as the pill, can be low. Evaluations of the use-effectiveness of different birth control methods in both developed and developing countries (for example, Westoff _et al_. (1953; 1963), Dumm _et al_. (1974), Belsky (1975), Huber _et al_. (1975), Potts _et al_. (1975)) indicate, however, user-failure rates for the diaphragm, IUD and pill to be consistently below five per cent as compared with failure rates for spermicides, condoms and "natural" methods ranging from three to 36 per cent.

TABLE 3.3.3: INITIATION OF "EFFICIENT" CONTRACEPTION,† CONTROLLING FOR PARITY AND YEAR OF MARRIAGE

	YEAR OF MARRIAGE											
	1929-50				1951-60				1961-71			
Parity i	A	B	C	D	A	B	C	D	A	B	C	D
0	96.3	0.09	20.0	8.6	95.2	0.15	14.7	14.6	95.5	0.39	6.7	38.9
1	86.4	0.07	53.2	14.9	78.6	0.12	50.7	23.8	51.3	0.23	22.6	51.3
2	71.9	0.08	54.5	20.7	62.8	0.16	62.2	33.7	26.0	0.16	46.8	55.7
3	45.9	0.11	70.0	26.0	38.4	0.21	59.0	41.8	8.7	0.19	27.8*	57.4
Percentage of ever-users of efficient methods among women who were fecund at parity 0				29.7				46.5				57.7
(N)	783				748				1118			

A – Percentage of women in marriage cohort who were still fecund at parity i and had not previously used efficient contraception.

B – Probability that fecund women initiated efficient contraception at parity i.

C – Percentage of women initiating efficient contraception at parity i who had used a less efficient method at some earlier time.

D – Percentage of women fecund at parity zero who initiated efficient contraception before parity i+1.

* Calculation based on a denominator of fewer than ten cases.

† Contraceptive sterilization, oral anovulants, IUD and diaphragm; see text.

independent of parity (Column B). At each parity the members of the 1951-60 marriage cohort were nearly twice as likely as the members of the earlier cohort to have initiated efficient contraception, and the proportion of ever-users reached 47 per cent. The 1951-60 and 1961-71 cohorts are similar to one another with respect to the probabilities that fecund couples who had no previous experience with efficient contraception adopted it after reaching parity two or parity three (Column B). The overall level of use of efficient contraception in the most recent cohort, however, was 57 per cent. This results from the relatively high probabilities that the most recently married women adopted efficient birth control at parity zero and, if they had not done so, initiated it if they reached parity one. For the 1961-71 cohort these probabilities were 0.39 and 0.23 respectively, while the corresponding probabilities for the 1951-60 cohort were 0.15 and 0.12.

Table 3.3.3 also indicates the percentage of women initiating efficient contraception at each parity who had previously used a method deemed less reliable. In general, the higher the parity attained before efficient contraception was initiated, the greater the likelihood of earlier experience with a less efficient method. For example, in the 1951-60 cohort 15 per cent of those who adopted efficient contraception at parity zero had already used a less efficient method, while at parities one and two this proportion increases to 51 and 62 per cent. Those women contributing to the 15 per cent at parity zero would have switched from an inefficient to an efficient method before the first birth; those contributing to the percentages at the higher parities could have used less efficient contraception in any of their previous birth intervals or could have switched methods at the parity at which they initiated contraception.

In both the 1929-50 and 1951-60 marriage cohorts, most women who initiated efficient birth control after bearing one or more children were not using contraception for the first time. In contrast, the members of the 1961-71 cohort were most likely to have made an efficient method their first, reflecting to a great extent the fact that, unlike the members of previous cohorts, they had available to them right from marriage unprecedentedly easy and reliable contraception.

Thus, inter-cohort differences in use of efficient contraceptive methods also reflect changes in the availability of such methods over time. The diaphragm and the IUD have been available in Australia since the 1930s, but all groups in the community have not always had equal knowledge about and equal access to these methods. Indeed, while the tradition of employing the Gräfenberg ring was well established in Melbourne before the 1950s, the device was prescribed principally as a back-up measure for women who had undergone therapeutic abortion (Ruzicka and Caldwell, 1977). Even if they had access to specific methods many couples may have found them unacceptable on religious or aesthetic grounds. For example, Caldwell and Ware (op.cit.) reported that in Melbourne use of the diaphragm was strongly related to education and that the diaphragm, with its associations with family planning clinics, was the least used of all major artificial methods of birth control by Roman Catholics. Wood (1974), in a study of attitudes to contraceptives amongst a group of middle-class women in Melbourne, found that difficulty in the acceptance and the reliable use of the diaphragm, condom and withdrawal might be explained by the fact that many women found them "repulsive".

Ryder (1973) posited that while most Americans since the 1930s have expected to marry and have two children, the means of realizing these goals have not always been widely available. In the past couples have been either "demographically disenfranchised" by unfavourable social conditions or unable to control unwanted fertility. Thus, he argued that rises in average completed family sizes between the 1930s and 1950s reflected a sharp decline in the proportion of women forced by economic considerations to have fewer than two children combined with the widespread failure to prevent unintended higher-order births, rather than a return to a large family norm. Ryder (1974) subsequently attributed fertility declines in the United States during the 1960s to improved birth control methods, such as the pill and sterilization. In particular, since the contraceptive effectiveness of modern methods depends more on their intrinsic characteristics than on the vigilance of the user (the use of the pill and the IUD being independent of coitus), these methods reduced the motivation necessary for the successful prevention of unwanted third and higher-order births.

Ryder's interpretation of the recent course of American fertility has not gone unchallended,[4] but his explanation of the effect of modern methods of fertility control appears to have some validity for Melbourne. Even in the 1929-50 marriage cohort not insignificant proportions of couples employed contraception before the first and second births and the overall level of usage amongst those who were fecund at parity zero was as high as 79 per cent. This offers testimony that the desire to space births and to limit completed family size was common in Melbourne well before the introduction of the pill. Nevertheless, the proportion of women in this cohort who used

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4. Blake and Das Gupta (1975) claimed that Ryder overstated the role of innovative contraceptive technology and understated the role of changing fertility preferences in recent American fertility declines. While not gainsaying the desirability of advances in birth control technology, they argued that individuals will only use efficient contraception if they have good reasons to do so. In their view, family sizes declined in the United States during the 1960s mainly because women wanted fewer children. For a continuation of this debate, see Ryder (1978) and Blake and Das Gupta (1978).

the IUD or diaphragm reached only about 15 per cent at parities two and three. The majority of contraceptors relied on relatively inefficient methods, such as condoms, rhythm and withdrawal, before the first birth and at subsequent parities. The results presented in this section provide no indication of the effectiveness with which contraception was used.[5] Undoubtedly, many couples employed inefficient methods successfully to space early births and continued to use them successfully to limit family size. Many couples who relied on relatively inefficient birth control methods, however, would have faced high risks of unwanted pregnancies.

Within Ryder's framework the explanation for widespread use of inefficient contraception in the face of desires for fertility control lies in the high degree of motivation required to use the efficient methods available before the introduction of the pill. That is, during the period of economic prosperity of the late 1940s and 1950s the marginal cost of having an additional, and originally unintended, child did not outweigh for most couples the requisite motivational level for the initiation of the use of the diaphragm or IUD. Indeed, the relatively high levels of efficient contraceptive use at the higher parities among women who married between 1951 and 1960 (see Table 3.3.1) largely reflects the adoption of the newly introduced contraceptive pill by members of this cohort, to whom the method would have been available, on average, after the second or third birth.

The most outstanding effect of oral contraceptives was the almost sure avoidance of unwanted pregnancy. In particular, the members of the 1961-71 cohort, to whom the pill was available right from the beginning of marriage, would have been able to space births, if they wished to do so, with far

5. This problem will be approached in Chapter Seven.

greater ease than was possible ever before. Indeed, many more women in the 1961-71 cohort than in the earlier cohorts chose to postpone the first birth and to space subsequent births, as evidenced by the high probabilities of initiating not only contraception, but reliable contraception, at the lower parities in this cohort relative to the earlier ones.

While the pill has made it easier to control the timing of childbearing it must be stressed that the spacing of births is not associated exclusively with its introduction. Small proportions of couples in the 1929-50 and 1951-60 marriage cohorts were sufficiently motivated to use efficient contraceptives, principally the diaphragm, early in marriage, and doubtlessly many used relatively inefficient methods with a considerable degree of success. Moreover, one cannot argue that the pill satisfied a deep-rooted wish to regulate the timing of childbearing, for it is unlikely that such a desire evolved in isolation from the means of satisfying it on a wide scale. As Lavis has noted, while declines in fertility during the 1960s have often been attributed to changes in the roles of women, "it is [also] possible that changes in attitudes related to sexual activity and reproduction grew out of the possibility of confident freedom from untimely pregnancy" (op.cit., p.62).

In summary, high levels of contraceptive use at parities two and three by the members of each of the three marriage cohorts indicate a general desire for small families. Whether couples attempted to space births as well as to limit completed fertility would have depended on the social climate prevailing early in marriage and, to some degree, on the contraceptive methods available. Few of the Melbourne respondents who married during and participated in the contraceptive revolution of the 1960s had completed their childbearing by the time of the survey. It is therefore impossible to judge unequivocally from the survey data whether widespread use of efficient contraception early in marriage would have engendered declines in completed fertility, although sustained declines in Australian period fertility rates since 1971 suggest that this has indeed occurred.

In the first place, the efficiency of modern contraceptive methods has allowed couples to avoid unwanted births with a hitherto unimaginable ease. The low degree of contraceptive vigilance necessary for the successful use of methods like the pill and the IUD could even encourage those who otherwise might have been contented with larger families to limit themselves to two or three children. Given the relatively small family size of Australians before the 1960s, however, modern contraception is likely to have its greatest impact by increasing the number of options open to those who use it early in marriage. In particular, the postponement of childbearing allows wives time to establish themselves in careers to which they can return after forming their families. Moreover, everything else being equal, deferral of childbearing raises the average age at which women bear children and shortens the period later in marriage during which they are exposed to the risk of pregnancy.

3.4 SOME SOCIAL DIFFERENCES IN CONTRACEPTIVE PRACTICE

The last section focused on the family planning practices of the members of different marriage cohorts in Melbourne. We cannot ignore, however, that the decision to practise family planning and the choice of contraceptive methods were also related to the ethnic and religious backgrounds of the respondents. These background characteristics are important for an understanding of the evolution of family planning in Australia given changes in the composition of the population after World War II. Such changes would help to explain, for example, the high proportions of couples in each of the three marriage cohorts who had used or were still using rhythm or withdrawal at the time of the survey.

The native- and British-born constituted virtually the entire pre-War population of Australia but only 90 per cent of the total in 1971. Changes in the ethnic composition of the Australian population were largely the consequence of successive waves of non-British immigration after the War. The first, involving Eastern European refugees together with Western and Central European migrants during the late 1940s, was followed after 1950 by large-scale Southern European immigration and, in the late 1960s, by a small but increasing stream of Asians (National Population Inquiry, op.cit.). Changes in the composition of the Australian population are reflected in the Melbourne sample: the non-British foreign-born leapt from two per cent of the married and presumably fecund women who were resident in Australia during 1940-44 to 32 per cent in 1971. That the latter proportion exceeds the proportion of non-British immigrants in the Australian population in 1971 results partly from a concentration of immigrants in the large metropolitan centres, partly from a preponderance of young adults in the immigrant population and partly because children born in Australia to immigrant parents bolster the ranks of the native-born.[1]

Table 3.4.1 shows married and presumably fecund Melbourne respondents resident in Australia during the 1940-44, 1955-59 and 1970-71 periods classified according to main methods of birth control used during these periods and country of birth or religion. The restriction that respondents be resident in Australia during the time periods specified in the table was necessitated by the observation that approximately two-fifths of the members of the sample were foreign-born and, of these, four-fifths married before coming to Australia (Caldwell and Ware, op.cit.). Only after her arrival in Australia can the contraceptive behaviour of an immigrant be said to contribute to the Australian experience. The Melbourne respondents were asked the main family planning methods they used in the seven five-year periods from 1925 and in shorter periods thereafter. The first period shown in the table, 1940-44, was chosen as the last period before substantial non-British immigration. The second period, 1955-59, was the last before the introduction of oral contraceptives and also marked a peak in use of the diaphragm. The third period, 1970-71, provides the most recent information.

The sub-groups distinguished in the table comprise native-born Roman Catholics (B), Southern European immigrants (C) and a residual group made up of Australian-born non-Roman Catholics and immigrants who came principally from Britain and North-western Europe (A). In the interest of brevity, and with little fear of inexactitude the members of the last group will hereafter be termed "Protestants". These three groupings were chosen to coincide with the major nativity and religious differentials in

1. Ruzicka and Caldwell (op.cit.) reported, for example, that while the average issues of specific birth cohorts of immigrants did not differ greatly from those of their Australian-born counterparts, the proportions of births to foreign-born mothers rose from 6 to 26 per cent in Australia between 1947 and 1971.

TABLE 3.4.1: MAIN FAMILY PLANNING METHODS USED IN STATED PERIODS BY MARRIED, FECUND WOMEN RESIDENT IN AUSTRALIA

	PERIOD OF OBSERVATION											
	1940-44				1955-59				1970-71			
Birth control method	A	B	C	Total	A	B	C	Total	A	B	C	Total
None	42.8	57.9	-	45.6	19.8	37.2	32.3	24.2	6.0	8.1	10.5	7.3
Oral anovulant	-	-	-	-	-	-	-	-	46.9	33.2	9.2	36.4
IUD†	1.9	0.0	-	1.6	6.7	2.5	0.0	5.2	12.0	9.4	1.0	9.1
Diaphragm	6.3	5.3	-	6.1	22.5	3.0	0.8	16.6	6.5	0.4	0.0	4.1
Spermicides	16.1	2.6	-	13.9	8.6	5.5	0.8	7.2	2.6	2.1	0.5	2.0
Condom	12.6	2.6	-	11.1	16.6	7.0	5.0	13.6	9.5	6.0	4.7	7.9
Rhythm	5.3	21.1	-	7.8	10.9	35.7	10.7	15.4	8.8	34.9	9.7	12.7
Traditional††	12.6	10.5	-	12.3	13.5	9.1	49.6	16.7	6.9	5.5	64.4	19.9
Method not specified	2.4	0.0	-	1.6	1.4	0.0	0.8	1.1	0.8	0.4	0.0	0.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(N)	(206)	(38)	-	(244)	(778)	(199)	(121)	(1098)	(1050)	(235)	(382)	(1667)
Percentage of fecund women	84.4	15.6	0.0	100.0	70.9	18.1	11.0	100.0	63.0	14.1	22.9	100.0
Percentage of all family planners	88.1	11.9	-	100.0	75.1	15.0	9.9	100.0	63.9	14.0	22.1	100.0

A - Australian-born non-Roman Catholics and immigrants from all regions except Southern Europe.
B - Australian-born Roman Catholics.
C - Southern Europeans, comprising immigrants from Italy, Greece, Yugoslavia, Malta, Spain and Portugal.

† Includes Gräfenberg ring.
†† Withdrawal, abstinence and douching.

family planning practices that Caldwell and Ware (op.cit.) identified in Melbourne. Australian-born Catholic women were found to have been less likely to have ever used birth control and, if they had used it, more likely to have used rhythm than their non-Catholic compatriots. Overall, the family planning experiences of non-Southern European immigrants were similar to those of the non-Catholic Australian-born. Southern Europeans differed from Catholic Australians and Protestants with respect to either the particular methods of birth control they employed or their overall levels of family planning. Thus, Southern European immigrants other than Greeks realized levels of contraceptive use similar to those of native-born Catholics; and Greeks favoured withdrawal and Italians rhythm over chemical, mechanical and hormonal methods of birth control.

The entries in the penultimate row of Table 3.4.1 provide a rough indication of changes in the composition of the married, fecund population of Melbourne since the early 1940s. Although Protestants constituted a clear majority in each of the periods shown, their relative position was greatly eroded from one period to the next. Protestants accounted for 84 per cent of the total during 1940-44; this proportion had declined to 71 per cent by 1955-59, and declined further thereafter, so that by 1970-71 it stood at only 63 per cent. These declines were largely due to the influx of Southern Europeans that occurred after 1950. Despite high levels of post-War immigration, however, Australian-born Roman Catholics constituted approximately one-sixth of the overall total during each of the three calendar periods. Australian Catholics maintained their relative position because of high Catholic fertility in the past.[2] That is, during the early

2. For example, Day (1971) estimated from 1961 Australian census data that among the members of the 1897-1921 birth cohorts who married before age 26, Catholics bore between 0.61 and 0.74 more children on average than non-Catholics. Caldwell and Ruzicka (1978) considered that Catholic - non-Catholic fertility differences constituted the only socially significant fertility differential during the Australian fertility transition of the late nineteenth century.

decades of this century Catholics had higher rates of natural increase than the non-Catholic population of Australia; had large-scale post-War immigration not occurred, the proportion of native-born Catholics in Australia would have increased. Indeed, when non-British migrants are omitted from the calculations, the proportion of native-born Catholics among fecund, married Melbourne respondents who were resident in Australia rises from 16 per cent during 1940-44 to 20 per cent during 1970-71.

The body of Table 3.4.1 highlights both changes in and differences between the contraceptive practices of Protestants, Australian-born Roman Catholics and Southern Europeans who were resident in Australia during specified periods. For example, during the 1940-44 period 57 per cent of the married, fecund Protestants, but only 42 per cent of the Australian Catholics, employed birth control. Moreover, among the family planners of that era, two-thirds of the Protestants, as compared with one-quarter of the Catholics, used mechanical or chemical contraceptives.

Although the overall level of family planning among fecund couples resident in Australia rose from 54 per cent during 1940-44 to 76 per cent during 1955-59, inter-group differences persisted with respect to both the proportions practising family planning and the particular methods used. Eighty per cent of the Protestants employed birth control during the 1955-59 period and nearly one-third used the diaphragm or the Gräfenberg ring, the most reliable methods then available. The increase in the use of birth control by Protestants between the two periods was due almost solely to increased use of these efficient methods as close to half the Protestants used less efficient methods in each period. Increases in the proportions using rhythm or condoms were offset by a decrease in the proportion using spermicides, and use of traditional methods remained much the same.

Sixty-three per cent of Australian Catholics employed birth control during 1955-59 but fewer than six per cent used the IUD or the diaphragm and only 13 per cent used condoms or spermicides. Nearly 60 per cent of Catholic contraceptors used rhythm, the only method other than abstinence not proscribed by church teaching. Thus, a 21 per cent increase in the level of family planning among Catholics between 1940-44 and 1955-59 was largely absorbed by increased use of rhythm.

A new feature of family planning during this period was the contribution of Southern European immigrants, who accounted for eleven per cent of the total and ten per cent of all family planners by 1955-59. Sixty per cent of the Southern Europeans, and 90 per cent of the contraceptors, employed rhythm or traditional methods.

By the 1970-71 period 93 per cent of the fecund couples in the sample were using some form of birth control and, for the first time, the contraceptors in each group were represented in the same proportion as the members of the group were in the population. There were still differences, however, in the relative frequencies of couples employing specific birth control methods. Protestants again proved to be the most innovative, with 47 per cent using the pill and twelve per cent the IUD. Only 34 per cent of Protestants used methods other than the pill and the IUD, as compared with 72 per cent during the 1955-59 period.

The proportion of fecund Australian Catholics using contraception jumped from 63 per cent during the 1955-59 period to 92 per cent during 1970-71. As Caldwell and Ware (ibid.) noted, "Catholic use of contraceptive methods regarded as illicit by the Church is ... [not] exclusively associated with the introduction of the pill and the debate within the Church during the 1960s" (p.23). Indeed, during the 1940-44 and 1955-59 periods approximately one-quarter of Australian Catholic family planners used mechanical or chemical contraceptives. Nevertheless, the birth control debate within the Church intensified pressures for reform and divided the Roman Catholic community. The effects of the debate, and social change, are evidenced by the family planning methods employed by Australian Catholics during 1970-71: while the proportion using rhythm (35 per cent) remained almost unchanged at its 1955-59 level, 51 per cent were using artificial contraception and 43 per cent the pill or the IUD.

While Southern Europeans prove to have been the least innovative in terms of the types of contraception used during 1970-71, the proportion practising family planning increased from 68 to 90 per cent between 1955-59 and 1970-71. The increase in the proportion using contraception was due primarily to an increase from 50 to 64 per cent in the proportion using traditional methods and only secondarily to the adoption, by nine per cent of the women, of the pill. There was virtually no change in the proportions of couples using condoms and rhythm, while in each period use of the IUD, diaphragm and spermicides was negligible. That so few Southern Europeans used the pill, although most were family planners, suggests that while they shared the same social environment as, for example, Protestants, they tended to respond in familiar ways rather than by experimenting with the modern technology of their new country.

In the last section, the proportions of couples using birth control were seen to rise within marriage cohorts from one parity to the next, and within each parity to rise from one cohort to the next. The analysis in this section has shown that levels and methods of contraceptive use were related not only to changes in the availability of different contraceptive methods but also to the national origins and religious backgrounds of wives.

These two analytical strands have been combined, as far as possible, in Table 3.4.2 to show fecund women at different parities classified by family planning methods used, year of marriage and country of birth or religion.

The criteria employed to classify the countries of origin and religions of the respondents are the same as those used in Table 3.4.1. In contrast to Table 3.4.1, however, the requirement that fecund women be resident in Australia has been waived because tabulation according to year of marriage requires that women be followed from marriage rather than arrival in Australia. In order to maintain cell sizes, family planning methods have been collapsed into broad categories: "modern" methods (the contraceptive pill and the IUD) form one group, as do barrier methods (the diaphragm and condoms) and spermicides, and rhythm and traditional methods.

Within each of the sub-groups of the sample and within each broad marriage cohort shown, the proportions of couples using birth control tended to increase with parity. In addition, the overall proportions of couples actually using contraception tended to increase from one marriage cohort to the next. Since Protestants are easily the largest of the three sub-groups, their parity-specific patterns of contraceptive use dominate the contraceptive profile of each of the three marriage cohorts shown in Table 3.3.1: this dominance was greatest in the 1929-50 cohort, 75 per cent of whose members fall into the Protestant group, and weaker in the 1951-60 and 1961-71 cohorts, where Protestants constitute 62 and 63 per cent of the respective totals.

In each of the three broad marriage cohorts, Protestants had the highest levels of use of contraception of the three sub-groups of the sample. In the 1929-50 cohort nearly half the Protestants employed birth control at

TABLE 3.4.2: MAIN FAMILY PLANNING METHODS USED BY FECUND WOMEN, CONTROLLING FOR YEAR OF MARRIAGE, PARITY AND COUNTRY OF BIRTH OR RELIGION†

	YEAR OF MARRIAGE											
	1929-50 Parity				1951-60 Parity				1961-71 Parity			
Birth control method	0	1	2	3	0	1	2	3	0	1	2	3
					Protestants							
None	54.4	35.2	24.4	22.0	48.9	29.9	19.1	13.8	31.8	19.8	11.0	12.0
Oral anovulant or IUD	1.6	2.5	3.7	5.8	1.8	4.7	10.4	22.3	40.3	42.0	46.8	45.6
Barrier or spermicides	27.1	33.9	39.9	37.3	30.6	33.4	30.5	24.6	7.0	9.9	10.3	8.7
Rhythm or traditional	14.4	25.0	27.9	31.4	14.7	22.6	29.3	28.5	11.2	17.0	21.6	25.0
Two or more methods	1.6	2.5	3.5	3.2	3.6	8.9	10.2	10.8	9.6	10.9	10.0	8.7
Method not specified	0.9	0.9	0.6	0.3	0.2	0.5	0.5	0.0	0.1	0.4	0.3	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(N)	(564)	(552)	(487)	(309)	(441)	(428)	(393)	(260)	(670)	(495)	(301)	(92)
					Australian-born Roman Catholics							
None	75.7	52.6	42.3	31.1	61.3	46.3	34.5	22.4	58.7	28.6	15.8	5.0
Oral anovulant or IUD	0.0	2.0	2.2	4.1	4.0	1.7	9.1	14.1	17.9	23.2	18.4	25.0
Barrier or spermicides	8.7	11.1	14.4	5.4	7.3	13.2	10.9	7.1	3.4	8.0	9.2	7.5
Rhythm or traditional	14.6	32.3	37.8	56.7	27.4	34.7	35.5	48.2	14.5	33.9	47.4	55.0
Two or more methods	1.0	2.0	3.3	2.7	0.0	4.1	10.0	8.2	5.5	5.4	7.9	7.5
Method not specified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.3	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(N)	(103)	(99)	(90)	(74)	(124)	(121)	(110)	(85)	(145)	(112)	(76)	(40)
					Southern Europeans							
None	65.1	47.6	34.6	42.1	70.0	43.8	24.2	25.0	61.9	25.3	16.7	10.2
Oral anovulant or IUD	0.0	0.0	0.0	0.0	0.0	0.0	1.6	3.7	3.2	3.4	7.3	12.8
Barrier or spermicides	2.3	4.7	8.6	3.5	4.1	4.1	7.0	10.0	2.8	4.3	7.3	2.6
Rhythm or traditional	32.6	45.3	54.4	52.6	25.2	51.4	66.4	60.0	31.3	62.7	65.4	74.4
Two or more methods	0.0	1.2	1.2	1.8	0.7	0.0	0.0	1.3	0.8	4.3	3.3	0.0
Method not specified	0.0	1.2	1.2	0.0	0.0	0.7	0.8	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(N)	(86)	(86)	(81)	(57)	(147)	(146)	(128)	(80)	(252)	(233)	(150)	(39)

† See footnotes to Table 3.4.1 for complete descriptions of classification criteria.

parity zero, and this proportion rose to nearly four-fifths amongst those who reached parities two and three. Barrier methods or spermicides were the most frequently chosen methods at each parity, although the use of rhythm and traditional methods was substantial at parities one and above. The proportions of Protestants in the 1951-60 cohort who used barrier methods and spermicides were similar to those in the previous cohort at parities zero and one, but lower at parities two and three. Parity-specific levels of use of rhythm and traditional methods were similar in these two marriage cohorts. Increases in the overall proportions of Protestants using contraception between the 1929-50 and 1951-60 cohorts appear to be associated with the introduction of oral contraceptives which, though available to few women early in marriage, would have been available to many after they had commenced childbearing. Declines in the use of barrier methods or spermicides were more than compensated by the large proportions adopting the pill and, to a lesser extent, the IUD and increases in the proportions of women using two or more methods.[3]

Nearly 70 per cent of Protestants married after 1960 used contraception before the first birth, 80 per cent used it after the first birth and nearly 90 per cent of those who bore a second child employed it thereafter. Moreover, at each parity about three in every five Protestant family planners employed the pill or the IUD. Despite the overwhelming popularity of artificial contraceptive methods, however, a sizeable proportion of Protestants comprising eleven per cent at parity zero and 25 per cent of those who reached parity three, still employed rhythm or traditional methods.

Amongst women married between 1929 and 1950, Australian-born Roman Catholics had the lowest levels of contraceptive use at each parity except

3. For the relative importance of the pill and the IUD in the 1951-60 cohort, which is three-fifths Protestant, see Table 3.3.1; as discussed earlier, use of two or more methods generally entailed substitution of the pill for a less efficient contraceptive method.

parity three. Only 24 per cent used contraception at parity zero, and this proportion rose to 47 per cent at parity one, 58 per cent at parity two and 69 per cent at parity three. Australian Catholic family planners were most likely to have used "natural" methods, principally rhythm, and the proportion of women actually using such methods increased from 15 per cent at parity zero to 57 per cent at parity three. Artificial contraception was used infrequently, although its popularity was greater among Australian Catholics who married after 1950. Australian Catholics in the 1951-60 cohort were more likely to have used contraception at each parity than those married earlier. For example, two-fifths used birth control at parity zero and four-fifths used it at parity three. There was little variation between the 1929-50 and 1951-60 cohorts in the parity-specific use of barrier methods or spermicides, while rhythm and traditional methods were more popular at parity zero and less popular at parity three in the later cohort. Patterns of use of modern contraceptives similar to those already observed among Protestants in the 1951-60 cohort are apparent, although the proportion of Catholic users was somewhat lower. For example, while nine per cent of Australian Catholics and ten per cent of Protestants used the pill or the IUD at parity two, only 14 per cent of Catholics, as opposed to 22 per cent of Protestants, exclusively employed these methods if they reached parity three.

While the proportion of Australian Catholics married after 1960 who used no contraception at parity zero was similar to that in the 1951-60 cohort, the proportions using birth control at subsequent parities were, in each case, nearly 20 per cent higher than in the earlier cohort. In their analysis of contraceptive practices in Melbourne, Caldwell and Ware (ibid.) concluded that the pill made gradual inroads into the use of rhythm because many Catholic couples were content to use rhythm to space their births and switched to reliable contraception only after completing their families. This speculation is not supported by the results presented in Table 3.4.2. In the 1961-71 cohort the proportion of Catholics using modern contraceptive methods hovered about 20 per cent at each parity. In contrast, use of rhythm or traditional methods was, as always, strongly parity-dependent and the levels of use at parities two and three actually exceeded those of Australian Catholics in the 1951-60 marriage cohort.

Parity-specific levels of contraceptive use among Southern Europeans in each of three marriage cohorts were closer to those of Australian Roman Catholics than to those of Protestants. Except for a slight decline in the proportion of Southern Europeans using contraception at parity zero between the 1929-50 and 1951-60 cohorts, the proportions using contraception at each parity increased from one marriage cohort to the next. The most striking feature of Southern European patterns of contraceptive use was the almost complete reliance of family planners on rhythm or traditional methods. For example, in the 1929-50 marriage cohort the proportion of Southern European family planners using rhythm or traditional methods ranged from a high of 93 per cent at parity zero to a low of 83 per cent at parity two. It is perhaps not surprising that so few contraceptors in this cohort used artificial methods since a large proportion of their early contraceptive experience would have taken place outside Australia.[4] Even when easy and reliable contraceptives were on the Australian market, however, the majority of Southern European family planners relied on rhythm or traditional methods:

4. Indeed, more than 90 per cent of Southern Europeans in the 1929-50 cohort married before coming to Australia: as the proportions of Southern Europeans who married before immigrating to Australia were about 60 per cent in the 1951-60 cohort and 30 per cent in the 1961-71 cohort, the degree to which contraceptive experience of Southern Europeans in the sample approaches their experience after arrival in Australia increases from one marriage cohort to the next.

in the 1961-71 marriage cohort the proportion of users relying on these natural methods ranged between a high of 84 per cent at parity one and a low of 79 per cent at parity two. In each cohort, small proportions of Southern Europeans used artificial methods, but the proportion using such methods exceeded 15 per cent only at parity three among women married after 1960.

3.5 CONCLUSIONS

In this chapter we concluded from a review of studies of fertility desires and expectations that it is extremely difficult to separate a couple's fertility intentions from its fertility performance. As a consequence we have preferred to examine volitional factors related to childbearing as evidenced by patterns of contraceptive use.

Analysis of parity-specific levels of contraceptive use within broad marriage cohorts suggests that the desire to control fertility has always been strong. While all but 13 per cent of the members of the Melbourne sample had employed birth control at some time in their lives, a sizeable minority, comprising half the women married before 1961 and two-fifths of the women who married later, reported that they had never used a reliable contraceptive method, such as the pill, IUD or diaphragm. The previous section demonstrates that parity-specific levels of contraceptive use and the actual methods chosen depended partly on the availability of methods but also on such social characteristics as religion and national origin.

Differences in methods of contraception used do not of themselves imply corresponding variations in fertility. For example, the proportions of women in the 1929-50 and 1951-60 marriage cohorts who reached parities one, two and three were almost identical despite differences not only in the availability of methods but also in actual contraceptive behaviour. Similarly, 15 per cent of Southern Europeans, and 14 per cent of Protestants, who married after 1960 had borne at least three children by the time of the survey despite the fact that contraceptors in the former group relied principally on natural methods while those in the latter relied on artificial methods of birth control.

In looking at patterns of parity-specific contraceptive use as indicators of attitudes toward childbearing, we have ignored the actual progression from one parity to the next. In the next chapter we shall examine the fertility patterns of the members of various marriage cohorts and, in the following chapter, sources of systematic variation in current family sizes.

CHAPTER FOUR

COHORT FERTILITY PATTERNS

How they were all married had two children,
and lived happily ever after.

Anthony Trollope - "Framley Parsonage" (1861)

4.1 INTRODUCTION

The previous chapter identified major changes in patterns of contraceptive use between women married in different years. This chapter examines patterns of family formation of members of different marriage cohorts defined in the Melbourne sample. The design of the sample precludes analysis of marriage patterns.[1] Nevertheless, in the absence of published vital statistics on the lengths of inter-live birth intervals beyond the first birth, the reproductive histories elicited from the respondents serve as an excellent vehicle for examining marital fertility.

The next section discusses the advantages of analyses based on cohorts defined in terms of year of marriage rather than year of birth and problems that nevertheless affect the definition of marriage cohorts. This is followed by an examination of the cumulative marital fertility of various marriage cohorts and their distributions of family size at the time of the survey and, finally, by an analysis of their childspacing patterns.

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1. See McDonald (1974a) for a full discussion of marriage patterns in Australia.

4.2 MARRIAGE COHORTS

For the purposes of the analyses presented in this thesis, cohorts could be defined either in terms of year of birth or in terms of year of marriage. Given a random sample of women selected without regard to marital status the former would be preferable as it would permit detailed examination of both marriage and fertility patterns. The analytic and substantive advantages associated with the use of birth cohorts[1] are negated, however, by the marriage criteria of the sample, namely, that respondents be once-married and still living with their husbands.

Older women who postponed marriage would have been eligible for inclusion in the sample by virtue of marriages contracted at ages not yet reached by the younger women in the population, while the members of the most recent birth cohorts, to be included, must have married relatively young. For example, a respondent born in 1950 could have married no later than age 21 while a respondent born in 1940 could have been ten years older when she married. Thus, everything else being equal, we should expect the marriage criteria to result in a selective under-representation of young women in the population from which the sample was drawn.[2] Moreover, the composition of birth cohorts derived from the sample, though providing few clues to changes in age-specific marriage rates and proportions marrying, would be partly determined by such changes that did occur over the time spanned by the study.[3]

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1. See Spencer (1971) and Ruzicka and Caldwell (op.cit.) for analyses of generational fertility in Australia.

2. This would also entail a bias toward younger ages at marriage among younger members of the sample, a bias evidenced in Table 4.2.1 by the decline of 3.3 years in mean ages at marriage between the 1941-45 and 1951-55 birth cohorts.

3. Indeed, in Australia the proportion of women aged 20-24 and 30-34 years who were married rose from 31 to 64 per cent and from 78 to 94 per cent between 1933 and 1971, and the median ages of women at first marriage fell from 23.4 to 21.0 years (National Population Inquiry, op.cit.).

For example, it can be seen from Table 4.2.1 that seven per cent of the members of the sample were born during 1916-20 and that 14 per cent were born during 1926-30. One cannot say on the basis of *these* data, however, whether the difference between the percentages mainly indicates a difference in the proportions of women who met the age criterion of the sample or a difference in the proportions of women who met the rather strict marriage criteria.

In light of the selection criteria for the sample, therefore, it seems appropriate to base primary comparisons on year of marriage rather than on year of birth. Nevertheless, this approach is not without problems. The body of Table 4.2.1 shows selected marriage cohorts broken down according to the years of birth of their members. The marriage cohorts are the same as those presented in Appendix 3A. Approximately 80 per cent of the women in each of the post-1939 marriage cohorts are found in the modal birth cohort and the birth cohort immediately its senior. In the case of the 1929-39 marriage cohort, which has a width of eleven years as compared with five or six for the others, 97 per cent of the women fall in the modal birth cohort and the birth cohort immediately its junior. The compression of the age range of women in the earliest marriage cohort is caused by the requirement that members of the sample be younger than 60 years of age.

Just as the marriage criteria of the sample bias recent birth cohorts toward the youngest married women, the age criterion biases the oldest marriage cohorts toward women who married young. For example, a woman who married in 1939 could have been at most 28 years of age at the time while one who married in 1971 could have been as old as 59. This bias is evidenced by the means and standard deviations of ages at marriage shown at the foot of Table 4.2.1. Thus, slight rises in both the means and standard deviations of ages at marriage up to the 1946-50 marriage cohort reflect the exclusion of older women rather than younger ages at marriage and greater homogeneity in

TABLE 4.2.1: DISTRIBUTIONS OF WOMEN MARRIED IN GIVEN YEARS BY YEAR OF BIRTH

	YEAR OF MARRIAGE									
Year of Birth	1929-39	1940-45	1946-50	1951-55	1956-60	1961-65	1966-71	Total	Mean Age at Marriage	Standard Deviation
1911-15	61.4	10.4	1.4	1.1	0.3	0.0	0.3	5.0	25.4	6.2
1916-20	35.3	35.8	9.5	0.5	1.3	0.2	0.2	7.2	24.4	5.2
1921-25	3.3	47.6	33.2	10.4	3.4	0.6	0.5	11.7	24.0	4.8
1926-30		6.2	49.4	36.9	9.1	1.9	0.6	14.4	22.9	4.0
1931-35			6.2	42.3	31.0	7.1	2.9	13.1	23.0	4.2
1936-40			0.3	8.8	47.3	28.5	7.0	14.9	22.3	3.5
1941-45					7.6	51.0	25.1	16.2	21.6	2.5
1946-50						10.7	54.1	15.2	20.3	1.8
1951-55							9.3	2.3	18.3	1.3
Total (N)	100.0 (153)	100.0 (260)	100.0 (370)	100.0 (364)	100.0 (384)	100.0 (467)	100.0 (654)	100.0 (2652)		
Mean Age at Marriage	21.6	22.2	22.6	22.7	22.8	22.3	22.5	22.5		
Standard Deviation	2.7	3.2	3.6	4.0	4.6	4.1	4.6	4.1		

marriage patterns among women in the first two marriage cohorts in the base population.

The stipulation that the marriages of the Melbourne respondents be intact may create other difficulties whether analyses are based on birth cohorts or, as in our case, marriage cohorts. The fertility of members of marriage cohorts derived from the sample will not be representative of that of women married in particular years (and resident in Melbourne in 1971) unless women whose first marriages were no longer intact had the same fertility characteristics as women who satisfied the sample criteria. In Australia the fertility of divorcées, when standardized by marriage duration, has tended to be slightly lower than that of continuously married women (Day, 1976). Distortions arising from the exclusion from the sample of such women are likely to be small, however, because relatively few marriages ended in divorce before the end of the active (as opposed to physiological) child-bearing span. Since the Second World War, the proportion of marriages terminated by divorce within 20 years exceeded ten per cent only in 1971 and, for most of the period, was considerably lower (ibid.). Similarly, while approximately ten per cent of marriages ended in widowhood before the wife reached age 50, only two per cent of ever-married women had been widowed before age 35 (by which age 95 per cent of all childbearing had occurred). Distortions in marriage cohorts due to female mortality are likely to be even smaller; for example, only one and five per cent of Australian husbands can be expected to be widowed by the ages of 35 and 50 respectively (McDonald, 1974b).

Apart from biases created by the sample criteria, problems can arise when fertility comparisons are based on year of marriage simply because marriage need not represent the beginning of the active reproductive span. For most women it does, but for others exposure to the risk of pregnancy can serve either to hasten or, perhaps, to delay marriage. Table 4.2.2 presents the marriage cohorts shown in Table 4.2.1 according to pregnancy status at marriage (i.e., whether brides had experienced a premarital birth, premarital conception, or neither) together with the average ages at marriage of the women in each of the cells.

Unlike the distinction between premarital and marital births, which rests on the reported marital status of the mother at the time of confinement, the distinction between premarital and marital conceptions rests on the inferred marital status of the mother at the time of conception. Slippages could result from the definition of premarital conceptions used in Table 4.2.2; namely, births occurring within eight completed months (i.e., 242 days) of marriage. Clinical studies cited in Chapter Two indicate that live birth gestation periods usually range from 260 to 290 days, with a mean of about 285 days, but in some cases they can be shorter. Thus, premature births conceived within marriage could be classified incorrectly as premarital conceptions. Such errors will be balanced to some extent, however, by premaritally conceived births of long gestations which are mistakenly classified as marital conceptions.

Approximately ten per cent of the women in the sample experienced a pregnancy before marriage, in a ratio of premarital conceptions to premarital births of nine-to-two. The incidence of premarital sexual exposure was undoubtedly higher than this, but the respondents were not asked explicitly about premarital sexual relations nor about premarital conceptions that were not carried successfully to term. In addition, the possibility cannot be discounted that women, anxious to conceal premarital conceptions, may have adjusted either their dates of marriage or first confinement in order to achieve a "respectable" interval between the two.[4]

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4. Although there is no evidence that premarital conceptions were

(Footnote continued on next page.)

TABLE 4.2.2: PERCENTAGE DISTRIBUTIONS AND MEAN AGES OF BRIDES BY PREGNANCY STATUS AT MARRIAGE AND YEAR OF MARRIAGE

	PREGNANCY STATUS (PERCENTAGE)			MEAN AGES AT MARRIAGE		
Year of Marriage	Premarital Births	Premarital Conceptions	Not Pregnant before Marriage	Premarital Births	Premarital Conceptions	Not Pregnant before Marriage
1929-39	1.3	8.5	90.2	23.1*	21.4	21.6
1940-45	1.5	6.2	92.3	23.4*	21.3	22.3
1946-50	2.2	6.2	91.6	22.6*	20.7	22.7
1951-55	1.1	6.9	92.0	23.8*	21.1	22.8
1956-60	2.1	9.4	88.5	26.3*	21.7	22.9
1961-65	1.1	9.2	89.7	23.0*	19.5	22.6
1966-71	2.9	10.6	86.5	24.8	19.9	22.7
Total	1.9	8.5	89.6	24.2	20.5	22.6

* Calculation based on fewer than ten cases.

The actual number of women who fell pregnant before marriage is small. Only 50 respondents admitted bearing a child out of wedlock and only 225 were adjudged as having a premarital conception. Despite some small cell sizes, differences are readily apparent between the average ages at marriage of women with different pregnancy statuses at the time of marriage. Within each marriage cohort those with premarital conceptions tended to marry earlier, and those with premarital births tended to marry later than women who experienced neither event.

That pregnant brides married younger than non-pregnant brides in each cohort may reflect the reaction to premarital pregnancy. In particular, if pregnancy were to precipitate marriage, a pregnant woman could be expected to marry sooner than a non-pregnant woman of the same age. Indeed, in the Melbourne sample the incidence of bridal pregnancy varies inversely with age at marriage. Excluding those with premarital births, 18 per cent of the women who married before age 20, but only six and five per cent of those who married at ages 20-24 and 25 or above, were pregnant when they married.[5] As

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4. (Continued from previous page)

systematically disguised in this way, in one case a hitherto concealed premarital conception came to light. The eldest child, who was eavesdropping on the interview, claimed that his mother had understated the year of his birth. His mother dismissed this, explaining to the interviewer that she was grateful for the opportunity of acquainting her son with the true circumstances of his conception.

5. These estimates are well below estimates derived from Australian vital statistics. For example, Basavarajappa (1968), defining a birth occurring within nine completed months of marriage as the product of premarital conception, estimated that since the 1930s at least half of all brides aged 15-19 and one-fifth of those aged 20-24 were pregnant at marriage. Ruzicka (1976b), basing estimates on single years of age and on the more lenient definition used in the present analysis, reported levels of premarital conception slightly lower than these. The comparatively low estimates for the Melbourne sample reflect, in part, sampling biases and fluctuations due to small numbers and, in the case of Basavarajappa's estimates, differences in definitions of premarital conceptions. However the major reason for the low sample estimates probably stems from real differences in the characteristics of the respondents and the base
(Footnote continued on next page.)

Basavarajappa (1968, op.cit.) noted, however, while the marriages of many Australians may have been precipitated by premarital conceptions, "... how many of the marriages of pregnant brides would have been contracted anyway, or how much of pre-marital pregnancy is in anticipation of marriage, is impossible to say." (p.133)

That women with premarital births married later than those with premarital conceptions has a simple explanation. Of two unmarried women of the same age and the same date of conception, the one whose premarital conception is legitimized by marriage will of necessity marry sooner than the one who bears an illegitimate child. That women with premarital births also married later than women who were not pregnant at marriage suggests that an unmarried mother is a less attractive potential marriage partner than a childless woman and, thus, if she marries at all would marry at a later age (Ryder and Westoff, 1971, op.cit.).

Women with premarital births will be excluded from all further analyses to eliminate possible distortions caused by their delayed marriages. In order to minimize age biases associated with the eligibility criteria for the sample and to enhance the comparability of different marriage cohorts, the analyses presented in this chapter will be restricted to women who married before age 25.

It can be seen from Table 4.2.3 that when such women are omitted from tabulations the sizes of most of the marriage cohorts are reduced by approximately 20 per cent, and that in each case the mean age at marriage

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5. (Continued from previous page)

population contributing to Australian vital statistics. For example, Melbourne contains large concentrations of Greeks and Italians, amongst whom premarital pregnancies are known to be rare (Ruzicka, 1977, op.cit.) and the sample, unlike Australian vital statistics, incorporates earlier experience in Italy and Greece. In addition, were premarital pregnancy to be associated with higher probabilities of marital dissolution, the stricture that Melbourne respondents' marriages be intact would automatically reduce the incidence of premarital conception in the sample.

TABLE 4.2.3: MEAN AGES AT MARRIAGE AND PERCENTAGES OF PREMARITALLY PREGNANT WOMEN AMONG NULLIPAROUS BRIDES MARRIED BEFORE EXACT AGE 25, BY YEAR OF MARRIAGE

Year of Marriage	Mean Age at Marriage	Standard Deviation	Percentage of Women Premaritally Pregnant	Percentage of Original Cohort	(N)
1929-39	21.0	5.2	9.0	87.6	134
1940-45	21.0	4.7	6.8	79.6	207
1946-50	21.0	4.6	7.5	75.7	280
1951-55	21.0	4.6	7.5	76.9	280
1956-60	20.9	4.5	10.1	81.3	296
1961-65	20.8	4.1	10.9	80.3	375
1966-71	20.8	3.6	12.2	79.2	518
Total	20.9	4.3	9.7	78.8	2090

declines to 21 years. The similarity in the mean ages at marriage of the members of the different cohorts is a convenient feature of these data. In particular, fertility comparisions should not be greatly confounded by marked differences in fertility due solely to differences in ages at marriage and, hence, to age-related variations in involuntary, physiological factors, at least at the beginning of marriage.

4.3 CUMULATIVE MARITAL FERTILITY

The timing of marital childbearing of each woman in the sample can be calculated by subtracting her exact age at marriage from her age, in months, at the time of each live confinement. Duration-specific fertility rates can then be calculated by dividing the total number of births occurring at exact durations of marriage by the estimated number of person-years lived at those durations. Cumulative fertility rates, calculated by summing duration-specific rates, are shown for various marriage cohorts in Table 4.3.1.

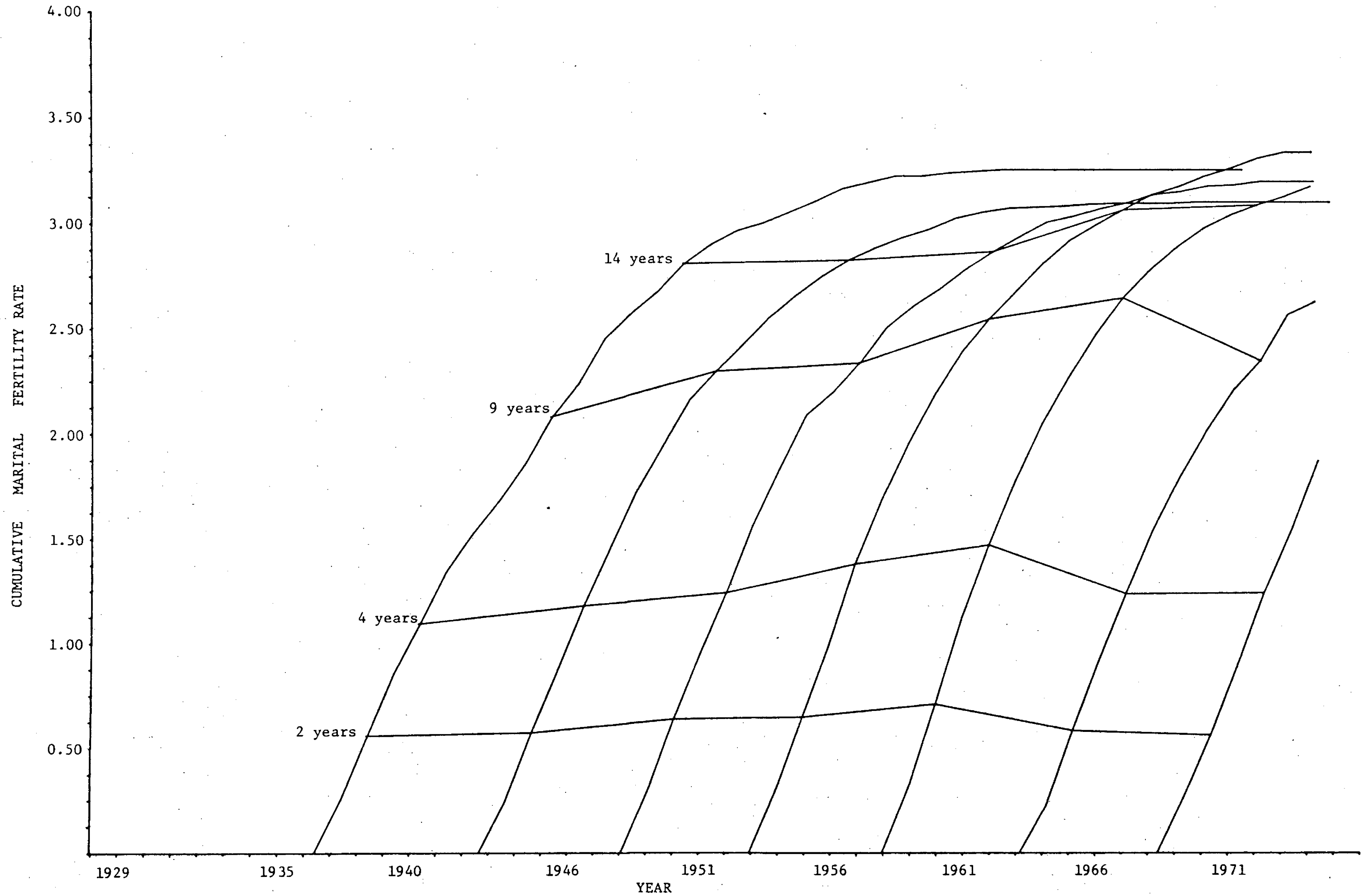
In order to facilitate comparisons between cohorts, cumulative marital fertility rates are shown in graphic form in Figure 4.3.1. In the figure the curvilinear lines represent cumulative fertility at single-year durations of marriage and originate on the abscissa at the approximate average years of marriage of the members of individual cohorts. These "cohort curves" have been connected at several durations of marriage (namely, two, four, nine and fourteen years). Had fertility remained constant each cohort would have the same fertility profile and the "duration lines" would run parallel to the horizontal axis (Friedlander and Goldscheider, 1978). Thus, the inflections of the lines provide a ready indication of inter-cohort changes in the rate of childbearing.

Before proceeding a cautionary note is in order. At the longest marriage durations in each marriage cohort the number of births and the total exposure times are small and, consequently, estimated duration-specific, and therefore cumulative, fertility rates will tend to be unstable. This is not critical for the older cohorts because at the long marriage durations, where fluctuations are most likely, fertility is either low or non-existent. In the case of the recent marriage cohorts, however, estimated fertility rates may be unstable at precisely those durations where changes in fertility patterns might be expected to occur. For example, only seven women in the

TABLE 4.3.1: CUMULATIVE MARITAL FERTILITY RATES BY YEAR OF MARRIAGE

Marriage Duration (years)	YEAR OF MARRIAGE 1929-39	1940-45	1946-50	1951-55	1956-60	1961-65	1966-71
1	0.25	0.25	0.29	0.30	0.32	0.23	0.27
2	0.56	0.57	0.64	0.65	0.71	0.59	0.57
4	1.10	1.18	1.25	1.39	1.47	1.24	1.25
6	1.53	1.73	1.84	1.96	2.05	1.80	1.87
9	2.08	2.30	2.34	2.55	2.65	2.35	-
14	2.81	2.83	2.87	3.07	3.09	-	-
19	3.11	3.06	3.10	3.32	-	-	-
24	3.25	3.10	3.21	-	-	-	-
29	3.26	3.11	-	-	-	-	-
Current	3.26	3.11	3.21	3.35	3.18	2.63	1.87
Approximate average year of marriage	1936	1943	1948	1953	1958	1963	1968

FIGURE 4.3.1: CUMULATIVE MARITAL FERTILITY RATES BY YEAR OF MARRIAGE



1966-71 cohort bore a child after five years of marriage and the corresponding total exposure time was only 20.8 person-years. Given numbers of this magnitude, a chance difference of one birth would cause the estimated duration-specific fertility rate (0.34) to fluctuate by 0.05 births per woman per year, or 14 per cent.

Women who had completed or almost completed their active childbearing spans by the time of the survey bore on average slightly more than three children each. The lowest average completed fertility (3.11 births) was experienced by those who married during 1940-45; the highest (3.35) was recorded for women who married between 1951 and 1955. Despite similarities in average completed family size, however, patterns of childbearing have not been constant in the recent past.

Many of those who married during the Second World War or the economic depression that preceded it may have been forced by adverse social conditions to forego childbearing during the early stages of marriage. This is reflected by the cumulative marital fertility curve of the 1929-39 cohort, which stood at 0.56 and 1.10 after two and four years marriage duration and exceeded two births per woman only at the end of nine years. Similarly, the cumulative fertility curve of the 1940-45 marriage cohort reached only 0.57 and 1.18 after two and four years of marriage. The effects of the heightened prosperity of the immediate post-War period, which helped to create the conditions that led to the "baby boom" of the 1950s, are evidenced for these women by rises in the cumulative fertility rates at the higher durations of marriage.[1] For example, women who married during the War contributed an average of 0.55 births

1. As mentioned earlier, the impact of immigration makes it difficult to relate measures of fertility derived from the Melbourne survey to those derived from Australian vital statistics: that a woman was resident in Melbourne in 1971 does not entail that her early childbearing took place in Australia.

each to their cumulative fertility rate during the fifth and sixth years of marriage, 0.57 births each between seven and nine years and an additional 0.53 births each during the next five-year span. For those who married before the War the "catching up" process was compressed to a large extent within durations 9-14 years, where the cumulative fertility rate jumped from 2.08 to 2.81 births per woman. Indeed, after recouping the fertility they had deferred earlier, the members of the 1929-39 cohort actually went on to have larger average family sizes than the members of the cohort immediately their junior.

The overall rate of family formation of the 1946-50 cohort was only slightly faster than that of the 1940-45 cohort. In contrast, women who married between 1951 and 1960 tended to have relatively high fertility during the first few years of marriage. The first indications of a change in the tempo of family formation are given by small rises in fertility at durations less than two years. These initial gains were sustained at longer durations, so that the gap between successive marriage cohorts continued to widen from one marriage duration to the next. For example, the cumulative fertility rate of the 1956-60 marriage cohort, the cohort to experience by far the fastest rate of family formation, reached 1.47 births per woman by four years marriage duration. This is 18 per cent higher than the fertility at the same duration of women who married during 1946-50, and 34 per cent higher than the fertility at the same duration of women who married during 1929-39. The 1951-55 and 1956-60 cohorts maintained their early leads, adding an average of 1.16 and 1.18 births respectively to their cumulative fertility rates at marriage durations 5-9 years. Thereafter, however, their marital fertility rates dropped below the levels of the earlier cohorts, and differences in cumulative fertility rates gradually began to disappear. Thus, although many of these women were still fecund at the time of the survey, we might expect their average completed family sizes to be very similar to those of women who married earlier.

The introduction and rapid dissemination of oral contraceptives in Australia in the early 1960s allowed (and perhaps even encouraged) many couples, who otherwise might not have done so, to defer childbearing early in marriage. The abruptness of the resulting change in the tempo of childbearing is demonstrated by the negative slopes of the duration lines linking the 1956-60 and 1961-65 marriage cohorts. Indeed, the disparity between the relatively low cumulative fertility of the two most recent marriage cohorts and the relatively high cumulative fertility of the 1956-60 cohort at every marriage duration is one of the most striking features of Figure 4.3.1.

In the past, changes in the tempo of family formation have tended to occur at marriage durations below five and above nine years. In the early years of marriage cohorts are differentiated by the extent to which their members deferred births, while in the later years they are differentiated by the extent to which their members recouped earlier deficits. With the exception of the 1929-39 cohort, fertility at durations 5-9 years remained remarkably constant, fluctuating within the range of 0.22 and 0.23 births per woman per year. The cumulative marital fertility rates of the 1961-65 and 1966-71 cohorts at two, four and, in the former case, nine years of marriage resemble closely those of the 1940-45 and 1946-50 marriage cohorts. Members of these earlier cohorts postponed births early in marriage, but caught up in the later years: the analysis presented in this section provides no clues as to whether members of the two most recent marriage cohorts will emulate the later childbearing behaviour of women who married during the 1940s in recouping deferred fertility.

4.4 SPACING OF BIRTHS AND FREQUENCY OF CHILDBEARING

The marital fertility rates examined in the last section reflect two dimensions of fertility. The first is the spacing of births; the second is the frequency of childbearing.

In the absence of fertility control these two factors will be complementary. The shorter the interval between births, the greater the expected number of children borne by fecund women during any given period (Henry, 1961b). If many couples are limiting their families, however, completed family size will be almost independent of the timing of childbearing because, whatever their lengths, the intervals between successive (higher-order) births describe the behaviour only of women who continue to reproduce (Srinivasan, 1972). Thus, differences between the cumulative fertility curves of two groups with identical childspacing patterns will be determined solely by the proportions in each who actually make the transition from one parity to the next. Or, two groups could exhibit similar overall patterns of cumulative fertility if comparatively high proportions of women with small completed family sizes in one were offset by comparatively high proportions with large families.

Table 4.4.1 shows the parity distributions and average family sizes of the members of the marriage cohorts examined in Section 4.3. The pre-1956 marriage cohorts, whose members can be expected to have completed their childbearing by the time of the survey, prove to be remarkably similar with respect to their parity distributions and their average family sizes. Approximately ten per cent of the women in each cohort bore fewer than two children, 60 per cent two or three and 30 per cent four or more children, resulting in average completed family sizes of the order of 3.1 to 3.3 births per woman. The 1956-60 marriage cohort shows slightly greater concentrations of women at parities three and four and a smaller proportion with five or

TABLE 4.4.1: PARITY DISTRIBUTIONS BY YEAR OF MARRIAGE

	YEAR OF MARRIAGE						
Parity	1929-39	1940-45	1946-50	1951-55	1956-60	1961-65	1966-71
0	5.2	1.4	2.1	3.2	2.0	4.3	39.0
1	8.2	9.2	5.7	6.8	7.4	14.1	39.5
2	25.4	30.5	30.3	27.2	25.7	48.5	18.0
3	29.9	27.1	28.3	27.2	32.2	25.9	3.3
4	11.9	14.0	17.9	14.6	21.6	6.9	0.2
5	11.2	11.1	9.6	12.1	6.4	0.3	-
6+	8.2	6.7	6.4	8.9	4.7	-	-
Total (N)	100.0 (134)	100.0 (207)	100.0 (280)	100.0 (280)	100.0 (296)	100.0 (375)	100.0 (518)
Average Family Size	3.26	3.11	3.19	3.28	3.04	2.18	0.86
Standard Deviation	2.23	1.61	1.69	1.81	1.34	0.92	0.84

more children, but it is possible that some of these women had not yet completed their families. In any case, applications of the Kolmogorov-Smirnov test and the t-test for the difference between means reveals no significant differences (α=0.05) between the parity distributions and average fertilities of any pair of the first five marriage cohorts. In light of these similarities, therefore, we may conclude that the differences observed in the cumulative fertility rates of these cohorts stemmed for the most part from variations in the timing of births. No inferences can be drawn from the parity distributions of the two most recent cohorts as few of the women married after 1961 would have completed their families by the time of the survey.

The means, 95 per cent confidence limits and medians of closed inter-live birth intervals are shown by birth order and year of marriage in Table 4.4.2. Two general patterns are evident in the average birth intervals contained in the table. First, within those marriage cohorts that have completed or almost completed childbearing, birth intervals tend to increase with birth order until the third or the fourth birth and to drop thereafter. This pattern is due to a combination of factors apart from differences in the incidence and efficiency of family planning at each parity. The fact that the interval between marriage and first birth is invariably shorter than the intervals between all subsequent births reflects both premarital conceptions[1] and the absence of post live birth amenorrhoea in the first birth interval. In the absence of contraception average birth intervals might be expected to rise monotonically with parity because the probabilities of conceiving and carrying a pregnancy successfully to term decline with age

1. See Table 4.2.3.

TABLE 4.4.2: MEANS, 95 PER CENT CONFIDENCE LIMITS AND MEDIANS OF CLOSED INTER-LIVE BIRTH INTERVALS (IN MONTHS) BY YEAR OF MARRIAGE AND BIRTH ORDER

		YEAR OF MARRIAGE						
Birth Order		1929-39	1940-45	1946-50	1951-55	1956-60	1961-65	1966-71
1	Mean	28.8±4.8	30.7±4.2	26.4±2.8	24.3±2.6	23.2±2.3	25.2±1.9	17.7±1.3
	Median	19.5	21.3	17.8	17.0	17.8	20.9	14.3
	(N)	(127)	(204)	(274)	(271)	(290)	(359)	(316)
2	Mean	45.7±6.6	38.4±3.6	37.4±3.2	32.7±2.7	28.2±2.0	30.3±1.5	23.0±1.5
	Median	34.5	30.9	30.4	27.6	23.9	27.5	23.2
	(N)	(116)	(185)	(258)	(252)	(268)	(306)	(111)
3	Mean	51.8±7.7	42.8±5.3	46.8±5.6	37.3±3.9	37.9±3.3	28.4±2.6	20.1±2.4
	Median	45.0	35.4	33.9	28.0	30.8	24.3	21.6
	(N)	(82)	(122)	(174)	(176)	(192)	(124)	(18)
4	Mean	40.9±6.3	49.8±8.5	49.7±7.7	39.8±5.8	35.8±4.0	29.3±6.0	
	Median	37.0	37.2	34.9	29.3	30.2	25.5	
	(N)	(42)	(66)	(95)	(100)	(97)	(27)	
5	Mean	39.6±9.6	45.2±10.6	41.4±9.2	41.6±7.7	25.3±6.0		
	Median	33.0	35.3	30.5	32.5	21.4		
	(N)	(26)	(37)	(45)	(59)	(33)		

(Henry, 1958). Since the time available for reproduction is finite, however, this tendency will be counterbalanced by one, noted by Sheps (1965) among American Hutterites, for women with large families to have shorter average birth intervals than those with small family sizes. In the table, for example, average second birth intervals are based on the reproductive histories of women with at least two children. A woman who bears exactly two children may contribute a second birth interval that is longer than the mean because of difficulties in conceiving. In contrast, a woman who goes on to have five or more children must typically have short characteristic birth intervals if she is to produce at least three more children within the relatively short active reproductive spans exhibited by the Melbourne respondents.[2]

These observations pertain strictly only to non-contracepting populations, but Young (1977b, op.cit.), after controlling for year of marriage, demonstrated that even with the high levels of contraceptive use of the Melbourne women the average lengths of birth intervals declined with increasing family size within each birth order. Further evidence is provided by Table 4.4.3, which shows the means and medians of closed birth intervals of women aged at least 40 years at the time of the survey, controlling for parity and birth order. At each birth order both the mean and median birth intervals tend to decrease with parity, while at each parity, the mean and median birth intervals tend to increase with birth order.

The comparison in Table 4.4.2 of average birth intervals of the same order across marriage cohorts provides an indication of changes in patterns of childspacing over time. In general, the intervals between births decline

2. For example, the average numbers of years between marriage and last birth of the 1929-39 through 1951-55 cohorts were only 10.7, 9.9, 10.0 and 9.0 respectively. The medians were 10.7, 9.5, 9.7 and 9.0 years.

TABLE 4.4.3: MEANS, 95 PER CENT CONFIDENCE LIMITS AND MEDIANS OF CLOSED BIRTH INTERVALS (IN MONTHS) BY PARITY AND BIRTH ORDER FOR WOMEN AGED 40 YEARS OR MORE

Birth Order		PARITY 1	2	3	4	5
1	Mean	44.7±16.3	22.8±4.3	23.5±4.3	19.1±3.5	16.8±3.3
	Median	31.8	28.5	23.8	17.7	16.1
	(N)	(30)	(91)	(107)	(72)	(59)
2	Mean		53.3±11.7	30.9±4.2	23.6±3.5	27.6±4.8
	Median		33.4	29.4	25.8	22.1
	(N)		(53)	(73)	(41)	(48)
3	Mean			51.9±8.3	30.7±7.1	31.2±3.0
	Median			39.7	29.7	26.0
	(N)			(55)	(29)	(35)
4	Mean				51.8±16.8	40.8±9.1
	Median				40.3	30.1
	(N)				(24)	(27)
5	Mean					37.4±8.8
	Median					32.2
	(N)					(21)

TABLE 4.4.4: LEVELS OF SIGNIFICANCE OF DIFFERENCES BETWEEN MEAN BIRTH INTERVALS OF WOMEN MARRIED IN DIFFERENT YEARS

Year of Marriage	Birth Order	YEAR OF MARRIAGE 1929-39	1940-45	1946-50	1951-55
1940-45	1	-			
	2	-			
	3	-			
	4	-			
	5	-			
1946-50	1	-	-		
	2	0.050	-		
	3	-	-		
	4	-	-		
	5	-	-		
1951-55	1	-	0.050	-	
	2	0.001	0.050	0.050	
	3	0.010	-	0.001	
	4	-	-	0.050	
	5	-	-	-	
1956-60	1	0.050	0.010	-	-
	2	0.001	0.001	0.001	0.010
	3	0.010	-	0.010	-
	4	-	0.010	0.010	-
	5	0.050	0.010	0.010	0.010

between successive marriage cohorts from 1940 to 1960. This indicates a gradual shift toward more rapid childbearing although, as we have already seen, this was not accompanied by increases in completed family size. The average birth intervals of the members of the 1929-39 cohort deviate from this scheme. After a slightly shorter first birth interval than that of women married during 1940-45, and substantial postponement of the second and third births, members of the 1929-39 cohort exhibited shorter subsequent birth intervals than those of the cohort immediately their junior, which suggests a recouping of fertility that had been deferred earlier.

Table 4.4.4 presents the results of t-tests performed to identify significant differences between the average birth intervals of the members of the first five marriage cohorts.[3] Somewhat surprisingly, only one of the differences observed between the birth intervals of the 1929-39, 1940-45 and 1946-50 cohorts proves to be statistically significant. While the average second and fifth birth intervals of the 1951-55 and 1956-60 cohorts are significantly different, it is apparent that the overall childspacing patterns of these two cohorts bear a closer resemblance to one another than to those of the earlier cohorts. Indeed, to some extent 1951 marks a change in broad patterns of childspacing. The comparatively long average birth intervals of women who married before that year indicate that many achieved some measure of success in spacing their births despite the relatively inefficient family planning methods widely available to them. That those who married during 1951-60 had short average birth intervals but did not have fertility far in excess of the earlier cohorts suggests that these women were more likely to employ contraception to limit the ultimate sizes of their families.

The ascription of "typical" childspacing patterns to different marriage cohorts on the basis of average birth intervals can, of course, be deceptive: the magnitudes of the 95 per cent confidence limits of the means indicate that the members of each of the pre-1961 cohorts, and especially the first three, were far from homogeneous with respect to the timing of births. Comparison of the means and medians in each cell of Table 4.4.2 reveals that the distributions of birth intervals are invariably skewed to the right. The values of the medians and, consequently, the extent of the skew vary with both year of marriage and birth order in much the same fashion as do the average birth intervals themselves.

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3. Average birth intervals specific to each birth order can be compared because the parity distributions of the women in each of these marriage cohorts are not significantly different and "an average interval ... is a weighted average for mothers of varying parity" (Pollard, 1975, p.411).

The cumulative marital fertility rates of the two most recent marriage cohorts suggested a pattern of family formation characterized by the widespread deferral of childbearing early in marriage, a pattern last seen among women who married during the late 1940s. This is not borne out by the average birth intervals of the 1961-65 and 1966-71 cohorts. The interval between marriage and first birth and first and second births of the 1961-65 cohort are only two months longer on average than those of women who married during 1956-60. All other birth intervals are considerably shorter than those recorded for the earlier cohorts.

The explanation for this apparent anomaly is that for women who are still within the reproductive span neither the interval between successive births nor the interval since the last birth is independent of the time of interview. In particular, the shorter the period of observation, the shorter the interval is likely to be (Balakrishnan et al., 1975). Relatively few of the women in the two most recent marriage cohorts had made the transition from one birth order to the next, but the fact that a woman had not reached a given parity during the limited time available does not preclude the possibility of her doing so later. Thus, the censoring of the reproductive histories of the most recently married women biases the (closed) birth intervals toward the fastest movers and obscures any lengthening in average birth intervals that might be occurring. Censoring bias could also explain the extremely short interval between the fourth and fifth births of the 1956-60 cohort.

Srinivasan (1970) has proposed using a fertility index based on the average time since last birth of women classified by parity in order to compensate for incomplete reproductive histories; but it is difficult to see why such a measure should be free of censoring bias. Censoring bias can be reduced or even eliminated if comparisons are restricted to the segments of the reproductive span that are common to all cohorts; but this procedure, when applied to birth intervals, limits one to an examination of women who have relatively long marriage durations. Another approach, and one which will be followed here, is to employ decrement tables that take into account the exposure times contributed by women with open-ended as well as closed birth intervals at each parity.

Life-table analyses of birth intervals have been carried out on Hutterite data by Sheps (1965, op.cit.) and on Canadian data by Balakrishnan et al. (op.cit.) and Pool (1978). The methodological implications of the technique have been examined with the aid of computer simulation models by Sheps et al. (1967 and 1970). These studies indicated that the inclusion of open-ended intervals in decrement tables compensates to a degree for censoring bias but fails to eliminate it completely. The reasons for this are two-fold. In the first place, no analytic technique can take into account births that have not occurred but that might occur after the maximum duration of exposure experienced by women who are still of childbearing age. Secondly, even if women are observed until the end of the reproductive period, biases will persist because of the finite nature of this span and because of variations between women with respect to factors such as fecundability. In order to minimize the first problem, Pool based some inter-cohort comparisons on the cumulative probabilities of reaching a higher parity within given marriage durations rather than on mean intervals between births. No solution has been found to the second problem but, as Sheps and her associates pointed out, a model - although imperfect - that partly adjusts for incomplete periods of observation is superior to one that simply ignores them.

A description of the method used to construct fertility decrement tables, together with tables calculated for specific birth orders within

TABLE 4.4.5: PARITY PROGRESSION RATIOS OBSERVED AT THE TIME OF THE SURVEY AND AS IMPLIED BY DECREMENT TABLES, ACCORDING TO YEAR OF MARRIAGE

	YEAR OF MARRIAGE					
	1929-50		1951-60		1961-71	
Parity	Observed	Implied	Observed	Implied	Observed	Implied
0	0.97	0.97	0.97	0.97	0.76	0.95
1	0.92	0.93	0.93	0.94	0.62	0.89
2	0.68	0.68	0.71	0.74	0.34	0.59
3	0.53	0.55	0.54	0.62	0.20	0.37
4	0.53	0.56	0.47	0.62	-	-

broad marriage cohorts, is contained in Appendix 4A. Table 4.4.5 presents the probabilities of moving from one parity to the next by the time of the survey and the life-time probabilities implied by the decrement tables. In each cohort and at each parity, the number of women at the longest marriage durations is small and, hence, the estimated probabilities of birth tend to be unstable. In order to reduce random fluctuations, the life-table parity progression ratios shown here have been truncated at the last interval for which the denominator of the birth probability is at least twenty women.

Similarities between the implied and observed parity progression ratios indicate that censoring bias is almost non-existent in the birth intervals of women who married before 1951 and in the first three intervals of those who married during 1951-60. An examination of the remaining pairs of parity progression ratios suggests, however, that the unadjusted data on the last two births of the 1951-60 cohort and on all births of the 1961-71 cohort are weighted in favour of the fastest movers. For example, only 76 per cent of the members of the 1961-71 cohort had reached parity one by the time of the

TABLE 4.4.6: CUMULATIVE PROBABILITIES OF MOVING FROM PARITY i TO PARITY i+1 WITHIN EXACT DURATIONS, AS IMPLIED BY DECREMENT TABLES, ACCORDING TO YEAR OF MARRIAGE

Parity (i)	Exact Duration at Parity i (months)	YEAR OF MARRIAGE 1929-50	1951-60	1961-71
0	12	0.27	0.31	0.25
	18	0.47	0.51	0.40
	24	0.58	0.64	0.54
	36	0.74	0.80	0.73
	48	0.81	0.88	0.84
	60	0.87	0.92	0.89
1	18	0.12	0.21	0.17
	24	0.29	0.42	0.32
	36	0.54	0.70	0.63
	48	0.69	0.81	0.78
	60	0.79	0.86	0.86
2	18	0.10	0.12	0.10
	24	0.19	0.27	0.25
	36	0.33	0.44	0.40
	48	0.45	0.53	0.51
	60	0.52	0.60	0.59
3	18	0.06	0.08	0.09
	24	0.12	0.18	0.16
	36	0.27	0.35	0.29
	48	0.36	0.43	0.37
	60	0.40	0.48	-
4	18	0.07	0.13	-
	24	0.16	0.24	-
	36	0.30	0.35	-
	48	0.37	0.39	-
	60	0.44	0.44	-

survey; but the life-table parity progression ratio indicates that given a long enough period of observation, and assuming that those who have not yet made the transition will have the same fertility patterns as those who have, 95 per cent of the cohort will ultimately bear at least one child.

An indication of the timing of childbearing is provided by the cumulative probabilities of moving from one parity to the next within given durations, as implied by the fertility decrement tables. These are shown at durations up to five years for the 1929-50, 1951-60 and 1961-71 marriage cohorts in Table 4.4.6.

The most striking change to occur in patterns of family formation since the late 1950s has been a shift in the timing of the first birth. For example, notwithstanding a slightly higher incidence of premarital pregnancy,[4] only 25 per cent of the women married after 1960 experienced a confinement within the first year of marriage as compared with 31 per cent of the women married during the previous decade. This gap widens within the next six months of marriage but declines thereafter, so that by the end of five years of marriage the deficit is negligible.[5]

The tendency for slower childbearing among the most recently married women relative to the previous cohort continues at parities one and above. Whereas these women were, on average, the slowest to produce a first birth, they appear to fall between the members of the 1929-50 and 1951-60 cohorts with respect to the spacing of subsequent births. Once again, however, despite a deferral of childbearing at the shorter durations, women who married during 1961-71 have the same probabilities of producing a second birth within five years of the first and a third birth within five years of the second as those who married during 1951-60.

Table 4.4.7 presents the distributions of family size observed at the time of the survey and completed family size implied by the decrement table parity progression ratios shown in Table 4.4.5. Since the observed parity progression ratios of women married before 1951 are almost free of censoring bias, the observed and implied parity distributions are virtually

4. Under the definition of premarital conceptions used in Section 4.2 (i.e. confinements occurring within eight completed months of marriage) twelve per cent of the women married after 1960, but only eight and nine per cent of those in the two earlier cohorts, were pregnant at marriage.

5. The recent trend toward the postponement of the first birth in Australia has been noted by Ruzicka (1976b, op.cit.).

TABLE 4.4.7: PARITY DISTRIBUTIONS OBSERVED AT THE TIME OF THE SURVEY AND AS IMPLIED BY DECREMENT TABLES, ACCORDING TO YEAR OF MARRIAGE

	YEAR OF MARRIAGE					
	1929-50		1951-60		1961-71	
Parity	Observed	Implied	Observed	Implied	Observed	Implied
0	2.6	2.6	2.6	3.5	24.4	4.8
1	7.4	7.2	7.1	5.7	28.9	10.6
2	29.1	28.7	26.4	23.7	30.8	34.5
3	28.2	27.4	29.7	25.4	12.8	31.3
4	15.3	15.1	18.2	15.9	3.0	18.8
5+	17.4	19.0	16.0	25.8	0.1	-
Total	100.0	100.0	100.0	100.0	100.0	100.0
(N)	(621)		(576)		(893)	

identical. By far the greatest divergence in the observed and implied parity distributions of the 1951-60 cohort occurs at parities five and above. Whereas no other divergence exceeds five per cent, application of life-table techniques produces an estimate of women with at least five children which is ten percentage points higher than the observed value of 16 per cent. The implied proportion of women ultimately reaching the highest parities may never be realized if women with fewer than five children at the time of the survey have since adopted effective contraception, if they were not already using it, in order to avert unwanted births.

The implied parity distribution of the most recently married women suggests a preponderance of completed families of two and, to a lesser extent, three children. It is important to note, however, that the ultimate values of the life-table parity progression ratios for the 1961-71 cohort - and, hence, the completed parity distribution which they imply - reflect a combination of fact and artifact. Part of the shift toward smaller completed family sizes is undoubtedly due to truncating the life-table parity progression ratios at shorter periods of exposure than those experienced by the members of the two earlier cohorts[6] as well as to the absence of information at parities four and above. Balanced against this is the possibility that the assumption of constant fertility patterns for the 1961-71 cohort is unrealistic. Women who managed to bear three or four children in the relatively short time available may have very different fertility patterns from those who did not. If this were so, the family building patterns of the members of the cohort would not be represented in an unbiased manner. In particular, the implied proportions of women reaching parities three and above may be over-estimates if those who have been successfully using contraception to space lower-order births continue to use it efficiently to terminate childbearing once they have borne as many children as they want.

The Melbourne survey provides other evidence of a strong aversion to voluntary childlessness and the one-child family and a widespread acceptance of (though not necessarily a desire for) the two-child norm (Ware, 1973, op.cit.). For example, while 90 per cent of the respondents would not have countenanced remaining childless and 80 per cent considered one-child families very undesirable, 79 per cent agreed that a family of two children is not too small. It is likely, therefore, that the implied percentages of women in the 1961-71 cohort ultimately bearing fewer than two children have been inflated as a result of long postponements of early births by a sizeable proportion of women and of the limited period of observation. Thus,

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6. For example, the ultimate probability of moving from parity one to parity two for the members of the 1961-71 marriage cohort is based on maximum period of observation of six years whereas the probability for the 1951-60 cohort is based on a maximum of ten. See Appendix 4A.

while over-estimations at both ends of the parity scale would suggest even greater heterogeneity among the most recently married women with respect to the spacing of births, the convergence toward completed families of two and three children which the life-table parity progression ratios imply is probably reasonable.

4.5 CONCLUSIONS

The examination of the childbearing patterns of Melbourne respondents who married before age 25 revealed differences in the cumulative fertility rates of the members of the five marriage cohorts defined between 1929 and 1960. In comparison with women married earlier, women who married during the 1950s tended to compress the bulk of their childbearing into the early years of marriage. For example, those married during 1929-39 averaged about 1.5 children within the first six years of marriage while women married during 1956-60 bore about two children each within the same marriage duration. As the parity distributions of the pre-1961 marriage cohorts were very similar at the time of the survey, it follows that the overall differences observed in the cumulative fertility curves of these cohorts stemmed principally from variations in patterns of childspacing.

The cumulative marital fertility rates of women who married during 1961-65 and 1966-71 proved reminiscent of those of women who married during the immediate post-War period, although this does not imply corresponding similarities in the timing and the frequency of childbearing of these cohorts. Analysis of fertility patterns, especially of the most recently married women, is complicated by the fact that the lengths of birth intervals and the values of parity progression ratios are not independent of marriage duration. To circumvent problems of censoring bias, fertility decrement tables were constructed for the three broad marriage cohorts employed in Chapter Three. This life-table approach indicated that the childspacing patterns of the members of the 1961-71 marriage cohort fell between those of the members of the 1929-50 and 1951-60 cohorts. Thus, the most recently married tended to postpone the first and, indeed, the second birth far longer than did women who married during the 1950s. There was also some evidence to suggest a return to the more heterogeneous childspacing patterns which characterized the family building of women married before 1951. In addition, the life-table parity progression ratios provided weak evidence for a slight decline in completed family size; although it must be reiterated that the strength of this supposition rests on the assumption that the members of the 1961-71 marriage cohort exhibited the same duration-specific fertility irrespective of the durations of marriage reached by the time of interview.

CHAPTER FIVE

FERTILITY DIFFERENTIALS

' ... 'Er 'usband - a nice man 'e was, too - 'e says to me, "Don't remind 'er of it, Mrs 'Arbottle, don't remind 'er of it." Whether she was frightened or whether she was 'urt by it I don't know, but she didn't 'ave no more children. "Lor!" I says to 'er time and again, "you'll get used to it, my dear, when you've 'ad nine of 'em same as me," and she smiled, but she never 'ad no more, none the more for that.'

'I suppose it does take some getting used to,' said Wimsey, 'but nine of them don't seem to have hurt *you*, Mrs Harbottle, if I may say so. You look extremely flourishing.'

Dorothy Sayers - "The Image in the Mirror" (1933)

5.1 INTRODUCTION

The 1904 New South Wales Royal Commission on the decline of the birth rate represents the first major inquiry to address itself to Australian fertility differentials. In the course of its deliberations on recent declines in the birth rate, which it traced to the "selfish" use of birth control by those who desired to avoid their obligations to the community, the Commission reported that average issues of marriages before the decline ranged from 4.32 for husbands in domestic occupations to 6.28 for husbands in agricultural pursuits. Wives born in New South Wales and married before 1881 were found to have "superior natural fertility" (p.12) to women born in the British Isles, although the fertility of those married later was found to have declined more than that of the overseas-born. Much medical evidence testified to the deleterious effect on the health of women of prevention of conception "even to the extent of leading to insanity." (p.18)

More recent census-based studies of fertility have directed themselves to those sources of fertility variation "about which there is more public, quantifiable evidence" (Hicks, 1971, p.43) than to those caused by "unlikely" variations in physiological determinants and "unprovable" changes in sexual behaviour. Borrie (1948), examining the 1911, 1921 and 1933 Censuses of Australia, reported that rural dwellers tended to have larger completed families than urban dwellers, manual workers larger families than professionals and white-collar workers, adherents to faiths demanding "relatively strict observance of certain religious principles"[1] (p.112) larger families than adherents to other faiths and the native-born larger families than immigrants.

1. Lutherans, Salvationists and Roman Catholics; fertility differentials by religion were also noted by Knibbs (1917) in the official report on the 1911 census.

Day's (1965, 1970 and 1971, op.cit.) analyses of the fertility of women who married before age 26 and who were at least 40 years of age at the 1954 and 1961 censuses pointed to the continuation of religious, residential and ethnic fertility differentials in Australia. In particular, Catholics consistently had more children than non-Catholics, rural dwellers more than those living in metropolitan areas, and the Netherlands-born more and the German-born fewer children than women born in other countries. More important, perhaps, were his findings that the relative frequencies of couples with fewer than two children and of couples with five or more children were declining within the various religious and ethnic groups and that the range of differences between groups were decreasing within each successive birth cohort. Ruzicka and Caldwell's (op.cit.) examination of the 1966 and 1971 censuses revealed that group fertility differentials have become smaller as average completed family size has declined but have not completely disappeared.

None of these Australian studies attempts a comprehensive analysis of the effects of age at marriage on fertility, although Day limited his analyses to women married before age 26 in an attempt "to keep to the barest minimum the effects of any involuntary sterility" (1971, op.cit., p.2044). Westoff (1975) argued that in the United States as late as 1970 age at marriage was probably the best single predictor of fertility and one whose importance had been insufficiently appreciated. Westoff and Ryder (1977a, op.cit.) summarized the importance of age at marriage for fertility as follows:

> "Age at marriage exerts such a powerful effect on fertility because it reflects the combination of many different influences, which either operate independently in the same direction or interact to reinforce each other. The younger the woman is at marriage, the earlier she is exposed to the risk of pregnancy at highly fecundable ages. Many marriages occur earlier than they would because of premarital pregnancy, a process that selects the more fecund women. Early marriage and/or early fertility forces many young people, both men and women, to leave school

> or forces women to stop work, and that, in turn, reduces exposure to interests and activities that may compete with marriage and the mother role." (p.286)

In his 1961 census analysis, Day (1971, op.cit.) found that after controlling for country of birth and religion a pronounced negative relation existed between age at marriage and completed fertility even among (fertile) Australian women who married before age 26.[2]

The analyses of Melbourne fertility patterns in the preceding chapter were restricted to women who married before age 25 in order to maximize the comparability of the different marriage cohorts. In doing so each marriage cohort was implicitly treated as a group homogeneous with respect to both the ages at marriage and the social characteristics of its members. In this chapter we shall examine first the relation between age at marriage and fertility and then the relations between various social characteristics of the respondents and their current family sizes.

Once again, analyses will be performed separately on the 1929-50, 1951-60 and 1961-71 marriage cohorts. Despite variations in social climate within these broad marriage cohorts,[3] there are a number of compelling reasons for employing them. First, these cohorts are sufficiently large to permit detailed analyses. Secondly, their use maintains consistency with results presented in Chapters Three and Four. Thirdly, sub-cohorts within each of these broad marriage cohorts have already been seen to be reasonably similar on a number of dimensions, such as mean birth intervals, parity distributions and parity-specific patterns of contraceptive use.

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2. This conclusion relates only to fertile women because Day eliminated childless women from the analysis in what he considered to be a standardization for premarital conception.

3. For example, the 1929-50 marriage cohort contains women who were married during the Depression, the Second World War and the immediate post-War period.

5.2 AGE AT MARRIAGE AND FERTILITY

Figures 5.2.1, 5.2.2 and 5.2.3 present cumulative marital fertility rates at single year durations of marriage according to age at marriage for the members of the 1929-50, 1951-60 and 1961-71 marriage cohorts. Ages at marriage have been classified as younger than 20 years, 20-24, 25-29, 30-34 and, where applicable, 35 years or older. These figures resemble Figure 4.3.1 in overall format but differ in that the cumulative fertility curves originate on the abscissae at average ages at marriage rather than average years of marriage. Thus, while the successive horizontal displacements of the curves correspond to exact marriage durations, they also provide an indication of the average ages of women at each point.

At the longest marriage durations in the younger age at marriage categories, and for ages at marriage exceeding 29 years, the numbers of women on which the estimated fertility rates are based are small[1] and hence relatively large sampling fluctuations occur. These estimates have nevertheless been included, both for the sake of completeness and to give a general indication of trends for late marriers and at long durations of marriage.

Figure 5.2.1 presents four series of cumulative duration-specific fertility rates for women married between 1929 and 1950 corresponding to average ages at marriage of 18.4, 22.2, 26.7 and 32.2 years. The cross-bars link the curves at one, four, nine, fourteen and nineteen years of marriage.

After one year of marriage, the members of the youngest marriage group have borne an average of 0.32 children as compared with 0.11 children for women who married at age 30 or above. It appears that during the first year of marriage the fertility of teenaged brides is augmented by premarital

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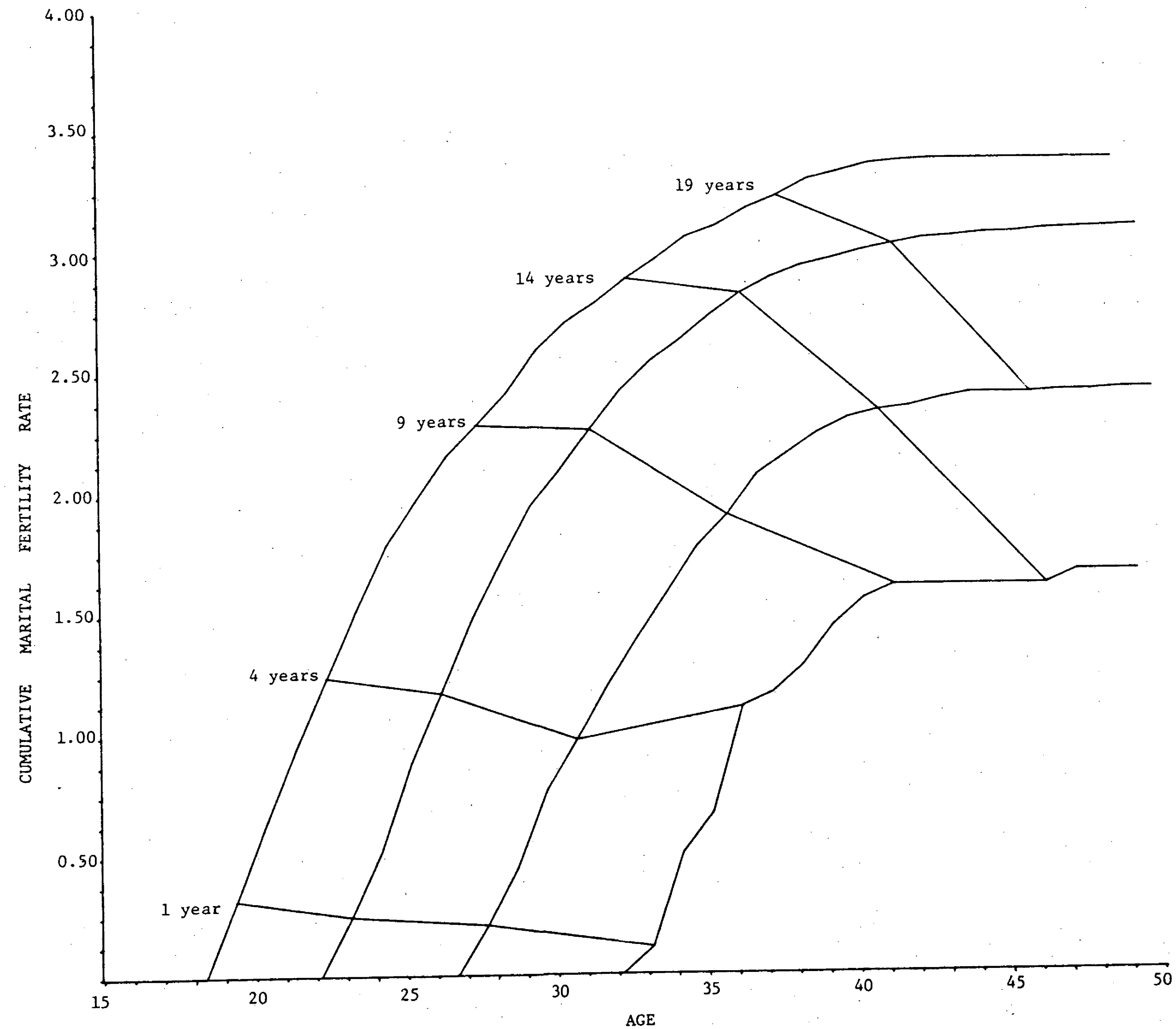
1. For example, only 18 women in the 1929-50 marriage cohort married between ages 30 and 34. See Table 5.2.1.

FIGURE 5.2.1: CUMULATIVE MARITAL FERTILITY RATES BY AGE AT MARRIAGE FOR WOMEN MARRIED DURING 1929-50



conceptions and relatively high fecundity while that of the oldest brides is diminished by lower fecundity and a lower incidence of premarital conceptions.[2] The combination of a higher incidence of premarital conceptions and higher fecundity at one end of the scale, and fewer premarital conceptions and lower fecundity at the other, produces an almost linear decline in the cumulative marital fertility rate with age at marriage by the end of the first year of marriage.

There is little to differentiate the fertility of women who married before age 20 and between ages 20 and 24 years during the next three years of marriage, but the rate of childbearing of those who married at ages 25-29 has already started to slacken. It is true that the curve of the oldest brides shows an upswing at four years marriage duration but these rates, based as they are on the experience of only 18 women, are undoubtedly unstable. Between four and nine years the fertility of women who married at ages 25-29 shows another slight downswing, and in this case the pattern is perpetuated in the cumulative fertility rates of those married after age 29. Indeed, after nine years of marriage the members of the latter group have virtually completed their childbearing. During the next five years of marriage the tempo of childbearing of women married at ages 25-29 slows to such an extent that most have completed their families by fourteen years of marriage. At this point, the excess fertility of teenaged brides over that of women married at 20-24 years (2.89 to 2.83 births per woman) is ascribable principally to the excess fertility of the former during the first year of marriage (0.32 to 0.24 births per woman). While the fertility rates of these two groups are decreasing by fourteen years marriage duration, the decline is more pronounced among women who married in their early twenties, so that

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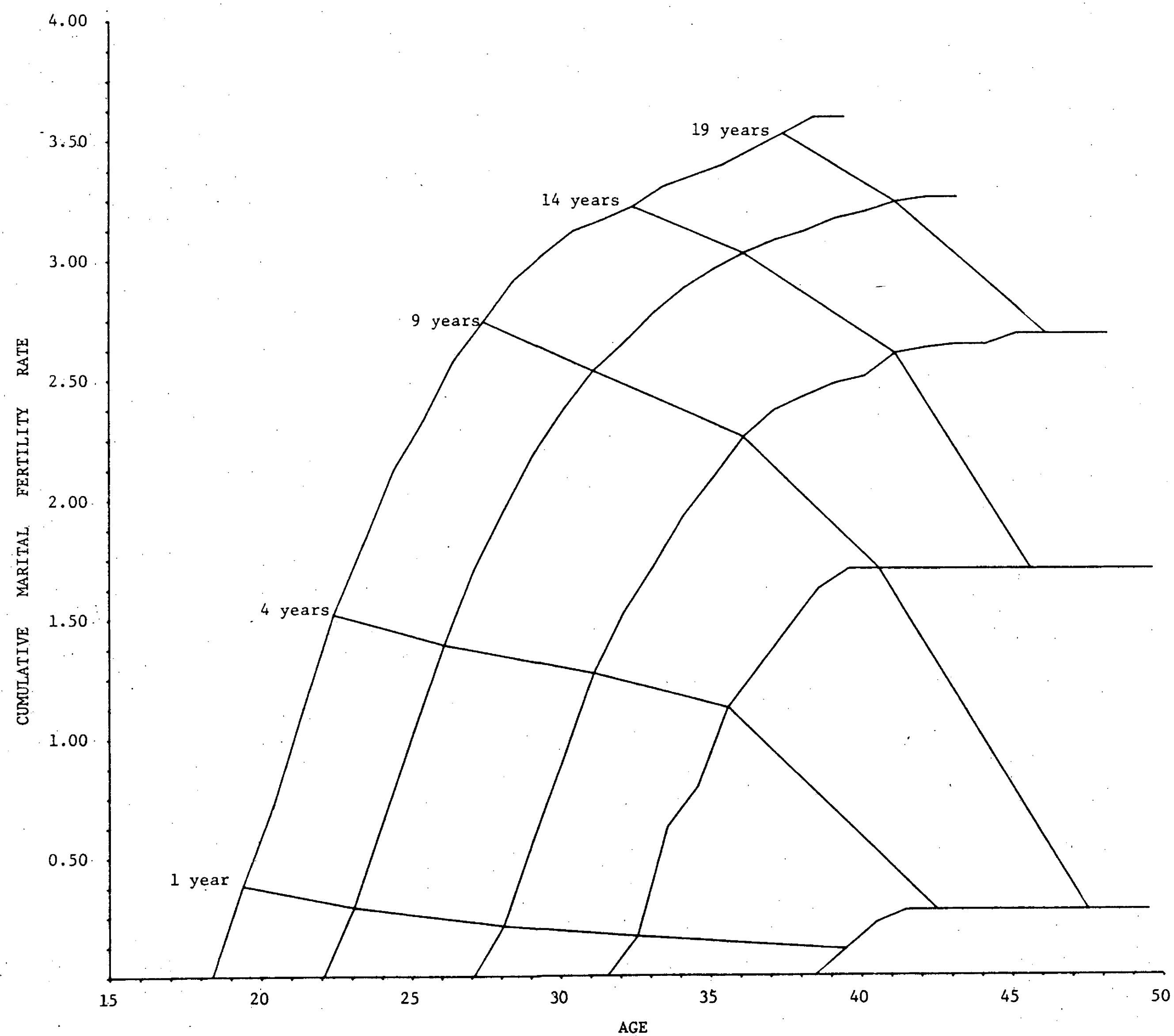
2. See Section 4.2.

these women ultimately bear fewer children on average than do the members of the youngest marriage group. The fact that each of the cumulative fertility curves lies virtually parallel to the horizontal axis beyond age 40 indicates that, whatever the ages at which they married, most women completed childbearing by their late thirties.

To summarize, Figure 5.2.1 demonstrates a loose inverse relation between age at marriage and both duration-specific and completed fertility. This is immediately obvious in the case of completed fertility, with women marrying at ages younger than 20, 20-24, 25-29 and 30-34 producing, on average, 3.38, 3.10, 2.42 and 1.67 children respectively. For women married at age 25 or older the effect of age at marriage appears with increasing intensity from at least nine years of marriage onward. In contrast, whether women marry when they are younger than 20 or 20-24 years of age, their fertility diverges hardly at all between marriage durations of at least one year and no more than fourteen years. The difference between the completed fertilities of these two groups reflects both the excess fertility of teenaged brides in the first year of marriage and their higher fertility after fourteen years of marriage have elapsed.

Figure 5.2.2 shows age at marriage-specific cumulative fertility rates for women who married between 1951 and 1960. While patterns broadly similar to those just observed appear in Figure 5.2.2, subtle differences do exist. For example, the tendency for cumulative fertility rates at given marriage durations to decline monotonically with age at marriage is, if anything, more regular here than it was among women who married earlier. And, unlike the preceding results, the fertility of women who married before age 20 exceeds that of women who married at ages 20-24 not only at the end of the first year of marriage and again after fourteen years, but at all marriage durations between the two.

FIGURE 5.2.2: CUMULATIVE MARITAL FERTILITY RATES BY AGE AT MARRIAGE FOR WOMEN MARRIED DURING 1951-60



The major differences between the fertility patterns of women married during the two periods, however, lies in the faster tempo of childbearing of the members of the 1951-60 cohort. In order to facilitate comparisons between the figures, cumulative fertility rates are presented in Table 5.2.1. Within each age at marriage group, women in the 1951-60 cohort have borne at least as many children and, in the majority of cases, more by the same marriage durations as had women who married before 1951. This is already obvious at four years marriage duration, by which time women who married at ages younger than 20, 20-24 and 25-29 years had borne an average of 1.52, 1.39 and 1.27 children as compared with 1.24, 1.17 and 0.98 births each for women married in these age groups in the 1929-50 cohort. The members of the later cohort who married before age 30 sustained their early lead during the next five years of marriage: women who married before age 20 average 1.23 children each as opposed to 1.05 for those married between 1929 and 1950, while the comparable figures for women married at ages 20-24 are 1.15 and 1.09 and at ages 25-29 are 0.99 and 0.93. This trend is reversed, however, at durations of marriage greater than nine years. For example, women who married before age 20 bear 0.47 children each between the ninth and fourteenth years of marriage as compared with 0.60 children for those in the 1929-50 cohort. The comparable figures for the 20-24 year marriage group are 0.49 and 0.57. Nevertheless, declines in the rates of "late" childbearing relative to those of the 1929-50 marriage cohort are not sufficient to offset the gains in fertility in the early years of marriage so that, age for age, women who married during 1951-60 produce larger families, on average, than did women who married earlier.

These observations mirror those made in Section 4.3 on the cumulative fertility patterns of women who married before exact age 25 during 1951-55

TABLE 5.2.1: CUMULATIVE MARITAL FERTILITY RATES BY AGE AT MARRIAGE AND YEAR OF MARRIAGE

	AGE AT MARRIAGE													
	Younger than 20 years			20-24 years			25-29 years			30-34 years			35 years or older	
	Year of Marriage			Year of Marriage			Year of Marriage			Year of Marriage			Year of Marriage †	
Marriage duration (years)	1929-50	1951-60	1961-71	1929-50	1951-60	1961-71	1929-50	1951-60	1961-71	1929-50	1951-60	1961-71	1951-60	1961-71
1	0.32	0.35	0.42	0.24	0.29	0.17	0.21	0.21	0.21	0.11	0.17	0.19	0.11	0.05
4	1.24	1.52	1.38	1.17	1.39	1.17	0.98	1.27	1.28	1.11	1.13	1.12	0.28	0.58
9	2.29	2.75	2.58	2.26	2.54	2.25	1.91	2.26	2.12	1.61	1.71	1.85	0.28	0.95
14	2.89	3.22	-	2.83	3.03	-	2.34	2.61	-	1.61	1.71	-	0.28	-
19	3.23	3.53	-	3.03	3.24	-	2.41	2.70	-	1.67	1.71	-	0.28	-
Current	3.38	3.60	3.06	3.10	3.26	2.44	2.42	2.70	2.12	1.67	1.71	1.85	0.28	0.95
Average age at marriage	18.4	18.4	18.6	22.2	22.1	21.9	26.7	27.1	26.8	32.2	31.6	32.3	38.5	40.8
Standard deviation	1.2	1.2	1.0	1.4	1.4	1.3	1.3	1.5	1.5	1.6	1.4		2.2	6.2
(N)	(196)	(178)	(298)	(425)	(398)	(595)	(130)	(118)	(141)	(18)	(24)	(43)	(18)	(20)

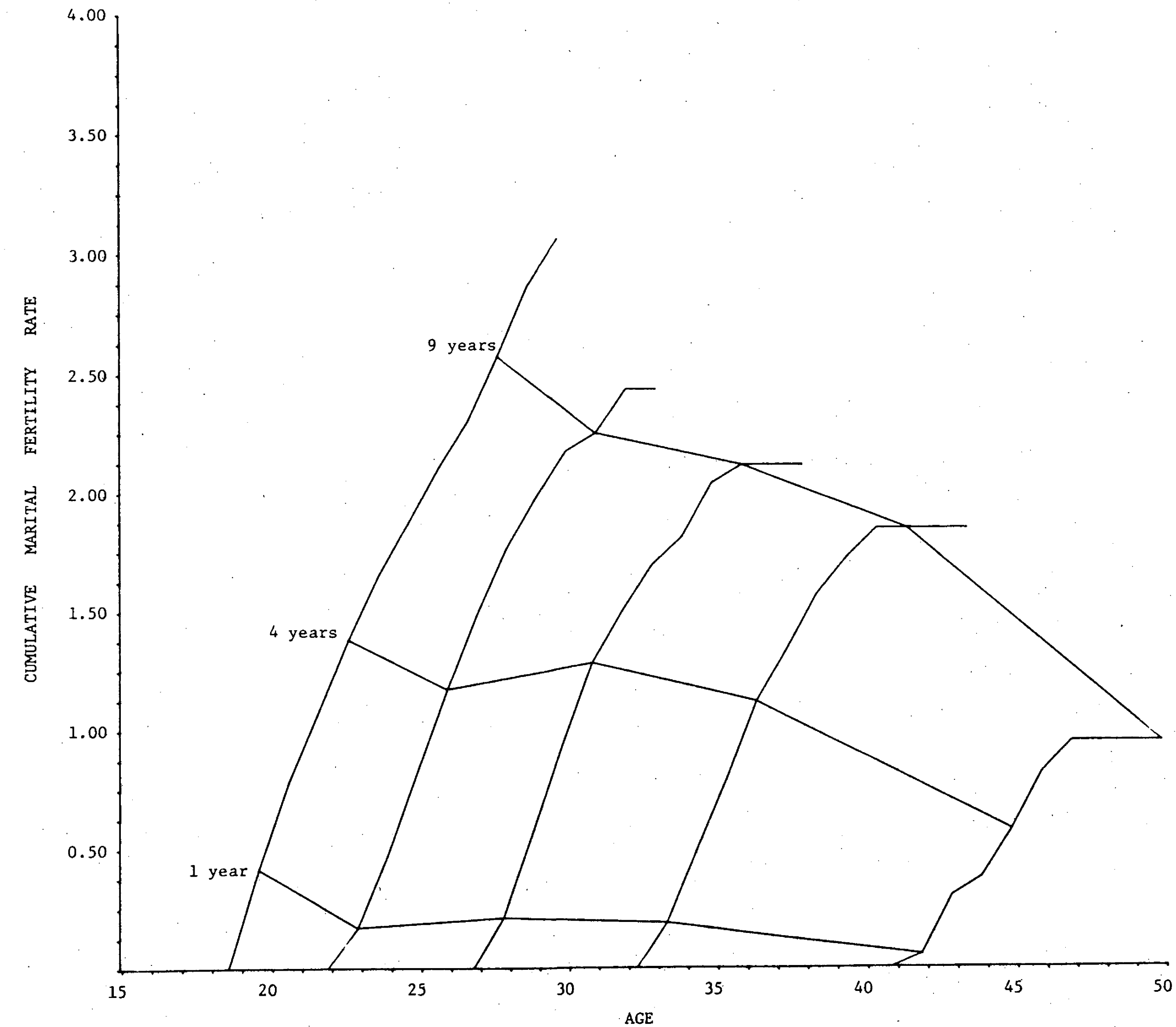
† No member of the 1929-50 marriage cohort was aged 35 years or older at the time of marriage.

and 1956-60. That women marrying during the 1950s compressed the bulk of their childbearing into a shorter span than did women who married during the previous two decades may be due not so much to the presence of some new behavioural influence as to the absence of the disruptive social and economic pressures engendered by the Depression and the Second World War. This is not to say, however, that other factors, such as increased employment opportunities for married women, greater tolerance for working mothers, rising standards of living and the introduction and dissemination of reliable contraception at the time when most of these women would have completed their families, can be ignored.

Cumulative marital fertility curves for women who married after 1960 are shown in Figure 5.2.3. Amongst these women the relation between age at marriage and fertility at the end of the first year of marriage departs markedly from the regular, inverse pattern observed in Figures 5.2.1 and 5.2.2. Those who married before age 20 demonstrate the highest fertility during the first year of marriage of the three cohorts under examination while those married at 20-24 demonstrate the lowest. In addition, there is little to differentiate the fertility of women who married at 20-24, 25-29 and 30-34 years.

The explanation for the large disparity between the fertilities at the end of the first year of marriage of women who married before age 20 and at ages 20-24 (0.42 to 0.17 births per woman) may be rather complicated. Given both a rising incidence of premarital conceptions and an unprecedentedly high level of illegitimate births to teenagers in Australia after 1960 (and this despite presumably greater access to easy and reliable contraception) (Basavarajappa, 1968, op.cit.), it is reasonable to infer that teenage premarital sexual activity was on the upswing. It is likely, therefore, that

FIGURE 5.2.3: CUMULATIVE MARITAL FERTILITY RATES BY AGE AT MARRIAGE FOR WOMEN MARRIED DURING 1961-71



excessive teenage marital fertility reflects an unusually high proportion of young brides whose marriages were precipitated by premarital pregnancies. That these girls became pregnant at all suggests either that they were taking no contraceptive precautions or that they were using contraception inefficiently. Moreover, in a group of unprotected or insufficiently protected women the more fecund can be expected to be the fastest conceivers.[3] By the early twenties (at which ages most women marry) there is thus a residual group comprising sexually active successful contraceptors, less fecund non-contraceptors and the hitherto sexually inactive. When they marry, contraceptors may find their earlier contraceptive success conducive to continued success in postponing the first birth should they, for example, wish to work after marriage. Similarly, the sexually inactive, having had more time to establish themselves in non-domestic roles before marriage, may not be contemplating childbearing during the first few years of marriage.

Women who married at ages 25-29 during the 1960s exhibit slightly higher fertility after one year of marriage than those who married at 20-24 years, although the difference is not statistically significant. Indeed, the fertility of 25-29 year-old brides at the end of the first year of marriage (0.21 births per woman) does not vary between marriage cohorts. For many of those marrying at relatively advanced ages, an awareness that age-related fecundity impairments may curtail childbearing altogether could strengthen the desire to start their families as soon as possible. Thus, apart from variations due to sampling fluctuations and possible differences in incidences of premarital conceptions, the deficits in fertility at one year's marriage duration between women married at 25-29 years and women

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3. It would be overly simplistic to ascribe the high fertility of teenaged brides after one year of marriage solely to increases in the proportion of teenagers who were sexually active before marriage. Rather, it is the contribution of the more fecund non-contraceptors and inefficient contraceptors among these women that elevates fertility.

married at 30-34 and 35 years or older are probably more physiological than volitional in origin.

Although the fertility after four years of marriage of women who married before age 20 is still higher than that of women who married at age 20 or older, it is interesting to note that their fertility is as low as it is. Teenaged brides contribute an average of 0.96 births each to their cumulative fertility rate between one and four years marriage duration. The additional fertility of those who married at 20-24 years is slightly greater again (1.00) and that of women who married at 25-29 years is slightly greater again (1.07). This is a reversal of the "natural" order, seen in the previous cohort, whereby duration-specific fertility declines with increasing age at marriage. Bearing in mind that a large proportion of the first births to the youngest brides were premaritally conceived, these data suggest that a significant proportion of these women belatedly discovered contraception and postponed the second birth, just as a large proportion of the women who married at 20-24 years delayed the first. That fertility between one and four years of marriage of women who married in their late twenties is higher again is probably due to the same force that shaped their fertility during the first year of marriage; namely, a desire to bear children as soon as possible.

By the end of the next five years of marriage the familiar pattern has reasserted itself, with women who married under 20, at 20-24 and 25-29 years bearing an average of 1.20, 1.08 and 0.84 children respectively. In each case, the fertility is less than that achieved by corresponding groups of women in the 1951-60 marriage cohort.

To recapitualte, within each of the three broad marriage cohorts examined, fertility at each marriage duration bears a loose inverse relation to age at marriage.[4] Supplementary information on parity distributions and average birth intervals presented in Appendix 5A indicates that in the 1929-50 and 1951-60 marriage cohorts, most of whose members had completed childbearing by the time of the survey, the differences observed between the fertility patterns of women who married in their teens and in their early twenties stem more from differences in the numbers of children borne than from differences in the spacing of births. In contrast, the differences in the fertility patterns of women who married before age 20 and at ages 20-24 during 1961-70 reflect differences in both the parities achieved and the timing of childbearing during the early years of marriage. The relatively flat trajectories of the cumulative fertility curves of the older brides result in each case primarily from their lower parities.

The most striking finding in this section is the strong inverse relation between age at marriage and fertility among women who have completed their childbearing. Some researchers have been hard pressed to see why age at marriage should strongly influence ultimate family sizes in societies in which knowledge about, access to and use of contraception is now almost universal and in which few women desire large families. Such a view has been expressed by Ruzicka and Caldwell (op.cit.):

> "Because both the pattern of contraceptive behaviour as well as family size norms have changed, advancement, or conversely, the postponement of marriage, becomes largely dissociated from the ultimate family size goals. Early age at marriage does not of necessity result in a very large number of children as used to be the case in the past. Neither does the postponement of marriage prevent the couple from having what is today considered a large family, say four children, if they so desire." (p.296)

4. A recent American study (Trussell and Menken, 1978) indicated that the pace of childbearing was related to age at first confinement. In particular, while the marital status of mothers at first birth proved to have little influence on subsequent fertility, younger ages at first birth were found to be associated with higher levels of completed fertility and with higher proportions of unwanted children.

Part of the explanation for this negative relation is that, whatever the ages at which they marry, few women bear children after reaching age 40. A further explanation may lie in the interaction between fertility goals, contraceptive use, contraceptive failure and fecundity. A simple example may help to make this clear. Consider two fecund women who marry at ages 20 and 30 respectively and both of whom wish to bear two children. In the first place, the older bride has a smaller probability of achieving her reproductive goal than the younger: secondary sterility is more likely to prevent her from doing so both because the probability of becoming sterile increases with age and because, fecundability being age-related, she is likely to take longer to bear her children. In other words, her period of exposure to risk of sterility between marriage and second birth is longer and her probability of becoming sterile in any month during this period is greater. Secondly, the younger bride not only has a longer fecund span to contend with, and is thus exposed to the risk of contraceptive failure for a longer period after bearing her children, but must use contraception more efficiently given that her average fecundability over her remaining potentially fertile years is higher. Thus, everything else being equal between the two, the younger bride is the more likely to overshoot, and the older bride the more likely to undershoot, her reproductive target.

5.3 FERTILITY DIFFERENTIALS

Gutman (1960) distinguished two approaches to the study of group fertility differentials: one in which the groups whose fertility differences are being analysed are regarded as "discrete universes of facts" and the other in which the different subgroups of the population are considered to be "samples drawn from a single universe of phenomena" (p.113).

The first approach entails the computation of summary measures to describe the fertility of each of the separate universes and a subsequent comparison of these summary measures. Such analyses are appropriate for the examination of how fertility, or other demographic and social characteristics, varies by social group. In Gutman's view, however, they often fail to address themselves to the larger questions concerning the major sources of variation in the fertility of the population as a whole.

For example, in his analysis of the fertility of women aged 40-44 at the 1961 census, Day (1971, op.cit.) found the greatest range of fertility differences to be among country of birth categories. In particular, Dutch-born women averaged the highest fertility with 4.30 children and the German-born averaged the lowest with 2.58, as compared with an average of 3.03 children for the remainder. Yet, on the basis of his data, one would be justified in concluding that maternal ethnicity adds little to our understanding of Australian fertility for the simple reason that the Dutch-born accounted for only 0.92 per cent, and the German-born only 0.54 per cent, of the total.

Gutman's second approach entails the application of analysis of variance-based techniques in order to determine what proportion of the total variation in fertility is attributable to differences within groups and what proportion to differences between groups. The advantages of such techniques is that they reveal not only the existence of fertility differentials, as will a set of cross-tabulations, but that they measure the extent and the overall importance of such differences. In light of these advantages, an analysis of variance-based technique, namely stepwise linear regression,[1] will be employed in the analyses of current fertility presented here.

The Melbourne survey collected a wealth of quantitative and qualitative information on the social characteristics of the respondents and their husbands. The means and standard deviations of quantitative variables included in the regression analyses (e.g., age at marriage, years of education) are shown for the three broad marriage cohorts in Table 5.3.1. Dummy variables created from qualitative variables (e.g., country of birth, religion) are shown in Table 5.3.2, and interaction terms created by combining both continuous and dichotomous variables are shown schematically in Table 5.3.3.

Among the continuous variables of Table 5.3.1, marriage duration has been calculated by subtracting age at marriage from the lesser of age 50 and age at the time of interview. This truncation was performed because, although fertility is linked positively with marriage duration, one cannot expect this relation to persist beyond the upper limit of the fecund span. In addition, for Australian-born women the variable 'Duration of Residence' has been assigned a value of zero rather than age at the time of interview. Accordingly, this variable has been used only for women born outside Australia, i.e. in interaction with the dummy variables 'Country of Birth'.

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1. This technique was discussed and applied in Section 2.2., and the tables presented in the present regression analyses follow the formats of tables in the earlier chapter.

TABLE 5.3.1: CONTINUOUS VARIABLES INCLUDED IN REGRESSION ANALYSES OF CURRENT FERTILITY

	YEAR OF MARRIAGE					
	1929-50		1951-60		1961-71	
Variable	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
(1) Age at Marriage (years)	22.24	3.33	22.71	4.27	22.28	4.02
(2) Marriage Duration (years)	25.20	3.19	15.67	2.94	5.13	2.97
(3) Education (years)	8.84	2.73	9.21	3.06	9.86	3.21
(4) Husband's Education (years)	9.37	3.14	9.56	3.31	10.26	3.52
(5) Roman Catholic Education (years)	1.77	3.41	2.28	3.80	1.97	3.77
(6) Husband's Roman Catholic Education (years)	1.59	3.33	2.20	3.85	1.99	3.78
(7) Duration of Residence in Australia (years)	5.62	10.26	4.71	7.54	3.53	6.29
Number of cases	769		736		1094	

TABLE 5.3.2: DUMMY VARIABLES INCLUDED IN REGRESSION ANALYSES OF CURRENT FERTILITY

Original Variable	Dummy Variables	YEAR OF MARRIAGE 1929-50 Mean	1951-60 Mean	1961-70 Mean
Country of Birth	* (8) Australia	0.671	0.599	0.588
	(9) United Kingdom	0.107	0.096	0.082
	(10) Southern Europe	0.112	0.202	0.236
	(11) Other Europe	0.070	0.057	0.049
	(12) Other	0.040	0.045	0.045
Husband's Country of Birth	*(13) Same as wife's	0.878	0.855	0.797
	(14) Different from wife's	0.122	0.145	0.203
Nominal Religion	(15) None	0.083	0.102	0.115
	(16) Roman Catholic	0.278	0.345	0.294
	*(17) Church of England	0.315	0.216	0.228
	(18) Protestant	0.248	0.219	0.194
	(19) Orthodox	0.031	0.082	0.129
	(20) Other	0.044	0.037	0.040
Importance of Religious Teachings	*(21) Important	0.691	0.659	0.541
	(22) Guidelines only	0.217	0.246	0.300
	(23) Unimportant	0.092	0.095	0.159
Frequency of Formal Religious Observance	*(24) None	0.536	0.526	0.626
	(25) Occasional	0.142	0.154	0.142
	(26) Two or more times per month	0.322	0.321	0.232
Husband's Nominal Religion	(27) None	0.113	0.129	0.141
	(28) Roman Catholic	0.276	0.333	0.299
	*(29) Church of England	0.302	0.230	0.209
	(30) Protestant	0.234	0.190	0.181
	(31) Orthodox	0.034	0.084	0.129
	(32) Other	0.042	0.034	0.041
Parental Family Size	(33) Raised in Institution	0.005	0.005	0.007
	*(34) 1-4 children	0.650	0.696	0.730
	(35) 5-6 children	0.203	0.178	0.173
	(36) 7 or more children	0.142	0.121	0.090
Husband's Parental Family Size	(37) Raised in Institution	0.014	0.018	0.010
	*(38) 1-4 children	0.588	0.630	0.694
	(39) 5-6 children	0.221	0.192	0.174
	(40) 7 or more children	0.177	0.160	0.122

continued

TABLE 5.3.2 continued

Original Variable	Dummy Variables	YEAR OF MARRIAGE 1929-50 Mean	1951-60 Mean	1961-70 Mean
Childhood Community	(41) Farm	0.055	0.030	0.037
	(42) Town with fewer than 10 thousand inhabitants	0.251	0.272	0.272
	(43) Town with 10 to 100 thousand inhabitants	0.124	0.154	0.127
	*(44) City with 100 thousand inhabitants or more	0.564	0.543	0.559
Husband's Childhood Community	(45) Farm	0.049	0.024	0.036
	(46) Town with fewer than 10 thousand inhabitants	0.235	0.274	0.261
	(47) Town with 10 to 100 thousand inhabitants	0.126	0.179	0.142
	*(48) City with 100 thousand inhabitants or more	0.584	0.519	0.556
Pregnancy Status at Marriage	*(49) Not pregnant	0.932	0.917	0.898
	(50) Pregnant	0.068	0.083	0.102
Worked Immediately after Marriage	*(51) No	0.581	0.384	0.250
	(52) Full-time paid employment outside home	0.307	0.518	0.681
	(53) Part-time or worked in home or family business	0.112	0.098	0.069
Husband's Occupation	(54) Professional	0.086	0.111	0.130
	(55) Managerial	0.133	0.121	0.068
	*(56) Clerical	0.150	0.147	0.173
	(57) Skilled	0.306	0.304	0.261
	(58) Semi-skilled	0.189	0.189	0.213
	(59) Unskilled	0.138	0.126	0.155
Number of cases		769	736	1094

TABLE 5.3.3: INTERACTION TERMS INCLUDED IN REGRESSION ANALYSES OF CURRENT FERTILITY

	Age at Marriage	Education	Husband's R.C. Education	Duration of Residence	Religion	Importance of Religion	Parental Family Size	Childhood Community	Worked after Marriage	Country of Birth x Religion
Age at Marriage					*				*	
Education	*				*			*	*	*
Husband's Education		*	*	*					*	
R.C. Education		*	*		*	*				
Country of Birth	*	*		*	*			*		
Husband's Religion			*		*					*
Importance of Religion		*			*					*
Religious Observance					*	*				
Husband's Parental Family Size							*			
Husband's Childhood Community								*		
Pregnancy Status	*	*			*	*			*	

* Interaction terms.

There is no reason why continuous variables, such as age at marriage and education, should be linearly related to fertility. In order to test for the possibility of non-linearity, therefore, continuous variables were transformed into both dummy variables and quadratics.

Some variables that might influence the fertility levels of individuals, such as income, have not been included at all. The reasons for the omission of income from the analyses are three-fold. First, although current incomes of both spouses were sought, eleven per cent of the women either did not know or refused to report their husbands' incomes and 32 per cent of the numerical responses were, on the respondents' own admissions, guesses. Secondly, income can be expected to be closely related to variables, such as education and husband's occupation, that have been included. Thirdly, one might also expect that income would be related to age, and through age to the stage of the family cycle a couple has reached.[2] Thus, household income at the time of the survey need not reflect family income at the time a woman was bearing children.

The respondents were asked whether they had worked before marriage, whether they worked at different stages of the family cycle (e.g., before childbearing, before the children went to school or at different stages of their schooling) and whether they were currently working. Current fertility is unlikely to be differentiated by labour force participation before marriage as 91 per cent of the members of the sample worked before they married. Of the remaining information about labour force participation, only that pertaining to work experience at the outset of marriage has been used. The reason for this

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2. At the aggregate level, for example, median incomes of the husbands of the Melbourne respondents tend to increase with age among white-collar workers but to show an inverted U-shaped pattern with age among manual workers.

is that current employment status may bear little relation to earlier behaviour, while questions about work experience at later stages of the family cycle presuppose that a woman has had children.

The results of the regression analysis for the 1929-50 marriage cohort are presented in Table 5.3.4. In the table, variables found to have statistically significant effects on fertility ($\alpha = 0.05$) are arranged in decreasing order from the greatest positive standardized regression coefficient. The numbers in parentheses placed next to the variable names correspond to the ordering of variables in Table 5.3.1 and Table 5.3.2. Under the regression model, the predicted family size of a woman equals the sum of the products of her value on each of the significant variables and the corresponding unstandardized regression coefficient, and the intercept.

The expected fertility of each woman is at least partly determined by her age at marriage. Indeed, age at marriage has the greatest negative effect on fertility and the greatest effect overall. A woman with no significant social characteristics who married at age 20 has a predicted family size of 3.17 children: were she married at age 25 this prediction falls to 2.67 children, and were she married at age 30, to 2.04 children. It should be noted that the relation between current fertility and age at marriage, measured in years, is not linear; rather, the linear relation exists between the square of age at marriage and fertility. Thus, the difference between the fertility of women with no significant characteristics who married at age 30 and at age 25 (0.63 births per woman) exceeds the difference between the fertility of women who married at age 25 and at age 20 (0.50 births per woman).

The underlying relation between age at marriage and fertility is modified if a woman has any of the significant characteristics. Roman

TABLE 5.3.4: REGRESSION ANALYSIS OF CURRENT FERTILITY OF WOMEN MARRIED DURING 1929-50

	MEAN	STANDARD DEVIATION			
CURRENT FERTILITY	3.05	1.80			
Variable	Mean	Standard Deviation	Standardized Regression Coefficient	Unstandardized Regression Coefficient (B)	95% Confidence Limits of B
Roman Catholic (16) x Husband Roman Catholic (28)	0.225	0.418	0.175	0.753	±0.297
Pregnant at Marriage (50)	0.068	0.251	0.165	1.182	±0.478
Australian-born (8) x 5-9 years R.C. Schooling (5)	0.081	0.272	0.137	0.903	±0.444
British-born (9) x Roman Catholic (16)	0.014	0.119	0.100	1.512	±0.991
Education (3) x Religion Unimportant (23)	0.866	2.825	-0.076	-0.048	±0.043
Education (3) x Born in "Other" Europe (11)	0.676	2.603	-0.088	-0.061	±0.046
Full-time Employment (52) x Not Pregnant (49)	0.298	0.457	-0.117	-0.461	±0.260
Age at Marriage squared x 10^{-2} (1)	5.057	1.565	-0.196	-0.225	±0.075
Intercept				4.065	±0.116
Multiple correlation coefficient (R)		0.430			
R squared		0.185			
Standard error of estimate		1.635			
F-test statistic		21.542			
Determinant		0.746			

Catholicism enters the equation in a number of ways: if both spouses are Catholic, if the woman is Australian-born and has had 5-9 years of Catholic schooling (almost all of such women being, in fact, Roman Catholic) or if she is a British-born Catholic. For example, we would predict an average family size of 4.68 children for a British-born Roman Catholic who married at age 20. Were her husband also Roman Catholic our prediction would rise to 5.43.

The only variable unassociated with Catholicism to exert a positive influence on fertility is the occurrence, or suspected occurrence, of a premarital pregnancy. Everything else being equal, the expected fertility of women who were classified as being premaritally pregnant is 1.18 births higher than women who were not.

Education serves to depress the family sizes of those to whom religious teachings were unimportant or who were born in "Other" (i.e. non-Southern) Europe. For example, if a woman has had ten years of schooling and considers religion to be unimportant in her day-to-day life[3], we would subtract 0.48 births from the family size predicted on the basis of her age at marriage and any other significant variables. Were she also born in Western Europe, we would subtract a further 0.61 births from the prediction. Thus, were both she and her husband Roman Catholic, the cumulative effect of education in interaction with both her attitude toward religion and her birthplace (1.09 births) would more than counterbalance the positive impact of Catholicism (0.75 births).

The remaining negative effect relates to women who were not premaritally pregnant and who worked full-time outside the home before bearing their first

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3. The exact wording of the question was: "In guiding your life, would you say that the teachings of religion were - very important - quite important - guidelines only - or not relevant?"

child. For the members of the 1929-50 marriage cohort, labour force participation at the beginning of marriage of those who were not premaritally pregnant reduces expected family sizes by 0.46 children.

Table 5.3.5 presents the results of the regression analysis performed on the current fertility of women who married during 1951-60. The variables that emerge here bear some similarities to those that proved significant in the previous regression.

In the first place, age at marriage is also a significant determinant of fertility among these women. In contrast to the earlier regression, however, marriage duration is also important. For example, given two women who are similar in all respects except that one has been married for 20 years and the other for 15 years, the predicted family size of the woman with the longer marriage duration exceeds that of the one with the shorter marriage duration by 0.27 births. That marriage duration enters the equation suggests both that some members of the cohort had not completed childbearing and the possibility that within this cohort family sizes may have declined over time.

Roman Catholicism helps to raise fertility but, again, the effects of Catholicism are felt only in interaction with other variables. The strongest positive effect is ascribed to Roman Catholic women who consider religious teachings to be an important guide to life. Couples in which both spouses are Catholic also have larger families than couples in which they are not; but unlike the previous regression in which the effect of religion was independent of birthplace, this effect is contingent on the wife's being Australian-born.

Education again has a negative impact on fertility of non-Southern Europeans but its negative effect on the fertility of Southern Europeans is even stronger.

As in the previous table, full-time participation in the labour force at the beginning of marriage serves to lower the fertility of women who were not

TABLE 5.3.5: REGRESSION ANALYSIS OF CURRENT FERTILITY OF WOMEN MARRIED DURING 1951-60

	MEAN	STANDARD DEVIATION			
CURRENT FERTILITY	2.98	1.69			
Variable	Mean	Standard Deviation	Standardized Regression Coefficient	Unstandardized Regression Coefficient (B)	95% Confidence Limits of B
Roman Catholic (16) x Religion Important (21)	0.298	0.457	0.144	0.533	±0.306
Parental Family Size 7+ (36)	0.121	0.326	0.113	0.583	±0.342
Roman Catholic (16) x Australian-born (8) x Husband Roman Catholic (28)	0.124	0.329	0.101	0.518	±0.409
Marriage Duration squared x 10^{-2} (2)	2.541	0.919	0.085	0.157	±0.119
Age at Marriage squared x 10^{-2} (1) x Part-time Employment (53)	0.532	1.981	-0.073	-0.063	±0.060
Education (3) x Born in "Other" Europe (11)	0.610	2.593	-0.082	-0.054	±0.042
Education (3) x Southern European-born (10)	1.107	2.556	-0.139	-0.092	±0.047
Full-time Employment (52) x Not Pregnant (49)	0.492	0.500	-0.173	-0.586	±0.228
Age at Marriage squared x 10^{-2} (1)	5.339	2.239	-0.265	-0.200	±0.051
Intercept				3.817	±0.109
Multiple correlation coefficient (R)		0.470			
R squared		0.221			
Standard error of estimate		1.501			
F-test statistic		22.897			
Determinant		0.455			

premaritally pregnant. In addition, regardless of whether they were pregnant, women who worked part-time immediately after marriage have lower than average fertility. The strength of this effect, however, depends on the ages at which women married. Thus, a woman who worked part-time directly after her marriage at age 20 can be expected to bear 0.25 fewer children than a woman similar in every respect save this early work experience. For women who married at ages 25 and 30, the reductions in fertility attributable to part-time employment are 0.39 and 0.57 births.

Table 5.3.6 presents the results of the regression analysis on women who married during the eleven-year period preceding the survey. Because of the relatively short marriage durations of these women, marriage duration is by far the most important determinant of fertility. Nevertheless, variables similar or identical to some that appeared in the two preceding regressions also appear in the table. The square of age at marriage again has a significant negative effect on current fertility, although it is evident that the relative importance of this variable for fertility is small during the early years of marriage. As in the 1951-60 marriage cohort, Roman Catholic couples in which the wife was Australian-born have significantly higher fertility than other couples. Premarital pregnancy emerges as an important determinant of fertility just as it did among women who married before 1951.

The respondents' expressions of the importance of the teachings of religion as guides for daily life prove to be significant either alone or in combination with education: both women who stated that religious teachings are unimportant and women who considered religious teachings only as guidelines to behaviour (the latter variable in interaction with years of education) tend to have lower than average fertility. Once again, full-time employment immediately after marriage of women who were not premaritally pregnant has a strong negative effect on current family size.

TABLE 5.3.6: REGRESSION ANALYSIS OF CURRENT FERTILITY OF WOMEN MARRIED DURING 1961-71

	MEAN	STANDARD DEVIATION
CURRENT FERTILITY	1.41	1.10

Variable	Mean	Standard Deviation	Standardized Regression Coefficient	Unstandardized Regression Coefficient (B)	95% Confidence Limits of B
Marriage Duration (2)	5.125	2.965	0.629	0.233	±0.016
Pregnant at Marriage (50)	0.102	0.303	0.106	0.382	±0.176
Roman Catholic (16) x Australian-born (8) x Husband Roman Catholic (28)	0.085	0.279	0.102	0.402	±0.168
Education (3) x Religious Guidelines (22)	3.187	5.110	-0.065	-0.014	±0.010
Age at Marriage squared x 10^{-2} (1)	5.126	2.110	-0.082	-0.043	±0.001
Religion Unimportant (23)	0.159	0.366	-0.100	-0.298	±0.135
Full-time Employment (52) x Not Pregnant (49)	0.638	0.481	-0.109	-0.249	±0.110
Intercept				0.619	±0.047

Multiple correlation coefficient (R)	0.701
R squared	0.491
Standard error of estimate	0.785
F-test statistic	149.720
Determinant	0.655

It is clear, then, that a number of common threads run through the regressions. Whatever the year in which they married, the age at which women marry has a significant negative effect on fertility quite independent of any other characteristics that might prove important. Moreover, the effect of age at marriage on fertility is felt with increasing intensity as age increases. As argued in the last section, much of the effect of age at marriage on fertility is physiological, but this is not to deny that age at marriage is itself partly indicative of, and determined by, social characteristics of the respondents. However, the sampling criteria of the Melbourne survey, particularly those associated with marital status, preclude a formal analysis of social determinants of marriage.[4]

The occurrence of premarital conceptions to women who married before 1951 or after 1960 serves to elevate current fertility. Women who married before 1951 and who were pregnant when they married average 1.18 more children than women who are similar in all other respects save pregnancy status. We have argued elsewhere that the premaritally pregnant are preternaturally fecund. The significance of this variable in the first but not the second marriage cohort suggests the intervention of social factors, namely increased accessibility and acceptability of reliable contraception. For example, oral contraceptives came on the market too late to be of much service to most of the women who married before 1951. The reappearance of premarital pregnancy in the regression analysis on the most recently married is due principally to the fact that the childbearing of these women is by no means complete. Consequently, current fertility is weighted toward early marital experience and, thus, gives undue emphasis to the first birth. Even so, the fertility of

4. Given the requirement that all women be married, for example, an analysis of the Melbourne data could never show that within one ethnic or religious group proportionately fewer women married than in the population as a whole.

the premaritally pregnant is only 0.38 live births in excess of that of other women, and we might expect this difference to disappear entirely by the time the members of this cohort have completed their families.

Roman Catholicism, in interaction with other variables, emerges as a strong positive influence on fertility in each of the regressions. Day (1968) speculated that Catholic doctrine influences fertility through a mechanism more complex than the advocacy of the desirability of large families and the proscription of "unnatural" methods of birth control. Although Catholic doctrine has indeed traditionally been pro-natalist, he considered its influence to be contingent on the position of Roman Catholics in the wider community:

> "... where Catholics are a majority there is no need to feel threatened or at bay *as a Catholic*, and hence, no particular incentive either to seek out co-religionists for support and example, or to attach oneself more closely to the Church and its teachings ...." (p.46)

On the other hand, where Catholics see themselves as a sizeable, and even politically significant[5], minority pro-natalist teachings may gain special appeal. Ware (1975, op.cit.) echoed these arguments when she noted that in Australia "... there is the additional factor that the influence of Irish Catholicism is very marked ... and the Irish have a very long tradition of defending the faith against external threats." (p.370)

Post-war immigration, especially from Italy, has served to swell the Australian Catholic community while at the same time introducing different strains into the Catholic system of values that had evolved in Australia. Day (1964) argued that the typical immigrant from a predominantly Roman Catholic country would have values and aspirations different from those of

5. From its birth during the "Cold War" of the early 1950s to its demise in the late 1960s the Democratic Labor Party, an anti-communist Catholic offshoot of the Australian Labor Party (itself dominated by Irish Catholics), contributed significantly to the balance of power in Australian politics.

both the Australian Catholic community she was entering and the Catholic community she had left. First, she grew up a member of a Catholic majority; secondly, her emigration differentiates her from her peers. Having broken with tradition to the extent of leaving her homeland, it is conceivable that she would be more amenable to modifying other traditional aspects of behaviour such as childbearing and labour force participation in the formal sector. Thus, the most informative social characteristic of this woman is not that she is a Roman Catholic but that she is an immigrant.

These arguments appear to have some application here. In no regression does the single fact that a woman is Roman Catholic bear significantly on her current fertility. Rather, this characteristic enhances fertility only in interaction with one or more other variables.[6]

Amongst the members of the 1929-50 marriage cohort Roman Catholicism proved to be significant if both spouses were Catholic, if the respondent were Australian-born with 5-9 years of Catholic schooling or if she were a British-born Catholic. The significance of the first of these variables suggests that having a Roman Catholic husband helps to reinforce Catholic attitudes as they pertain to childbearing, or that having a non-Catholic husband erodes them. Moreover, in the 1929-50 cohort, 44 per cent of the Catholic women whose husbands were also Catholics were native-born Australians. While Australian Catholic schooling is sufficient to influence fertility on

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6. Commenting on fertility differentials in Australia during the 1891-1911 period, Hicks (op.cit.) cautioned that high Roman Catholic fertility relative to that of other denominations may have been a function more of social class than religious belief. The existence of Catholic - non-Catholic fertility differentials that cannot be fully explained by socio-economic factors have been well documented in North America (see, for example, Burch, 1966; Long, 1970) although more recent evidence(Balakrishnan et al., op.cit.; Jones and Westoff, 1979) suggest that these differences are fast disappearing. The second round of the Princeton study (Westoff et al., 1963) indicated that fertility varied with ethnic origin among American-born Roman Catholics, with Catholics of Irish extraction manifesting higher fertility than those of Italian origin.

its own, it would also serve to reinforce Catholic pro-natalist values.[7] Finally, British-born Roman Catholics are undoubtedly similar in many respects to Australian Catholics, coming as they did to a predominantly British culture, albeit with antipodean modifications, in which Catholics form an important minority.

The results of the regression on the first marriage cohort intimate, then, that the fertility of Australian- and British-born Catholics might exceed that of other Catholic women. The analysis of the 1951-60 cohort offers stronger evidence of a divergence in childbearing patterns among the members of the Catholic community. In the first place, although Roman Catholic respondents for whom religion is an important arbiter of daily behaviour have larger than average families quite independent of their husbands' religions and their own birthplaces, the only Catholic *couples* to have significantly high fertility are those in which the wife was Australian-born. Secondly, the family sizes of Southern Europeans tend to decline with increasing education despite the fact that 63 per cent of the Southern European women in the cohort were Roman Catholic. A rift in the Catholic community is further evidenced by the regression analysis on the most recent marriage cohort in which the only significant "Catholic effect" to emerge again involved both spouses being Roman Catholic and the wife Australian-born.

While adherence to Catholic doctrine may reinforce positive attitudes toward childbearing, the lack of adherence ro religious doctrine, whatever one's nominal religious affiliation, appears to have the opposite effect. In the 1929-50 marriage cohort, the predicted family sizes of women who considered the teachings of religion irrelevant to the exigencies of everyday life were found to decline with increasing education. This variable emerged singly

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7. See also Ware's (1975, op.cit.) analysis of the fertility behaviour and attitudes of immigrants in Melbourne.

in the regression analysis on women who married after 1960, while the fertility of those who looked to religious teachings only as a guide to behaviour also declined with years of education. One might speculate that in any group the more worldly are the most likely to break with convention, one aspect of which is religion, another aspect of which is an ideal of domesticity in which children and motherhood play a central role. Moreover, it is noteworthy that, in two of the three instances in which the respondents' opinions of the importance of religion emerged, the strength of the effect depended upon education, and that this variable appeared on its own only in the most recent, and the best-educated, cohort.[8] Thus, while education would almost certainly foster "unconventional" attitudes (as indicated by opinions on religion), it is only among women who are in some way innovative that education lowers fertility. The explanation for this relation might be that a better-educated woman has more interests outside the home, greater opportunities for pursuing such interests, higher material aspirations which a relatively large family would endanger and, consequently, a stronger motivation for controlling fertility than her less-educated sister.

Immigrants are also innovative to the extent that they have deliberately chosen a new homeland which, presumably, offers greater opportunities and material benefits for them and their children. In the first cohort the fertility of immigrants from "Other" (i.e. non-Southern) Europe and, in the second, the fertility of Southern Europeans as well, declines with years of education.

8. It might also be noted that in no regression did the frequency of attendance at religious services, either on its own or in combination with other variables, prove important.

In each of the regressions, full-time participation in the workforce at the beginning of marriage exerted a negative influence on the fertility of women who were not premaritally pregnant. In the regression on the 1951-60 cohort, part-time employment at the beginning of marriage in combination with age at marriage proved to be significant as well.

Richmond (1974), examining increases in the proportion of married women entering the Australian labour force during each intercensal period between 1947 and 1966, noted that young mothers have shown an increasing willingness to work outside the home. In addition, she found that while children have become less of a bar to their mothers' working, the participation rates of married women tended to peak in the mid-forties (by which age most women have completed childbearing) and that within age groups the proportion of mothers working declined with increasing family size. Ruzicka and Caldwell (op.cit.) studied increases in female labour force participation rates between 1961 and 1971 in conjunction with declines in fertility over the period, but did not "attempt to resolve the problem of the direction of the causal relationship between women's economic activity and their fertility" (p.257). Young (1977b, op.cit.) pointed out that a compression of the active childbearing span[9] " leads to an increasingly younger age of the mother when the last-born child is sent off to school and when the last child leaves home ... [and] is a significant factor in the recent increase in the workforce participation of married women." (p.201) Given no increase in age at marriage, compression of the childbearing

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9. Such a compression occurred among members of the 1951-60 cohort who married before age 25, although their family sizes did not differ significantly from those of the members of earlier marriage cohorts. See Section 4.4.

span would have this effect even in the absence of a decline in fertility.

The National Population Inquiry (op.cit.) reported that the average completed family sizes of women in the labour force at the 1954 and 1966 censuses were lower than those of women not in the labour force, and that the lowest fertility of all was recorded for wives in professional, administrative and clerical occupations. While the authors acknowledged that the relation between work-force participation and fertility is very complex, they concluded that their analysis lent some support to the suggestion that the pressure for small families rises with the proportion of women employed, and especially the proportion working in "career" occupations.

Ware (1976, op.cit.) argued that since census data refer only to a single moment of time, they cannot show "whether wives have fewer children in order to work, or whether wives who have fewer children for other reasons nevertheless find it easier to remain in the work-force." (p.413) Her detailed analysis of the work experiences of the members of the Melbourne sample led her to the tentative conclusion that it is not work experience that influences fertility but fertility that influences the decision to work:

> "The great majority of working wives are not career women devoted to non-familial roles, nor do they plan their families to fit in with fixed work-force participation intentions. Wives who are working are not markedly more likely to practise contraception nor to desire no further children at any given parity. The alternative hypothesis: that wives who have fewer children for other reasons are more likely to participate in the work-force remains." (p.426)

Ware stressed that the major causal factor in this relation is not infecundity (although it is possible, of course, that some subfecund or infecund wives will consciously substitute paid employment for the occupation of rearing the children they were unable to bear). Rather, she gave paramount importance to motivational factors, such as women's educational aspirations for their children, that serve not only to depress fertility but, by depressing fertility, make it easier for women to continue working or to return to work after bearing children.

Ware's emphasis of motivational factors seems reasonable[10] but the results of the regression analyses presented here suggest that her conclusions are wrong. Were full-time labour force participation at the beginning of marriage to influence the current fertility of only the most recently married, we would conclude that its effect is a transient one, influencing the timing of marital childbearing but not completed family sizes. The appearance of this variable (as well as part-time employment in the 1951-60 cohort) in the regression analyses on women who, by and large, have completed their families suggests that married women who work outside the home before childbearing may acquire a taste for the former at the expense of the latter. This is not to say that a woman who works immediately after marriage will be unwilling to bear children or that a woman who bears children as soon as possible after marriage will be loth to enter the labour force at a later date. Rather, a woman whose early married life is spent working instead of childbearing may not only be more familiar with and more attracted by interests outside the home but may also be more appreciative of the benefits of an extra income. Thus, she is probably more likely to be enthusiastic about returning to the work-force in middle age than a woman who has never worked during her married

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10. Her statement that working and non-working wives of the same parity are almost undifferentiated by contraceptive use is therefore questionable. Motivations alone cannot affect fertility. Perhaps, whatever the incidence of usage, working wives are more highly motivated than their non-working peers to use contraception efficiently.

life.[11] Indeed, in the 1929-50 marriage cohort, 58 per cent of the non-premaritally pregnant women who worked full-time immediately after marriage were working full- or part-time at the time of the survey, as opposed to 41 per cent of the women in the residual group. Comparable figures for the members of the 1951-60 cohort are 51 and 44 per cent.

Thus far we have been investigating sources of systematic variation in the current family sizes of the members of different marriage cohorts. While the identification of variables that bear on current fertility tells us about fertility differences at the time of the survey, we can also examine the differential progressions of fertility since the beginning of marriage. Ideally, this would entail the selection of groups with mutually exclusive significant characteristics in order to show the "pure" effect of each variable on fertility. For example, were a regression analysis to yield only two significant social characteristics, being Roman Catholic and working after marriage, we could contrast the cumulative fertilities of non-working Roman Catholics and working non-Roman Catholics at the beginning of each year of marriage. In addition, we might wish to examine the joint effect of these two variables by looking at the fertility of Roman Catholics who worked after marriage. As each of the regression analyses yielded a considerable number of significant variables, however, the isolation of groups of women who possess only one significant social characteristic causes such a depletion of numbers as to render our original intention impracticable. An alternative approach, and the one followed here, is to examine the cumulative fertilities of women with a characteristic of interest regardless of whether they possess other significant characteristics. In the example

11. It is interesting to note that the actual occupations of working mothers appear relatively unimportant for fertility. Ware (ibid.) reported that only four per cent of the Melbourne respondents were mothers employed in professional occupations and that "straining" the definition to include clerical workers as well only raised this percentage to nine.

above, this would entail looking at the fertility of Roman Catholics irrespective of labour force participation and the fertility of working wives irrespective of religion.

Figure 5.3.1 compares the average fertilities of two groups, one with consistently high current fertility and one with consistently low current fertility, with the average fertility at single year durations of marriage of all women in the 1929-50 marriage cohort. Figures 5.3.2 and 5.3.3 present similar information for the 1951-60 and 1961-71 marriage cohorts. The formats of these figures resemble those of figures presented earlier in this chapter, with the cumulative fertility curves originating on the abscissae at average ages at marriage, but with the proviso that fertility has been measured as averages rather than rates in order to retain consistency with the regression analyses. These two systems of measurement will, of course, yield identical estimates as long as the number of women at each marriage duration is non-decreasing; and, again, small numbers of women at the longest marriage durations in each marriage cohort may lead to relatively large fluctuations in average fertilities at the tail of each curve. To facilitate comparisons, average duration-specific fertilities at various marriage durations are presented in Table 5.3.7.

The high fertility group shown in Figure 5.3.1 comprises couples in which both spouses are Roman Catholic; the high fertility groups shown in Figures 5.3.2 and 5.3.3 comprise Roman Catholic couples in which the wife was Australian-born. The low fertility group in each marriage cohort subsumes women who were not premaritally pregnant and who worked full-time directly after marriage.

In each of the figures the cumulative fertility curves of the "high" and "low" fertility groups are well differentiated even in the first year of

FIGURE 5.3.1: AVERAGE DURATION-SPECIFIC FERTILITIES OF SELECTED SOCIAL GROUPS IN THE 1929-50 MARRIAGE COHORT

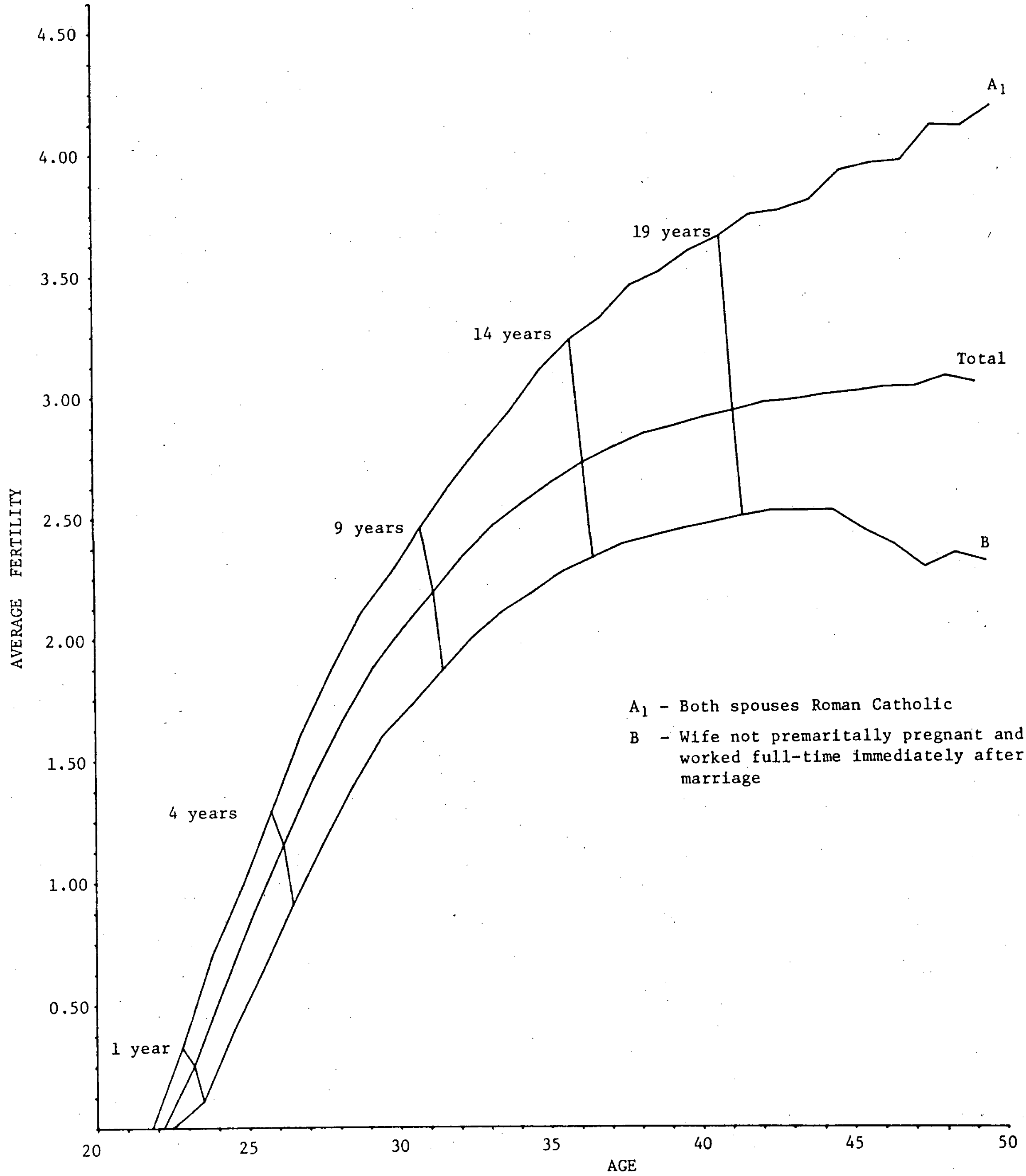

FIGURE 5.3.2: AVERAGE DURATION-SPECIFIC FERTILITIES OF SELECTED SOCIAL GROUPS IN THE 1951-60 MARRIAGE COHORT

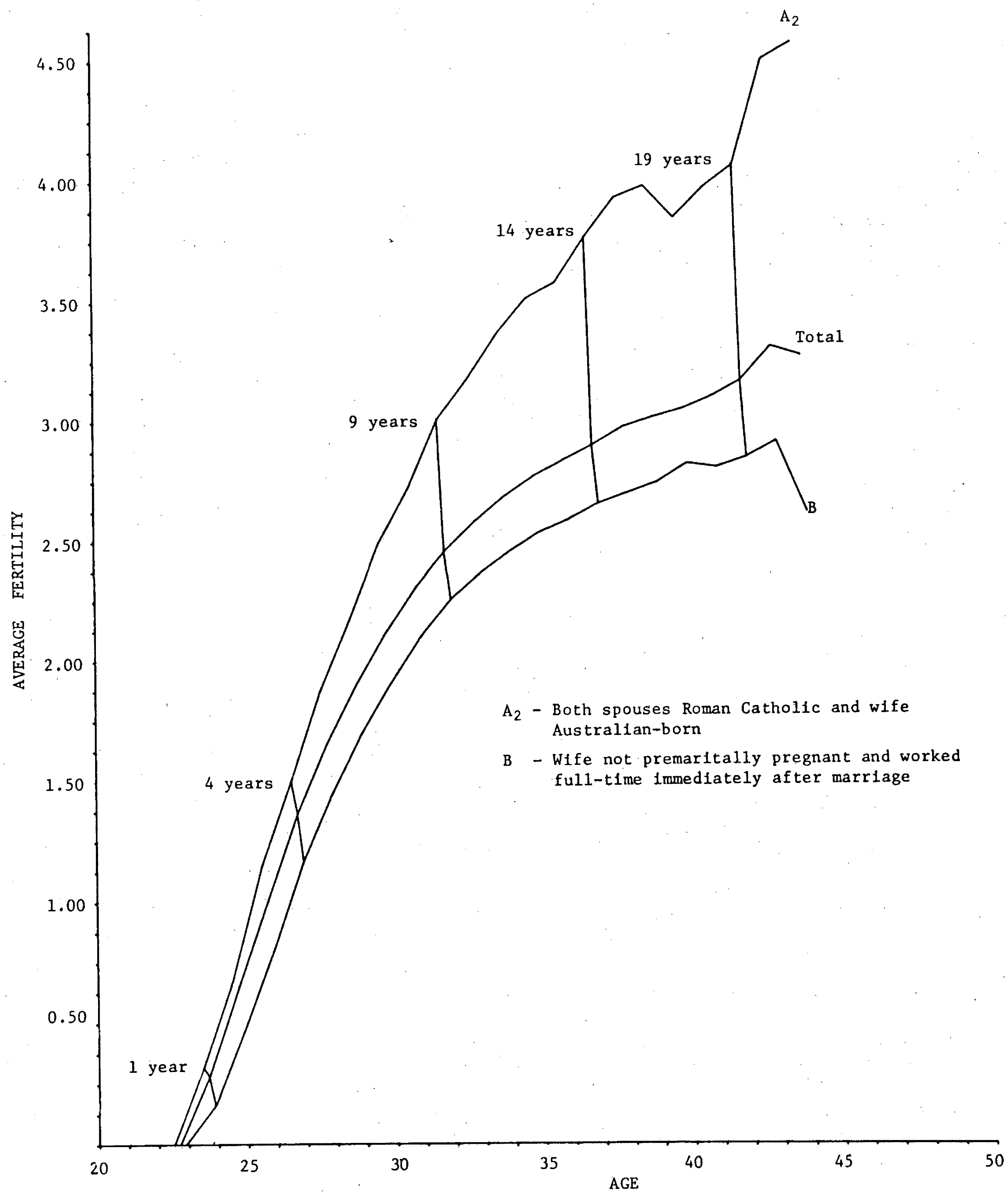

FIGURE 5.3.3: AVERAGE DURATION-SPECIFIC FERTILITIES OF SELECTED SOCIAL GROUPS IN THE 1961-71 MARRIAGE COHORT

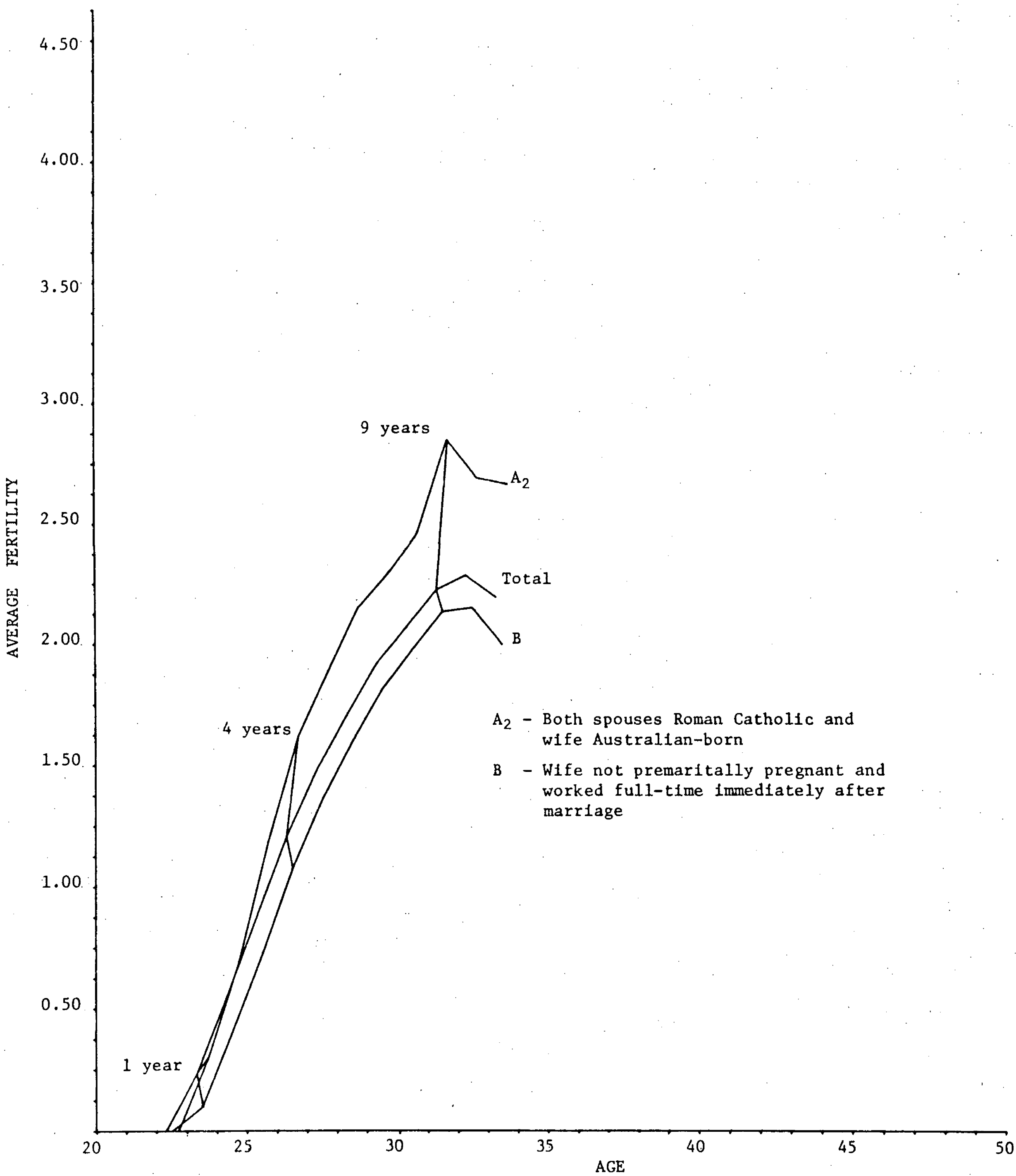

TABLE 5.3.7: MEANS AND 95 PER CENT CONFIDENCE LIMITS OF FERTILITY AT GIVEN MARRIAGE DURATIONS BY YEAR OF MARRIAGE AND SELECTED SOCIAL CHARACTERISTICS

		YEAR OF MARRIAGE								
		1929-50			1951-60			1961-71		
Marriage Duration (years)		A_1	Total	B	A_2	Total	B	A_2	Total	B
1	Mean (N)	0.33±0.07 (173)	0.25±0.03 (769)	0.11±0.04 (220)	0.32±0.10 (91)	0.28±0.03 (736)	0.16±0.04 (362)	0.30±0.09 (93)	0.23±0.03 (1094)	0.10±0.01 (697)
4	Mean (N)	1.30±0.12 (173)	1.16±0.06 (769)	0.91±0.11 (229)	1.51±0.19 (91)	1.37±0.06 (736)	1.17±0.08 (362)	1.62±0.20 (68)	1.21±0.05 (774)	1.08±0.06 (472)
9	Mean (N)	2.46±0.18 (173)	2.19±0.08 (769)	1.87±0.15 (229)	3.01±0.32 (91)	2.46±0.09 (736)	2.26±0.12 (362)	2.85±0.49 (20)	2.23±0.13 (221)	2.14±0.17 (125)
14	Mean (N)	3.24±0.25 (173)	2.73±0.10 (769)	2.34±0.17 (229)	3.77±0.50 (69)	2.90±0.13 (568)	2.66±0.17 (273)			
19	Mean (N)	3.66±0.31 (173)	2.94±0.12 (769)	2.51±0.19 (229)	4.06±0.82 (32)	3.17±0.25 (202)	2.85±0.32 (98)			
Current Fertility		3.86±0.34	3.05±0.13	2.60±0.20	3.91±0.46	2.98±0.12	2.69±0.15	1.83±0.26	1.41±0.06	1.23±0.08
Average Age at Marriage		21.8±0.5	22.2±0.2	22.5±0.4	22.5±0.9	22.7±0.3	22.9±0.4	22.7±0.7	22.3±0.2	22.5±0.3
Average Marriage Duration†		25.0±0.5	24.2±0.2	25.2±0.4	15.7±0.6	15.6±0.2	15.5±0.3	5.2±0.6	5.1±0.2	4.9±0.2

A_1 - Both spouses Roman Catholic.
A_2 - Both spouses Roman Catholic and wife Australian-born.
B - Wife not premaritally pregnant and worked full-time immediately after marriage.

† - Truncated at the lesser of age 50 and age at time of interview.

marriage. For example, Roman Catholics in the 1929-50 marriage cohort average 0.33 births during the first year of marriage as compared with only 0.11 births per woman among the working wives. It should be noted, however, that differences between the fertilities of these two groups in the first year of marriage partly reflect the absence, by definition, of the premaritally pregnant from the group whose members worked before childbearing. They do not imply that Catholic couples have a higher incidence of premarital conceptions than non-Catholic couples. In fact, the Roman Catholic couples identified in each of the figures are slightly less likely than other couples to have had their early marital lives complicated by premarital pregnancies.[12]

The fertility differentials between the "high" and "low" fertility groups increase with marriage duration. In the first marriage cohort, for example, Catholic fertility (1.30 births per woman) exceeds that of the low fertility group (0.91 births per woman) by more than 40 per cent at four years marriage duration. By nine years of marriage, the excess fertility of the Catholic wives over that of the women who worked directly after marriage has risen to 0.59 children (2.46 to 1.87 births per woman), and this differential continues to grow at each subsequent marriage duration until, by the time of the survey, it stands at 1.26 births per woman (3.86 to 2.60). Moreover, in each cohort similarities in the average ages at marriage and durations of marriage of the members of the high and low fertility groups, which are shown at the foot of Table 5.3.7, indicate that these two factors can be eliminated as important determinants of group fertility differentials.

The fertility curves of the "high" and "low" groups depart from what might be called the "pure" effects of Catholicism and early work-force

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12. In the 1929-50 marriage cohort four per cent of the Catholic women with Catholic husbands, but seven per cent of the remaining women, experienced a confinement within eight months of marriage. Comparable figures for the Roman Catholic and non-Roman Catholic couples in the 1951-60 and 1961-71 cohorts are four and nine, and nine and ten per cent.

participation on fertility. As discussed above, the reasons for this are that the groups are not mutually exclusive and that the presence of other characteristics might serve to alter the fertility trajectories. In the 1929-50 marriage cohort, for example, everything else being equal, Roman Catholics appear to have the highest fertility. If the wife worked before childbearing, however, her fertility at each marriage duration can be expected to be lower than if she had not; if she were native-born and had had 5-9 years of Catholic schooling, her fertility might be correspondingly elevated. Or, if she had both of these characteristics, the negative influence of the one might largely counterbalance the positive influence of the other.

5.4 CONCLUSIONS

In this chapter we have examined the relation between age at marriage and fertility and identified various social characteristics that influence family size. In Section 5.2 we explained the effect of delayed marriage on fertility largely by reference to physiological factors. Nevertheless, differences in ages at marriage may themselves be indicative of differences in attitudes to childbearing and family life in general. The regression analyses presented in the preceding section yielded a number of social factors, such as religion, labour force participation, education and country of birth, that alone or in combination also help to enhance or diminish family sizes.

Each of the variables identified in the regression analyses "explains" a significant proportion of the variance in fertility, but this does not mean that the actual proportion of the variance it explains is high. This is demonstrated by Table 5.4.1 which shows, for each marriage cohort, the proportions of variation in current fertility attributable to marriage duration, age at marriage and various social characteristics. Although the total variance explained by the regression models rises from 19 per cent in the 1929-50 cohort to 22 per cent in the 1951-60 cohort and to 49 per cent in the 1961-71 cohort, it is immediately apparent that these rises mainly reflect the increasing importance of exposure times for fertility at relatively short marriage durations. That is, in the 1951-50 marriage cohort some women have not completed childbearing, while in the 1961-71 marriage cohort few women have completed childbearing. In contrast, the proportion of the variance of current fertility attributable to social factors after controlling for the effects of age at marriage and marriage duration, though never high, actually declines across marriage cohorts.

TABLE 5.4.1: VARIANCE OF CURRENT FERTILITY "EXPLAINED" BY REGRESSION ANALYSIS

	YEAR OF MARRIAGE		
	1929-50	1951-60	1961-71
Percentage of variance explained† by			
Marriage Duration	0.0	1.3	41.2
Age at Marriage	4.4	8.3	0.7
Social Characteristics	14.1	12.5	7.2
Total explained	18.5	22.1	49.1
Variance	3.24	2.86	1.20

† Controlling for other significant variables.

Gutman (op.cit.) remarked as long ago as 1960 that:

> "We seem to be entering a phase in the history of differential fertility where the traditional group differences are disappearing. This does not, of course, mean that fertility variation will disappear from the population considered as a whole .... [T]raditional group differences ... are coming to account for a smaller proportion of the total variance [of the fertility] of the population. If this is so, would it not be the path of wisdom to convince ourselves of the fact, to know how much the contribution of inter-group differences is being reduced and the rate at which this decline is taking place?" (p.116)

In societies in which most couples control their fertility, fertility reflects to a large extent the interplay of the predispositions, preferences and circumstances of individuals within the confines of physiological laws. In the past, since many of these attributes have been shared by the members of broad social groups, it has been possible to explain some of the variation in fertility in terms of easily-defined and easily-identified social characteristics. Thus, one might have expected a Roman Catholic mother to behave in one way and a working mother to behave in another. In Melbourne, the small proportions of variance of current fertility explained by social factors even in the oldest marriage cohort offer strong testimony that knowledge about women's memberships in well-defined social groups provides little information about their family sizes. If the trend for more women to have fewer children continues, and there is evidence that it will, variation in the fertility of the population will decline. This does not imply in turn that systematic sources of variation in fertility will disappear entirely.[1] What it does suggest, however, is that it will become increasingly difficult for demographers to seize upon obvious social characteristics in order to differentiate fertility and that the explanatory power of any such characteristics will lessen.

In this chapter the relations between fertility and various social and demographic characteristics of the respondents have been examined independently of physiological mechanisms. Nevertheless, social factors do not affect fertility directly: Catholics do not have more children than non-Catholics simply because they are Catholics; working mothers do not have fewer children than non-working mothers simply because they are employed. Rather, Catholics may have higher fertility because they are less likely to practise family planning, while working mothers may have lower fertility because they are more likely to use contraception efficiently. On the other hand, women who marry in their mid thirties are likely to have small families because their marital experience comes at a time when their fecundity is declining. Potential fertility can therefore be depressed either by contraception or by fecundity impairments, or by both. The following chapter

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1. In the 1951-60 marriage cohort, for example, women who had at least six siblings had significantly more children than those coming from smaller families. This could represent an inter-generational transmission of family size norms (Simmons and Turner, 1974) quite independent of such things as religious affiliation.

develops a simple model based on birth intervals in order to partition fecundity into its various components.

CHAPTER SIX

A BIRTH INTERVAL MODEL

"... A strange enigma is man!"

"Someone calls him a soul concealed in an animal," I suggested.

"Winwood Reade is good upon the subject," said Holmes. "He remarks that, while the individual man is an insoluble puzzle, in the aggregate he becomes a mathematical certainty. You can, for example, never foretell what any one man will do, but you can say with precision what an average number will be up to."

Arthur Conan Doyle - "The Sign of Four" (1890)

6.1 INTERMEDIATE FERTILITY VARIABLES

Raymond Pearl (1936) provided an inventory of the biological elements of human fertility. He identified in all seven particular variables (for example, "congress of separate sexes", "separation of germ cells and products", coitus and duration of reproductive capacity) and two general ones (age and race). In addition, he indicated several indirect factors, such as age at marriage, religion and physical and mental health, that could bear on the biological variables.

Lorimer (1954), examining the social and cultural correlates of fertility in non-industrialized societies, cautioned that attention should be focused on aspects of behaviour that influence "the capacity to produce viable offspring under the usual conditions of marriage and sexual behaviour prevailing in any society" (p.23). Indeed, he discussed in detail the constraints imposed on fertility by delayed marriage, depressed fecundability, foetal losses and adolescent and anile sterility, although the importance of these constraints was largely ignored in his subsequent analysis of the ways in which social structure and culture may enhance or diminish fertility levels. In the words of Davis and Blake (1956), Lorimer "... by failing to make clear the ways in which fertility *can* be affected, gives in some ways a confused picture of how it *is* affected" (p.213).

Davis and Blake (ibid.), in a now classic article, formulated an analytic framework within which the effects of any cultural practice on fertility can be judged. They identified three necessary and socially-recognized steps in reproduction - intercourse, conception, and gestation and parturition - and, related to these, eleven "intermediate" fertility variables. Their schematic outline is shown in Table 6.1.1.

TABLE 6.1.1: THE DAVIS-BLAKE PARADIGM

I. Factors Affecting Exposure to Intercourse ("Intercourse Variables")

A. Those governing the formation and dissolution of unions in the reproductive period.

1. Age of entry into sexual unions.
2. Permanent celibacy: proportion of women never entering sexual unions.
3. Amount of reproductive period spent after or between unions.
   a. When unions are broken by divorce, separation or desertion.
   b. When unions are broken by death of husband.

B. Those governing the exposure to intercourse within unions.

4. Voluntary abstinence.
5. Involuntary abstinence (from impotence, illness, unavoidable but temporary separations).
6. Coital frequency (excluding periods of abstinence).

II. Factors Affecting Exposure to Conception ("Conception Variables")

7. Fecundity or infecundity, as affected by involuntary causes.
8. Use or non-use of contraception.
   a. By mechanical and chemical means.
   b. By other means.
9. Fecundity or infecundity, as affected by voluntary causes (sterilization, subincision, medical treatment, etc.)

III. Factors Affecting Gestation and Successful Parturition ("Gestation Variables")

10. Foetal mortality from involuntary causes.
11. Foetal mortality from voluntary causes.

Source: Davis and Blake (op.cit., p.212)

No social practice, it was argued, can influence fertility except through the medium of the intermediate fertility variables. Thus, regardless of the characteristic forms of personal relations and modes of behaviour in a society, its level of fertility reflects the balance of its values on the intermediate variables. It follows that societies may have similar levels of fertility produced by different combinations of values on the intermediate variables; conversely, societies with similar values for some of the variables may have widely different fertility. Moreover, each of the variables should be considered when examining a society's fertility since "... the absence of a specific practice does not imply 'no influence' on fertility, because this very absence is a form of influence." (p.213)

Fertility control may be achieved through deliberate attempts to manipulate one or more of the intermediate variables. As Davis and Blake noted, however, cultural practices may have consequences for fertility that are at once unintended and unrecognized by the members of the society.[1]

Davis and Blake framed their model at the level of societies. While the overall position of any society on each of the eleven variables can be stated (at least in theory), it is evident that the intermediate variables are the attributes of individuals in societies and not of societies themselves. The Davis-Blake framework, therefore, can serve as a useful conceptual scheme for studying fertility at the level of individual women or couples although, in the case of the Melbourne sample, some simplifications need to be made. In the first place, permanent celibacy and marital dissolution must be ignored since only once-married women whose marriages were intact were interviewed. Secondly, and as discussed in more detail later in this chapter, no use has been made of data on coital frequency: quite apart from the reliability of such data, the relation between coital frequency and fertility is unquantifiable in the absence of information about many other factors.[2] Thirdly, distinctions between "mechanical and chemical" and "other" (e.g.

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1. Freedman (1961-62) later extended this thesis in a broad discussion of the ways in which the intermediate variables could be influenced directly by social norms about family structure and about the variables themselves, and indirectly by aspects of social organization and environmental conditions.

2. For example, lengths of menstrual cycles, time of ovulation, period of viability of the ovum and the sperm. See Section 2.2.

rhythm) methods of contraception may be misleading as they ignore changes in the availability of different methods over the study period. In addition, voluntary abstinence will be treated as a form of birth control as it is difficult to distinguish it from periodic abstinence.

6.2 MODEL BIRTH INTERVALS

Values of the intermediate variables can be estimated for each couple directly from responses to questions about different facets of family formation; for example, age at marriage, pregnancy losses and durations of contraceptive use. This approach, however, is subject to a variety of problems. In the first place, response errors may not be independent of the time elapsed between the occurrence and the reporting of events. Even if the existence of errors can be ignored, estimates of some of the intermediate variables would be biased if equal weight were assigned to each year of a woman's reproductive span. That is, since fecundity declines with age, a specific contraceptive practice can be expected to prevent more births on average among women in their twenties than among women in their forties. In addition, knowledge of the type of contraception used gives no clue as to the efficiency with which it is used. Similar problems arise when trying to assess the impact of subfecundity on fertility, since some couples may suffer relatively minor fecundity impairments while others may be completely sterile.

An alternative approach might be gained through an indirect standardization technique analogous to those developed to facilitate the analysis of fertility on the aggregate level. For example, Coale (1967) based a series of indices on the "natural"[1] fertility rates observed among Hutterites in order to compare the effects of marriage patterns and family planning practices on the fertility of different populations over time.

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1. "Natural" in the sense that it occurs in the absence of deliberate parity-specific attempts to control the occurrence of births (Henry, 1961b, op.cit.).

Bongaarts (1978) has developed a set of indices to quantify the separate influences of marriage, contraception, lactation and induced abortion on societal fertility levels.

Lee and Isbister (1966) employed a hypothetical fertility schedule, giving the births that contraceptors would have been expected to have experienced in the absence of birth control, to demonstrate the effects of family planning programmes on the fertility of particular future years. In doing so, they assumed the average interval between births to be approximated by the inverse of the fertility rate of fecund couples.

Wolfers (1969) formulated a model which directly incorporated the notion of birth intervals. In particular he used mean age-specific prospective birth intervals (i.e. those commencing at given ages) in conjunction with life-table estimates of contraceptive continuation rates to calculate the potential births averted by the participants of a family planning programme in Singapore.[2]

Bongaarts (1976, op.cit.) employed birth intervals to link the biological components of reproduction of marital fertility rates. He initially derived mean intervals between successive births from models incorporating biological parameters, such as the probabilities of conception and spontaneous abortion and the average durations of gestation and post-partum amenorrhoea, under various simplifying assumptions. After allowing for induced abortions and proportions sterile, he estimated age-specific fertility from the inverse of the average intervals between births.

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2. See Wolfers (1975) for a discussion of the concepts involved and a review of approaches attempted in evaluating family planning programmes.

"Typical" birth intervals of non-contraceptors of given ages could serve as a standard for estimating values of the intermediate fertility variables for each couple in the Melbourne sample. Thus, we could employ a summary measure of the distribution of first birth intervals of non-contraceptors to assess the impact of, for example, contraception and sub-fecundity on the fertility of women immediately after marriage. Since post live birth amenorrhoea is a component of all but the first birth interval, family building experiences during subsequent periods of marriage could be evaluated on the basis of the birth intervals of couples who employed no birth control after attaining parity one.

James (1963, op.cit.) warned that average birth intervals will be biased if the sample represents births rather than women. In particular, since highly fecund women have on average shorter birth intervals than their less fecund peers, in the absence of contraception they would be expected to bear more children during any specified time. Wolfers (1968) summarized this situation in the following hypothetical example:

> "Assume that each woman has a 'characteristic interval' which is exactly determined by the values of fecundability and infecund period appropriate to her. Then the frequency with which intervals of different lengths will appear in a specified period will be in exact reciprocal relationship to the lengths of the intervals. Thus, if there are equal numbers of women bearing children every year and every five years, five times as many intervals of one year will be recorded as will intervals of five years. Therefore the occurrence in a series of intervals, of one interval of five years, can be taken as representing five times as many women with this characteristic interval in the sampled population, as the occurrence of one interval of one year indicates women with a one-year characteristic interval." (p.256)

Thus, in this example the average interval between births occurring to women during a given period can be seen to be the harmonic mean of the characteristic intervals of all women in the group.[3]

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3. The harmonic mean, H, is defined by the expression $1/H = 1/N \left(\sum_{i=1}^{N} 1/x_i \right)$.

Wolfers distinguished between what he termed "mean birth intervals (births)", where each birth is given equal weight, and "mean birth intervals (women)", where each woman is represented regardless of the number of children she might bear during the period under study. In an application based on only the first closed birth interval, such as the estimation of fecundability in Section 2.2, these measures are identical. Difficulties arise when one considers a comparable procedure beyond parity one because of the depletion of the ranks of non-contraceptors. Moreover, a simple amalgamation of the higher-order birth intervals of non-contraceptors introduces problems of the sort discussed by Wolfers. The average lengths of subsequent birth intervals can be used, however, if corrections are made for the harmonic elements in the distributions.

The harmonic elements can be eliminated by augmenting the frequencies of the reported birth intervals by the intervals themselves. Both the mean of the resulting augmented frequency distribution and the mean birth interval (births) provide estimates of the mean birth interval (women), but Wolfers argued that neither is a good estimator. Apart from differences in the incidence of foetal mortality and the durations of gestation, the birth intervals of women may vary in two other ways. The first arises from variation between women with respect to past partum infecundity and the probability of subsequent conception. The second stems from stochastic variation among women with common fecundity characteristics. In Wolfers' view, the best estimate of the mean birth interval (women) lies between the averages of the observed and augmented frequency distributions. This can be obtained by apportioning the variance of the birth intervals between these two sources of variation.

Under the assumption that fecundability is distributed geometrically, Wolfers derived a model which expresses the relations between the mean birth interval (women) and its determinants. The form of his model is as follows:

$$3W^2 - (2A + 2C + 1)W + (C^2 + C + a - b + V) = 0 \qquad (1)$$

where W = mean birth interval (women)

A = mean of the augmented frequency distribution

V = uncorrected variance of the distribution of birth intervals

C = mean duration of infecundity

a = "within-group" variance, i.e. variance of the infecund period among women with common fecundity characteristics

b = "between-group" variance, i.e. variance of the infecund period between women with different fecundity characteristics.

The mean birth interval (women) can then be estimated by substituting values for parameters A, V, C, a and b and solving the quadratic equation.[4]

Quantities A and V can be calculated directly from the reported distribution of birth intervals of parturient women. Values for C, a and b must be fitted. Wolfers argued that variation in post partum infecundity among women with the same fecundity characteristics (a) is apt to be trivial. Noting that "between-group" variation in infecundity (b) is likely to be related to the length of the infecund period (C), he suggested that these quantities be estimated from the variance of the reported birth intervals. In particular, he assigned a value of 2 to a, and gave as estimating formulae for b and C

$$b = V/8 \qquad (2)$$

and

$$C = 2(V/8)^{\frac{1}{2}} + 10. \qquad (3)$$

The expression for the mean length of the infecund period, it will be noted,

4. The estimated mean birth interval (women) associated with the smaller root is unrealistic as it is always shorter than the mean birth interval (births) (Wolfers, ibid.).

TABLE 6.2.1.: ANALYSIS OF UNPROTECTED INTER-LIVE BIRTH INTERVALS BY AGE

Age	Mean birth interval (births) (M)	Total variance (V)	Mean of augmented frequencies (A)	Mean infecund period (C)	Mean birth interval (women) (W)	Harmonic mean fecundability[1] (ρ)	Number of birth intervals
15-19	22.64	93.40	26.76	16.83	24.08	0.138	113
20-24	22.80	80.20	26.31	16.33	23.79	0.134	438
25-29	24.87	105.17	29.10	17.25	25.99	0.114	326
30-34	26.57	160.66	32.61	18.96	28.66	0.103	155
35-39	27.38	204.24	34.84	20.11	30.31	0.098	34
Total	24.11	107.24	28.56	17.32	25.52	0.122	1066

[1] $\rho = 1/(W-C)$

has two components: a constant term, made up of nine calendar months for gestation and one month for the puerperium following a live birth, and a variable term for post partum infecundity.

Complete results obtained by applying Wolfers' model to the unprotected inter-live birth intervals of Melbourne women are presented in Table 6.2.1. Mean prospective birth intervals (women), W, tend to increase with age while mean fecundability tends to decline. The average fecundability over all ages (0.12) is the same as that estimated from the first birth intervals of non-contraceptors in Chapter Two.

TABLE 6.2.2: MODEL PROSPECTIVE AGE-SPECIFIC BIRTH INTERVALS

Age	First birth	Second and subsequent births
Younger than 20	16.3	24.1
(n)	(511)	(113)
20-24	17.3	23.8
(n)	(450)	(438)
25-29	19.0	26.0
(n)	(118)	(326)
30-34	18.7	28.7
(n)	(27)	(155)
35-39	-	30.3
(n)		(34)

Age-specific average first birth intervals and mean birth intervals (women) for non-contraceptors are shown in Table 6.2.2. It should be noted that the table includes neither average first birth intervals for ages at marriage greater than 34 years nor mean birth intervals (women) for ages greater than 39 years. Only nine of the 38 women in the sample who married after age 34 later bore a child, and only eight women reported a second or subsequent birth interval commencing after age 39. Since insufficient data are available for estimating average birth intervals at these ages, late marriers will be excluded from the ensuing analyses and birth intervals starting after age 39 will be ignored. Indeed, even if data were available for our purposes the likelihood of positive biases in the estimates based on them increases with age. This is because a woman at the older child-bearing ages must bear a child in a relatively short time if she is to bear a child before menopause supervenes.

Children conceived before but born after marriage complicate the analysis of nuptial fertility. Lorimer (op.cit.) argued that for young couples living in consensual unions which entail no "precise and irrevocable arrangements for marriage" (p.24), the occurrence of a premarital conception may precipitate the decision to marry. He speculated, therefore, that in societies where such unions are common, women who marry at unconventionally young ages may be differentiated from their peers with respect to fecundity. We have argued earlier that this tends to be generally true for premaritally pregnant women regardless of the ages at which they marry. The age-specific average first birth intervals shown in Table 6.2.2 were calculated so as to compensate for the biases toward longer intervals that would result if premaritally pregnant women were not considered. Births occurring after eight or more completed calendar months from the data of marriage have been assumed to be the products of marital conceptions. Women who bore their first child within eight months of marriage were assigned a birth interval of twelve months - three months for the exposure period before conception and nine months for gestation.

Henry (1961b, op.cit.) stated that the fertility rate of fecund couples of a given age "... is approximately equal to the inverse of the average of those [live birth] intervals where the beginning or the end, or both, fall in the age group under consideration." (p.86) Bongaarts (1976, op.cit.) used this identity to derive monthly birth probabilities from theoretical birth intervals in order to estimate age-specific fertility rates. Potter (1969) used a variation, namely, the ratio of the average prolongation of stay in the fecundable state associated with the use of IUDs to the average duration per birth that might have been required had IUDs not been adopted - to estimate the potential births averted by a contraceptive programme.

A similar procedure, based on the model prospective age-specific birth intervals for fecund couples shown in Table 6.2.2 will be employed here. Since the equilibrium monthly rate of occurrence of births for fecund couples of a given age is approximately equal to the reciprocal of their mean prospective intervals between births, any one month within a birth interval of a fecund non-contraceptor should contribute an average of $b = 1/W_x$ births to her fertility, where W_x is the model recurrence time between births for women aged x months at the birth from which the interval is measured. During the period between ages x and x + n months, therefore, we should expect "typical" fecund non-contraceptors to bear an average of B children each, where

$$B = \sum_{i=x}^{x+n-1} b = \frac{n}{W_x} . \qquad (4)$$

The unit of reproductive time (W_x) for women after they have reached parity one, the mean birth interval (women), has three components: a period of post partum infecundity following a live birth, a subsequent delay before another successful conception occurs and a gestation interval. Each of these components is taken into account implicitly when estimating the average monthly fertility rate (b).

Some modifications need to be made when estimating the potential fertility of couples during the interval between marriage and first birth. In particular, if entry into sexual union[5] were treated as being analogous to a confinement the procedure outlined above would overestimate the potential fertility of couples who reported longer waits before the first birth than expected on the basis of the model first birth intervals for noncontraceptors. This is because after experiencing a period sufficient for a "theoretical" birth to occur, a woman would again be assigned an average monthly fertility which includes no allowance for temporary infecundity following a confinement. A simple example will make this clear.

Let the model first and subsequent birth intervals be 15 and 20 months respectively. Suppose that of two women married at the same age, one bore a child after 15 months and a second child after a further 20 months while the other produced a birth only after 35 months of marriage. If we were to apply equation (4) sequentially to the reported birth intervals of the first women, her predicted fertility would coincide exactly with her reported fertility during the period of observation. Application of the equation to estimate the potential fertility of the second woman during the same period yields a value of 35/15 = 2.33 births.

In order to correct for the over-prediction that would result if allowance were not made for post partun amenorrhoea after a hypothetical first birth, the potential fertility of couples during the initial period of marriage will be estimated by analogy with equation (4) as

$$B = \frac{a}{W'_x} + \frac{(n-a)}{W_{x+a}} \qquad \text{where } n>a \qquad (5)$$

$$= 1 + \frac{(n-a)}{W_{x+a}}$$

5. Age at marriage or, in the case of a premaritally pregnant woman, twelve months before her age at first confinement.

where W'_x denotes the model first birth interval shown in Table 6.2.2, x is the age of wife at entry into sexual union (in months), x + a her age at which the first birth would theoretically occur, x + n her age at first confinement and, therefore, n the number of months between marriage and first birth. Using equation (5), the fertility predicted for the second woman in the example is reduced from 2.33 to 2.0 births.

For a woman who produced a first birth within the time expected for women of her age post partum infecundity need not be considered. In this case, equation (5) reduces to

$$B = \frac{n}{W'_x} \qquad \text{where } n \leq a. \qquad (6)$$

In the next section, we shall test this simple measurement model against the parity distribution of non-contraceptors. We shall then discuss how the model can be used to quantify the effects of factors, such as contraceptive use and subfecundity, on the fertility of the members of the Melbourne sample.

6.3 TESTING THE MEASUREMENT MODEL

The left-hand panel of Table 6.3.1 presents the average fertility levels associated with different combinations of ages at marriage and marital durations as calculated on the basis of the model outlined in the last section. The right-hand panel of the table shows these levels after adjusting for the proportion of naturally sterile couples at each age derived from the fecundity decrement table in Chapter Two.

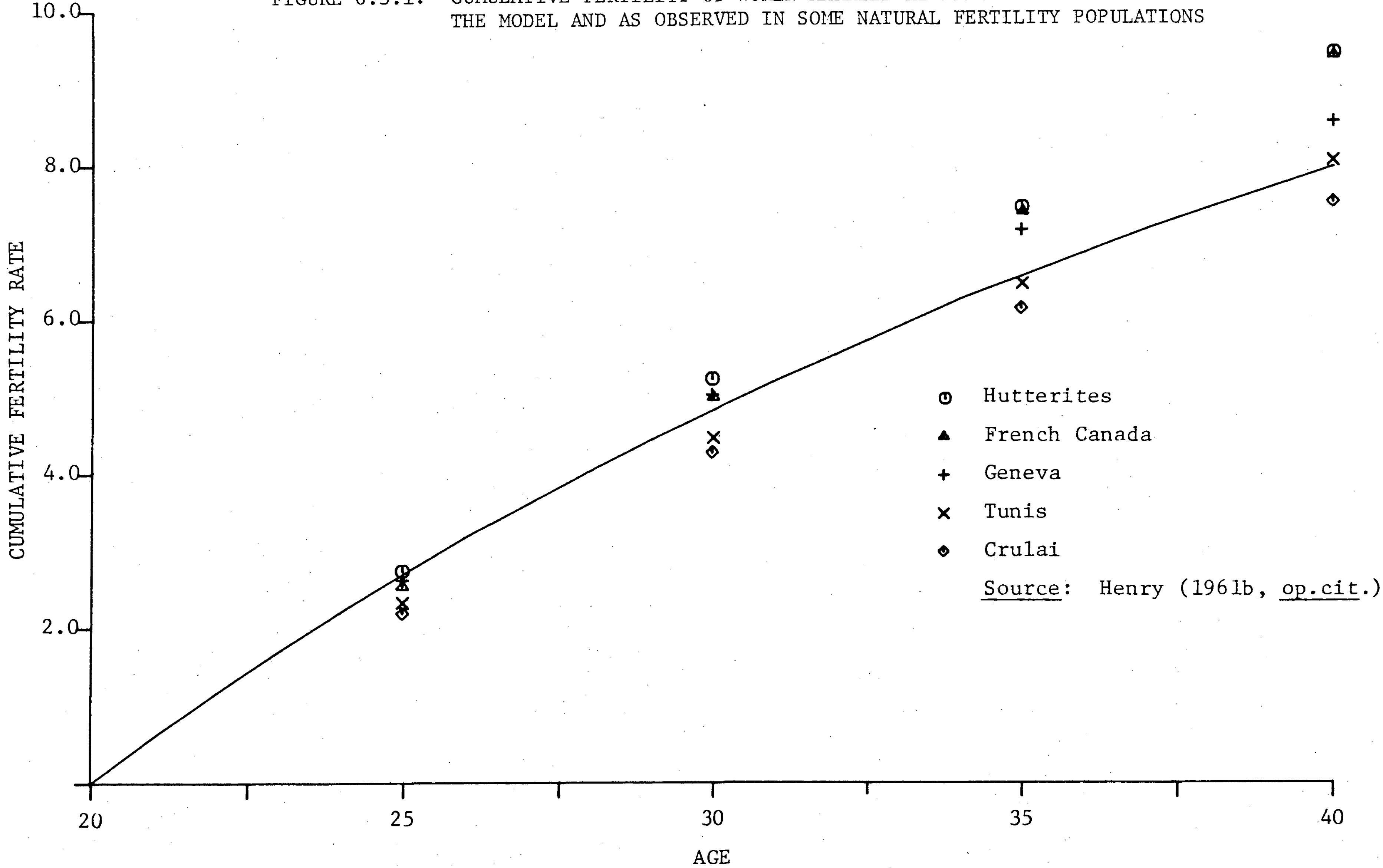
TALBLE 6.3.1: AVERAGE FERTILITY BY EXACT AGE AT MARRIAGE AND MARRIAGE DURATION PREDICTED BY BIRTH INTERVAL MODEL

	UNADJUSTED FOR NATURAL STERILITY				ADJUSTED FOR NATURAL STERILITY			
	Age at marriage				Age at marriage			
Marriage duration	15	20	25	30	15	20	25	30
5	2.81	2.80	2.58	2.44	2.76	2.71	2.39	2.04
10	5.34	5.11	4.67	4.42	5.20	4.55	4.14	3.48
15	7.65	7.20	6.65		7.34	6.60	5.57	
20	9.74	9.18			9.09	8.04		
25	11.72				10.50			

On average a woman with typical fecundity characteristics who married when aged 15 would be expected to bear 11.7 children were she to remain fecund until she reached age 40. This figure reduces to 10.5 births per woman under the estimated natural sterility conditions prevailing among the members of the sample. Although potential fertility declines with

1. Table 2.5.1 was constructed from the dependent probabilities of natural and operative sterility, i.e. the probabilities of attribion to a cohort of fecund couples from one cause while controlling for attrition from the other. The proportions sterile used to calculate the right-hand panel of Table 6.3.1 are based on the age-specific probabilities of sterility due to natural causes alone.

FIGURE 6.3.1: CUMULATIVE FERTILITY OF WOMEN MARRIED AT EXACT AGE 20 AS PREDICTED BY THE MODEL AND AS OBSERVED IN SOME NATURAL FERTILITY POPULATIONS



increasing age at marriage and coincidental decreases in the length of the effective fecund span, reproductive capacity remains high even at the older marital ages. For example, the expectation over a ten year period for a woman who married at age 30 is 3.5 births.

The fertility levels given by the model after adjusting for natural sterility are similar to the levels reported for different natural fertility populations. For example, Henry (1961b, op.cit.) reported 13 natural marital fertility schedules that together implied an average of 7.6 births per woman between the ages of 20 and 39 years in the absence of mortality, as compared to 8.0 births per woman for the present model. Figure 6.3.1 compares cumulative average fertility predicted by the birth interval model for women married at age 20 with corresponding estimates derived from five natural fertility populations. The predicted cumulative fertility curve passes neatly through the cumulative fertilities estimated at five year intervals.

At the aggregate level, our model gives results consistent with observed natural marital fertility schedules. In order to test how well the model prospective age-specific birth intervals in Table 6.2.2 encapsulate the experiences of individuals, the fertility levels predicted for non-contraceptors in the sample will be compared with their achieved family sizes. In doing so, we shall confine our attention to women who have borne at least one child in the absence of birth control. For a woman who reported having never used family planning, the inputs for the estimation correspond to her ages, measured in months, at marriage and subsequent confinements. For a woman who adopted contraception after experiencing one or more confinements, the cut-off point for the simulation corresponds to her age at the end of the last birth interval prior to the initiation of family planning. In the case of a woman suspected of premarital conception, age at entry into sexual union has been assumed to be equal to age at first confinement less an allowance of twelve months for conceptive delay and gestation.

It is unlikely that the actual fertility of any non-contraceptor in the sample will coincide exactly with the fertility predicted for a woman with the same age at marrige and marriage duration. This is because random fluctuations will cause variations in the fertility even of women who have the same fecundity characteristics. Moreover, since fecundity characteristics vary from woman to woman, we would expect the birth interval model to under-predict the fertility of some women and over-predict the fertility of others. Ideally, the model would provide a correct prediction of the fertility of each woman, but so long as the estimates it does provide are unbiased it is still a valuable tool.

Results obtained by applying the fertility model to the pregnancy histories of individual women are presented in Table 6.3.2. The fertility predictions contained in the body of the table have been rounded to the nearest whole number and, thus, constitute discrete representations of the continuous distributions actually predicted for the women at the various parities. Summary measures shown at the bottom of the table, however, have been calcuated from the excat number of births predicted for each woman.

Overall, 75 per cent of the predictions lie within ±0.5 births of the observed fertility levels and 95 per cent are correct within a margin of ±1.5. The averages of the observed and predicted births are the same, while the variance of the fertility predictions exceeds that of the observed levels by nearly 40 per cent. The simple correlation between the family sizes observed and the family sizes predicted from the model age-specific birth intervals is 0.84. The square of the correlation coefficient indicates

TABLE 6.3.2: PREDICTED PARITY BY OBSERVED PARITY FOR NON-CONTRACEPTORS

Predicted births (Y)	OBSERVED BIRTHS (X) 1	2	3	4	5	6	7	Total
0	1	-	-	-	-	-	-	1
1	562	54	-	-	-	-	-	616
2	40	174	33	-	-	-	-	247
3	6	30	59	11	2	-	-	108
4	4	9	21	25	7	1	-	67
5	4	2	4	11	4	4	2	31
6	1	-	2	1	3	4	7	18
7	2	-	1	2	5	-	5	15
8	-	-	-	-	-	-	1	1
9	-	-	-	-	-	-	-	-
10	-	-	1	-	-	-	1	2
Total	620	269	121	50	21	9	16	1106

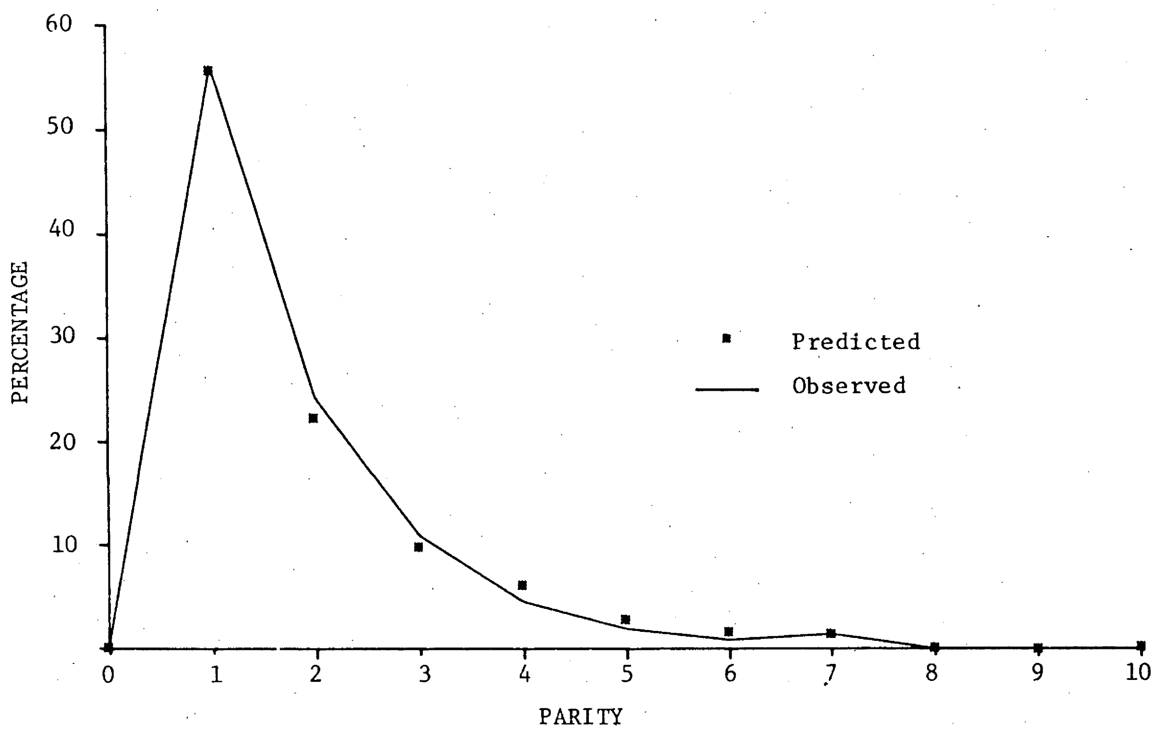
$\overline{X} = 1.80$ Var (X) = 1.48

$\overline{Y} = 1.80$ Var (Y) = 2.04

Cov (X,Y) = 1.47 $r_{xy} = 0.84$

that 71 per cent of the variance in predicted fertility can be "explained" by reference to the number of births that did occur. Although the amount of variance explained is not inordinately high, a simple linear regression[2]

FIGURE 6.3.2: OBSERVED AND PREDICTED PARITY DISTRIBUTIONS OF NON-CONTRACEPTORS



reveals that on average there is an almost one-to-one relation between predicted and observed fertility.

An examination of Figure 6.3.2 shows that the aggregate level predictions obtained from the model also fit the observed values extremely

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2. The estimated least squares regression equation is $\hat{y} = 0.012 + 0.991x$, where x symbolizes the observed and $\hat{y}$ the predicted number of births.

well throughout the range of parities considered. The largest deviation between the observed and the predicted proportions of women at any parity is two per cent and most are less than one per cent. It is evident from the table, however, that the predictive accuracy of the model at both the aggregate and the individual levels rests in part on a counterbalancing of the estimation errors for individual women.

Apart from possible errors in the ages at marriage and subsequent confinements used as inputs for the model and in the contraceptive histories used to select the test population, discrepancies between predicted and observed fertility reflect the difficulties one faces when trying to capture an inherently stochastic process with a deterministic model. For example, the simple model employed here does not allow for variations in fecundity, the components of which determine the exact lengths of the birth intervals of each woman in the sample. Rather, the model birth intervals on which our predictions are based incorporate average conceptive delays, foetal mortality, gestation periods and periods of post partum infecundity. The accuracy of individual predictions depends, therefore, on how closely the woman whose fertility we are estimating resembles the "average" woman of the model.

The pattern of residuals in Table 6.3.2 suggests the existence of variations in the components of fecundity. Over-predictions appear below, and under-predictions appear above, the main diagonal. Subfecundity is evidenced by both the relative frequency and the range of over-predictions among couples at parities one, two and three. For subfecund couples the problem may lie more in having as many children as they would like rather than in controlling unwanted fertility. Thus, it is likely that many subfecund couples, having already experienced long delays before births, had little recourse to contraception. In addition, since most of the fecund couples in Melbourne did adopt birth control to limit the ultimate sizes of their families, the tendency for the proportion of under-predictions to increase with parity suggests that many of the couples at the higher parities differed from their peers not only with respect to their relatively short intervals between births but with respect to their failures to take effective contraceptive precautions as well. It is possible, therefore, that predictive errors are accentuated by non-use of contraception by couples who had either lower or higher than average fecundity. Indeed, among women who reported having never used birth control the correlation between observed fertility and fertility predicted by the model falls from 0.84 to 0.77; in contrast, among those who initiated contraception after experiencing one or more births the correlation rises to 0.91.

Few of the components of fecundity are directly observable or reportable and, moreover, the quality and usefulness of some types of data which can be collected in a survey are doubtful.

The model birth intervals make no use of Davis and Blake's sixth intermediate variable, coital frequency. Any attempt to make explicit use of data on coital frequency poses two quite distinct problems. The first is the quality of the data. The Melbourne respondents were asked about coital frequency over an "average" four week period. Eleven per cent of the women supplied no answer and nine per cent were uncertain. The usefulness of the responses provided by those who did answer the question is dubious. Some women might have understated their rates of coitus through a sense of modesty or exaggerated them in an attempt to impress the interviewer. Moreover, it is doubtful that in any country women would be able to recall correctly their frequencies of intercourse unless, perhaps, the occurrence (or non-occurrence) of coitus were so infrequent as to constitute a memorable exception to their daily routines. In Melbourne, additional problems arise in assessing the reference point of the "average" four week period.[4] For example, assuming that coital frequency declines with age and that a 50 year old woman interpreted the question as pertaining to the recent past, her response would provide no information about her behaviour ten, twenty or thirty years before the date of interview.

Secondly, the fact that, save in extraordinary circumstances, conception cannot occur in the absence of coitus has led many researchers to over-emphasize the importance of coital frequency for fertility. The level of fertility, however, is by no means proportional to the frequency of intercourse. Keyfitz (1972), for example, demonstrated that given an average duration of infecundity within birth intervals of 17 months and an original fecundability of 0.2, a 50 per cent reduction in the frequency of coitus taken at random would result in a decline in the birth rate of less than 20 per cent. Lorimer (op.cit.) argued that high coital frequencies can even lower fertility from what it otherwise might have been by reducing the probability of conception:

> "Apart from the specific timing with reference to knowledge about ovulation, the chance of conception in any given period rises to a hypothetical point with increased frequency of coitus; beyond this point the chances of conception are reduced, through decrease in number of active spermatozoa released in each sexual union and in other ways."(p.23)

Some information that would be of value was not collected in the Melbourne survey. For example, no information was sought on the duration and intensity of breastfeeding following live births. Lactation is known to delay the return of the menses and to suppress ovulation and, thus, to prolong the period of post partum infecundity (Cronin, 1968). In the

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4. The exact question was, "How many times in an average four weeks do you and your husband make love (have sexual intercourse)?"

absence of lactation post partum amenorrhoea may be as short as six weeks (Sharman, 1967). The longer a woman breastfeeds, however, the longer her expected period of post partum infecundity. The scanty data available for Australia indicate durations of lactation amenorrhoea ranging from two months to more than a year, depending on whether maternal milk is the baby's sole source of nourishment or whether it is supplemented by artificial means (Gross, 1978). These findings are preliminary, however, and pertain to women in an on-going clinical study who are committed to some degree both to breastfeeding and to non-supplementation. They cannot be taken as indicative of typical patterns in Melbourne or in Australia as a whole. Differences in breastfeeding habits may account for some of the predictive errors observed in Table 6.3.2.

Miscarriages, stillbirths and induced abortions will lengthen the birth intervals in which they occur. The age-specific birth intervals used in the model implicitly include allowances for average foetal losses. The accuracy of the fertility prediction for each woman will depend to some extent, therefore, on whether she experienced fewer or more foetal losses during the period than allowed for by the model.

Table 6.3.3 shows the average numbers of foetal losses reported by the women in the test population controlling for birth order and the accuracy of prediction. The overall pattern of foetal deaths is as we should expect, although we must stress that some of the numbers on which the proportions are based are small and that we do not know when the reported foetal deaths occurred relative to the reported live births. In the table average foetal losses can be seen generally to rise monotonically with parity. Moreover, at each parity the average for women whose fertility was under-predicted tends to be less, and the average number of foetal losses for women whose fertility was over-predicted tends to be greater, than the average number of foetal losses for women whose fertility was predicted

TABLE 6.3.3.: AVERAGE FOETAL LOSSES ACCORDING TO THE RELATION BETWEEN OBSERVED AND PREDICTED PARITY

Parity		A	B	C	Total
1	Mean	0.0	0.35	1.18	0.42
	(n)	(1)	(562)	(57)	(620)
2	Mean	0.17	0.45	1.20	0.51
	(n)	(54)	(174)	(41)	(269)
3	Mean	0.45	0.49	1.38	0.69
	(n)	(33)	(59)	(29)	(121)
4	Mean	0.63	0.40	1.93	0.88
	(n)	(11)	(25)	(14)	(50)
5	Mean	0.56	0.50	2.13	1.14
	(n)	(9)	(4)	(8)	(21)
6	Mean	0.80	1.25	–	1.00
	(n)	(5)	(4)	(0)	(9)
7	Mean	1.22	0.20	4.00	1.25
	(n)	(9)	(5)	(2)	(16)
Foetal losses per live birth		0.12	0.30	0.77	0.29

A Predicted parity less than observed parity.

B Predicted parity equals observed parity.

C Predicted parity greater than observed parity.

correctly. The findings of this table suggest that the predictive power of the model can be improved by taking reported foetal mortality explicitly into account.

From the point of view of the individual couple, a foetal death prevents a particular live birth. As Keyfitz (1977) pointed out, however, "the logic of individuals becomes grossly misleading when applied to populations" (p.313). While conceptive delays are independent of the outcome of pregnancy, the period of gestation for a miscarriage or induced abortion is considerably shorter than that for a live birth while that relating to a stillbirth is slightly shorter than that for a live birth. Moreover, post partum infecundity will be extended by lactation, which occurs only after a successful pregnancy. For example, in an analysis based on Taiwanese data, Potter (1972) showed reductions in fertility due to an induced abortion in the absence of contraception to be in the region of 0.40 to 0.45 births. In addition, this effect was found to be largely independent of age among women younger than 40 years.

We cannot estimate the average number of births averted by spontaneous and induced abortions independently of the number of live births averted by stillbirths. Since the majority of foetal losses are abortions[5] we will estimate the average effect of spontaneous and induced abortions on fertility using the assumption that one stillbirth prevents 0.9 live births.

In this calculation we employ the fertility histories of the 232 women in the sample who had borne at least one child and who reported having never used birth control. The childbearing span of each woman was divided into segments defined by her ages at marriage and confinements but, unlike the fertility predictions presented in Table 6.3.2, an additional segment subsuming the time since the occurrence of the last birth was included. The upper limit of the last segment was defined as

(1) the woman's current age if she were fecund and younger than 40 years at the time of the survey,

(2) the lesser or respondent's estimated age when either she or her husband became sterile, and age 40

or (3) if the woman were pregnant, her age pro-rated to her expected

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5. See Section 2.3.

date of delivery. The expected number of births in each segment was then calculated on the basis of the model age-specific birth intervals. Next, the excess of predicted over observed births was diminished by 0.9 live births for every reported stillbirth to provide an estimate of births averted through abortions and subfecundity. Finally, these estimates were regressed on the reported number of miscarriages and induced abortions. The slope of the resulting simple regression equation (0.36)[6] then serves as an estimate of the average effect of abortions on fertility.

6. The estimated regression equation is $\hat{y} = 1.48 + 0.36x$, where x is the reported number of abortions and $\hat{y}$ is the estimated number of births averted by abortions and subfecundity.

6.4 USES OF THE MODEL

The fecundity of individual members of the Melbourne sample will be estimated under the assumptions of the model outlined earlier in this chapter. The excess of estimated over observed births between marriage and first birth and in subsequent birth intervals can then serve as measures of the effects of various intermediate variables on fertility. For example, given a model birth interval of 20 months, a woman who reported using contraception and who experienced a birth interval of 30 months would be said to have averted 0.5 births through contraception, in the terms of our model. Had she not reported using contraception, we would ascribe the averted births to fecundity impairments. In this sense, therefore, "fecundity impairments" constitute a residual category rather than a primary cause of infertility.

As discussed in Section 6.2, women who married after age 34 will be excluded from the analyses and birth intervals starting after age 39 will not be considered. When assessing birth intervals that are not confined within one five-year age group, the model prospective birth intervals appropriate to the relevant age groups will be used. For example, if a woman gives birth at exact age 24 and not again until exact age 27 and the model interval specific to the 20-24 year age group were 20 months, the initial 20 months of her birth interval will be assessed on the basis of the interval appropriate to the 20-24 age group, while the remaining 16 months will be assessed according to the model interval specific to the 25-29 age group.

The birth interval model estimates the number of births averted in each birth interval and ascribes this number to one of various causes. We have described a simple method of estimating births averted through foetal wastage. Logically, involuntary foetal losses can be classed with fecundity impairments while induced abortions can be classed with birth control.[1] Although we do not know the timing of foetal losses, they can occur only when a woman is presumably both fecundable and exposed to the risk of conception. We shall assume here that the effects of reported foetal losses on fertility are distributed within the childbearing span in proportion to the estimated number of births averted by fecundity impairments and birth control, and adjust the initial estimates of the effects of these two variables accordingly. For example, consider a woman who averts 1.0 births through contraception during the first birth interval, 0.5 births through fecundity impairments during the second birth interval and whose reported foetal losses provide an estimate of 0.6 births averted in this way. Partitioning births averted in each interval, we say that in the first birth interval 0.4 births are averted by foetal loss and 0.6 births by contraception. Similarly, in the second interval, we say that 0.2 births are averted by foetal loss and 0.3 by fecundity impairments. Were the foetal losses spontaneous, we estimate that in the first birth interval 0.4 births are averted by fecundity impairments and 0.6 by birth control, while the original estimate of births averted by fecundity impairments in the second birth interval remains unchanged. On the other hand, were the foetal losses induced, our original estimate for the first birth interval remains unchanged but in the second birth interval we estimate that 0.2 births are averted by birth control and only 0.3 by fecundity impairments.

This model is, admittedly, crude. In general, averted births can be ascribed to fecundity impairments only when no contraceptive usage has been reported. Moreover, contraceptors may not even be aware of subfecundity

1. Analogously, contraceptive sterilization will be classed with birth control whereas sterility produced by an operation performed reportedly without contraceptive intent will be classed with fecundity impairments.

because their fecundity has recently been untried. The model aims specifically at identifying deficit rather than excess fertility. In other words, the model birth intervals represent the "typical" birth intervals of fecund non-contraceptors at given ages, and we attempt to quantify the effects of factors, such as contraception, which extend the observed birth intervals beyond the intervals taken as a standard. As the model birth intervals are averages, however, some women will have birth intervals which are actually shorter than these. If the observed interval between births is shorter than the model interval, the predicted number of births will be less than the actual number and, thus, the measure of births averted will take on an unrealistic negative value. In such cases the "births averted" measure will be assigned a value of zero.

Although crude, the model has the advantage that estimated intermediate fertility variables can be related directly to individual members of the sample. In the following chapter, we shall employ the model to estimate the relative contributions of factors such as contraception and fecundity impairments in determining ultimate fertility in Melbourne.

CHAPTER SEVEN

APPLICATION OF THE BIRTH INTERVAL MODEL

"... And another thing. I have been reading in my papers about something very modern called Birth Control. What is it?"

Basil explained.

"I must have a lot of that. You will see to it. Perhaps it is not a matter for an ordinance, what do you think? We must popularize it by propaganda - educate the people in sterility. We might have a little pageant in its honour ..."

Evelyn Waugh - "Black Mischief" (1932)

7.1 INTRODUCTION

The birth interval model developed in the previous chapter allows the estimation of the fertility that would be realized in the absence of both birth control and fecundity impairments. In this respect, the model provides estimates of fecundity, that is, the biological capacity to reproduce. A couple's fertility is bounded by a minimum of zero and such a hypothetical maximum which could be realized only under the most favourable circumstances. Achieved fertility falls short of this maximal level because of the intervention of factors such as contraception and subfecundity.

In this chapter we first examine the relative impacts at each age of delayed exposure to the risk of conception, fecundity impairments and birth control on the fertility of the Melbourne respondents. We then apply the birth interval model to examine the extent to which fecundity was averted by contraception in different periods. Finally, we apply the model to analyse patterns of family formation of members of different broad marriage cohorts.

In this application "delayed exposure" refers to marriage after the age of 15 years. That model birth intervals increase with age reflects the declining fecundity of *fecund* women: the model intervals do not take into account the intervention of primary or secondary sterility which is therefore, by default, the principal cause of impaired fecundity. In essence, a woman is imputed to suffer "fecundity impairments" within a birth interval if that interval exceeds the appropriate model age-specific interval and no contraceptive use was reported: if contraception were used in the interval, the surplus of observed over model birth interval is attributed to birth control. Throughout the chapter the term "averted births", or "averted fecundity", is used to describe fecundity which is unrealized for either volitional or non-volitional reasons. While the use of the term is well-established only in studies of contraceptive use-effectiveness (Wolfers, 1975 op.cit.) it will be employed here, for the sake of conciseness, to refer also to the intervention of involuntary factors such as impaired fecundity.

7.2 COMPONENTS OF FECUNDITY

Figure 7.2.1 depicts the disaggregation of the fecundity implied by the birth interval model at single years of age among all women in the sample who married between the ages of 15 and 24. The lowest line in the figure (A) shows the average numbers of children born to women at each age. The remaining lines in the figure represent the average fertilities that would result if various assumptions were met. The uppermost line (D) represents the average fecundity at each age implied by the model; that is, the average fertilities we would expect if all women were continuously exposed to the risk of childbearing from age 15 onward and were both fecund and non-contracepting.[1] The next highest line (C) represents implied fertility if all women were fecund non-contraceptors from entry into sexual union. Given the restriction on the upper age at marriage, this line coincides with the estimated "fecundity" curve beyond age 25. The next line (B) shows the fertility expected at each age if no woman were to have ever used birth control after she married.

Thus, the area under the lowest curve (A) corresponds to average total fertility between ages 15 and 39. The area between this and the next highest curve (B) represents average numbers of births averted by birth control within marriage. Similarly, the area between curves C and B denotes births averted by fecundity impairments. Finally, the triangular area at the extreme left of the graph represents births averted by delaying marriage beyond age 15.

The starting point for the estimation procedure for each woman is age 15. The births predicted by the birth interval model in each year between

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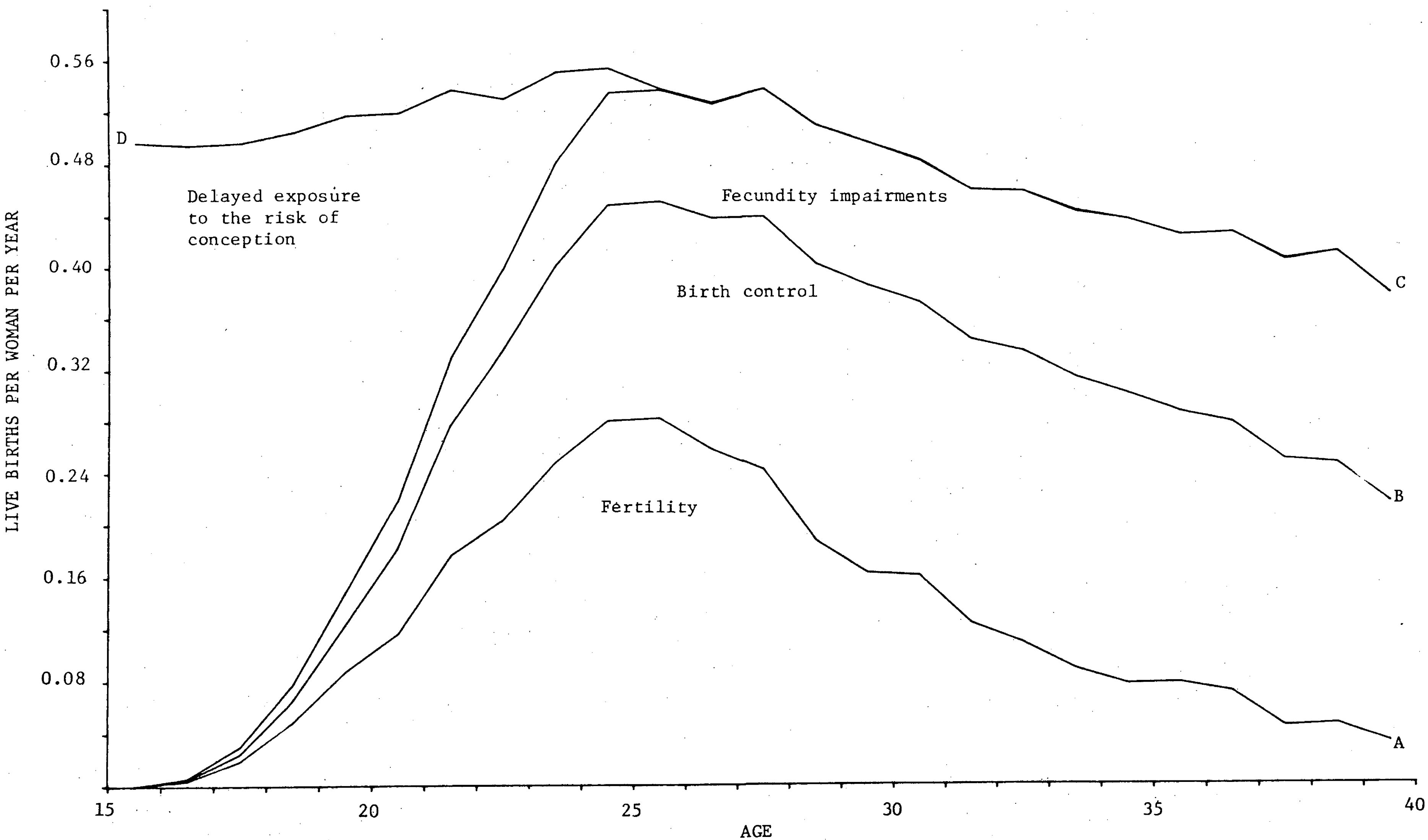
1. The tabulations on which Figure 7.2.1 are based also included temporary marital disruptions, but the numbers of births averted at each age in this way were few. While this does not necessarily contradict earlier conclusions that the Second World War disrupted the early marital childbearing of many couples, in the overall sample the effect on fertility of such marital disruptions is negligible.

FIGURE 7.2.1: DISAGGREGATION OF IMPLIED FECUNDITY OF WOMEN WHO MARRIED BETWEEN AGES 15 AND 24



age 15 and age at marriage (or, in the case of those classified as premaritally pregnant, twelve months before age at first confinement[2]) were then equated with births averted by delayed exposure to the risk of conception. The birth interval model was then applied successively to each birth interval and the excess of predicted over observed births assigned to birth control or fecundity impairments according to whether contraception was used during the interval. Estimates of births averted were then adjusted for involuntary and voluntary foetal losses following the method described in Chapter Six. Births averted in each interval were next distributed over the interval. No birth interval commencing after age 39 contributed to the analysis. The last, open, birth interval was truncated at the woman's estimated age at next confinement if she were pregnant at interview or the lesser of age 40 and age at interview if she were not. Finally, the total numbers of births observed and births averted by different causes at each age were divided by the number of women who survived to that age to provide the estimates shown in the graph.

Since the Melbourne respondents were not asked explicitly about their fertility experiences and contraceptive histories before marriage, we can assess the relative importance of birth control and fecundity impairments only once we know women have become exposed to the risk of childbearing. In constructing Figure 7.2.1, therefore, no attempt has been made to disaggregate the effects on fertility of fecundity impairments and birth control before marriage from the effects of delayed entry into sexual union.

Figure 7.2.1 does not differentiate women by year of marriage. Rather than identifying members of the sample in this way, we have attempted to reduce heterogeneity in ages at marriage by restricting the present analysis

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2. See Section 6.2.

to women who married before exact age 25. Results obtained for women who married between ages 25 and 34 will be discussed separately. By splitting the sample by age at marriage we may, of course, introduce distortions associated with both period and cohort effects,[3] but the graphs nevertheless serve as a useful introduction to applications of the birth interval model.

Table 7.2.1 presents the average numbers of children born to members of the sample who married before exact age 25, and births averted by various factors. The fecundity implied by the model at each age increases slightly during the late teens, remains more or less constant at just above 0.5 births per woman per year until the late twenties and then declines steadily thereafter. Under the assumptions of the model, the expected fertility of a woman aged at least 40 who married at age 15 and who neither used birth control nor suffered fecundity impairments is 12.2 births. In contrast, average fertility calculated on the basis of the estimated age-specific fertility rates, at 3.2 births per woman, is 9.0 births below the hypothetical maximum. Among the three major fertility depressants shown, the greatest number of implied births is ascribed to birth control (3.8), and this is followed by delayed exposure to the risk of childbearing (3.0) and fecundity impairments (2.3). It is clear from the table as well as the figure, however, that the impact of each of these factors varies greatly from age to age.

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3. Moreover, quite apart from the high degree of sampling variability which would result if marriage cohorts were examined separately, results pertaining to the 1961-71 cohort would be misleading. Since the members of this cohort had relatively short marriage durations, what would purport to represent age-specific behaviour would, in large part, actually represent duration-specific behaviour according to age at marriage. For example, with average marriage durations slightly shorter than five years, age-specific fertility at age 30 is unlikely to incorporate the experiences of women married much before age 25.

TABLE 7.2.1: AVERAGE NUMBERS OF BIRTHS OBSERVED AND BIRTHS AVERTED BY VARIOUS CAUSES WITHIN FIVE-YEAR AGE GROUPS AMONG WOMEN MARRIED BETWEEN AGES 15 AND 24

Age	Observed Births	Births Averted by: Birth Control	Births Averted by: Fecundity Impairments other than Birth Control	Births Averted by: Delayed Exposure	Implied Fecundity	Number of Women at Mid-point of Interval
15-19	0.16	0.06	0.05	2.25	2.52	2083
20-24	1.03	0.62	0.33	0.72	2.70	1955
25-29	1.14	0.98	0.49	-	2.61	1528
30-34	0.56	1.11	0.62	-	2.29	1171
35-39	0.27	1.01	0.77	-	2.05	879
Total	3.16	3.78	2.26	2.97	12.17	

At ages 15-19, observed fertility and births averted by either birth control or impaired fecundity are low simply because few of the women are exposed to the risk of conception at these ages. Delayed entry into sexual union is still the greatest fertility depressant at ages 20-24 even though all women are married before age 25. The average numbers of births averted by fecundity impairments increase, albeit irregularly, with age. Fecundity impairments prevent an average of 0.3 births per woman at ages 20-24, and the estimate rises to 0.5, 0.6 and 0.8 births per woman in the three subsequent five-year age groups. The estimated average number of births averted by birth control also increases steadily with age until the early thirties and then remains fairly constant. The average number of births to women over the 15-39 year age range is less than the number of births averted by birth control, but greater than the average numbers of births prevented by either delayed marriage or fecundity impairments. From an overall minimum of only 0.2 births per woman between ages 15 and 19, observed fertility rises to its highest level, 1.1, in the mid-twenties before declining again.

As discussed earlier, the fertility estimates and the estimated numbers of births averted by fecundity impairments and birth control at each age are derived from marital experience only. To remove the effect on fertility of delayed exposure, Table 7.2.2 shows the percentages of implied fecundity of exposed women accounted for by fertility or ascribed by the birth interval model to birth control or impaired fecundity.

The total marital fecundity implied by the birth interval model, 9.2 births per woman, is partitioned unequally between observed fertility (34 per cent) and births averted by birth control (41 per cent) or by fecundity impairments (25 per cent). That women exposed to the risk of conception at ages 15-19 realized three-fifths of their implied fecundity is due, in part,

TABLE 7.2.2: PERCENTAGES OF AVERAGE IMPLIED MARITAL FECUNDITY OF WOMEN MARRIED BETWEEN AGES 15 AND 24 ASCRIBABLE TO FERTILITY, BIRTH CONTROL AND FECUNDITY IMPAIRMENTS

	AGE					
	15-19	20-24	25-29	30-34	35-39	Total
Fertility	59	52	44	24	13	34
Birth Control	22	31	37	49	49	41
Fecundity Impairments other than Birth Control	19	17	19	27	38	25
Total	100	100	100	100	100	100
Implied Marital Fecundity	0.27	1.98	2.61	2.29	2.05	9.20

to the fact that approximately one in five was premaritally pregnant. That only 22 per cent of their fecundity is ascribed to birth control suggests that even if their marriages were not precipitated by premarital conception many teenaged brides, having seen no reason to postpone marriage, may have seen no reason to postpone childbearing. The proportion of marital fecundity ascribed to fertility declines within each higher age group while the proportions ascribed to birth control and to fertility impediments tend to remain constant or to increase. For example, were all women exposed between the ages of 20 and 24 years, they would realize 52 per cent of their implied fecundity and avert 31 and 17 per cent through birth control and impaired fecundity. Comparable figures at ages 25-29 are 44, 37 and 19 per cent.

Birth control is a more important depressant of fertility than fecundity impairments within each age group shown. The proportion of implied marital fecundity ascribed to birth control increases steadily until the early thirties, where it levels off at about one-half. In contrast, the effects of fecundity impairments are fairly constant in the late teens and twenties, where they account for close to one-fifth of implied marital fecundity. At this point, however, they become increasingly important so that, by the late thirties, they avert nearly two-fifths of the fecundity implied by the model. Thus, the proportions of fecundity averted through birth control and fecundity impairments are closest in the youngest age group, where few women are trying to avert births, and approach one another again in the oldest age group, where more women are beginning to suffer impaired fecundity.

Figure 7.2.2. presents the decomposition of the implied fecundity of women who married between the ages of 25 and 34 years, and follows the same format as Figure 7.2.1. The fluctuations in the observed fertility curve (A), especially in the late twenties and early thirties, partly reflect the small numbers of women in the sample who married between ages 25 and 34. Since the overlying curves shown in the figure are obtained by adding estimates of averted births to the fertility curve, these fluctuations are perpetuated in curves B, C and D. The estimated fecundity curve (D) may also fluctuate as a result of the contribution of women who have birth intervals shorter than the standard intervals of the model. That is, since negative "births averted" scores are not assigned to women with shorter than model birth intervals, implied fecundity will be over-estimated at those ages at which there is an unusual preponderance of women with extremely short intervals between births.

Such fluctuations cause variations between the age-specific implied fecundities of women who married before and after exact age 25. The latter results are shown, along with estimates of births observed and births averted by birth control, fecundity impairments and delayed exposure at different ages, in Table 7.2.3. At each age, however, differences in the implied fecundities of women who married at ages 15-24 and of women who

FIGURE 7.2.2: DISAGGREGATION OF IMPLIED FECUNDITY OF WOMEN WHO MARRIED BETWEEN AGES 25 AND 34

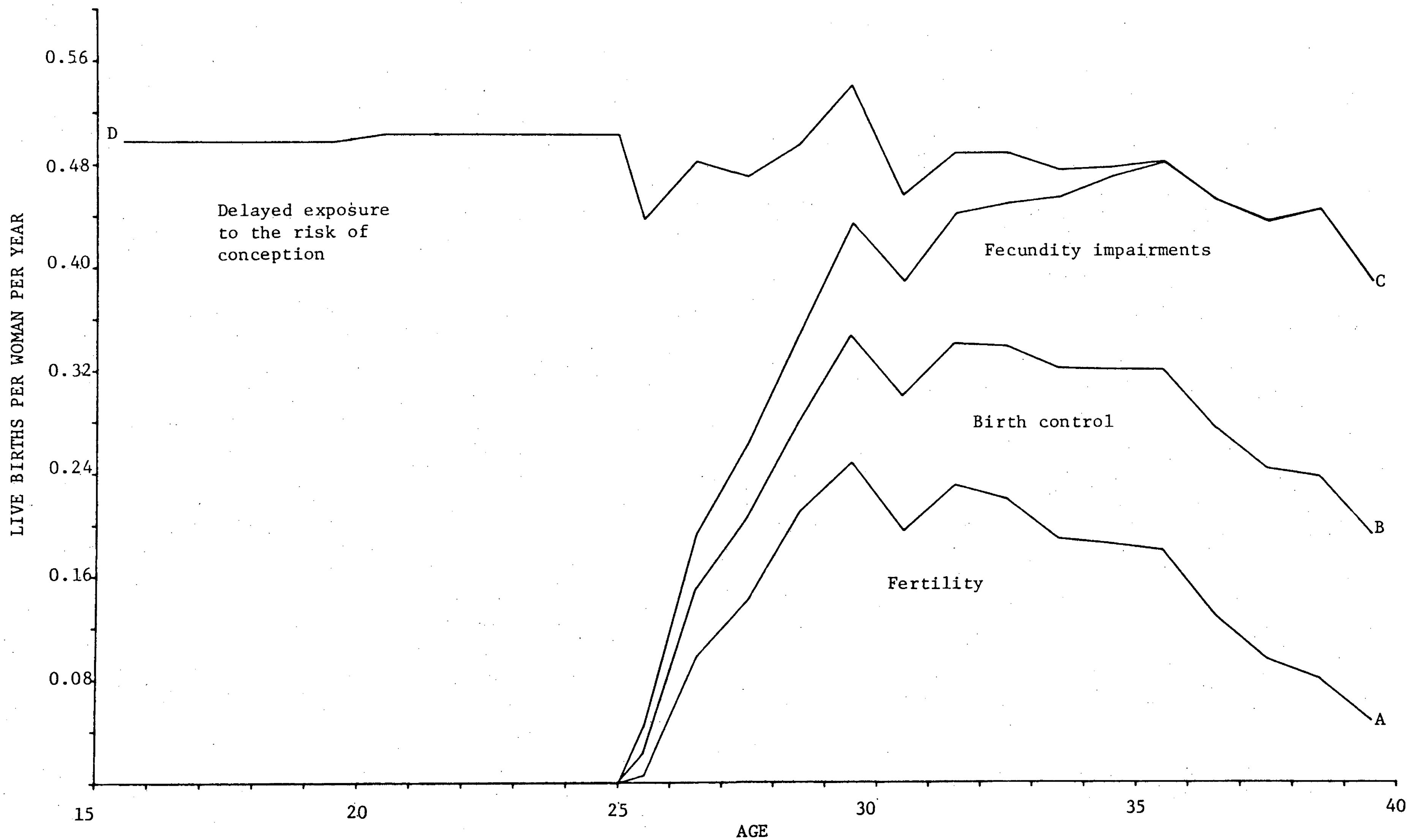

TABLE 7.2.3: AVERAGE NUMBERS OF BIRTHS OBSERVED AND BIRTHS AVERTED BY VARIOUS CAUSES WITHIN FIVE-YEAR AGE GROUPS AMONG WOMEN MARRIED BETWEEN AGES 25 AND 34

Age	Observed Births	Births Averted by: Birth Control	Births Averted by: Fecundity Impairments other than Birth Control	Births Averted by: Delayed Exposure	Implied Fecundity	Number of Women at Mid-point of Interval
15-19	-	-	-	2.49	2.49	470
20-24	-	-	-	2.52	2.52	470
25-29	0.71	0.30	0.28	1.13	2.42	465
30-34	1.03	0.60	0.58	0.17	2.38	402
35-39	0.54	0.74	0.94	-	2.22	322
Total	2.28	1.64	1.80	6.31	12.03	

married at ages 25-34 are slight. Moreover, the total fecundities implied by the model over the entire 15-39 year age range are very similar.

The estimated age-specific fertility rates of the members of the sample who married between the ages of 25 and 34 imply that on average women will bear only 2.3 births each as compared with a hypothetical maximum of 12.0. As total implied fecundity is measured from age 15, even a woman who marries at age 25 can be expected to avert 5.0 births by delaying marriage for ten years. Taking into account ages at marriage, the average number of births averted through delayed exposure to risk rises to 6.3, or more than half the total fecundity implied by the birth interval model.

As among women who married before age 25, the late marriers avert, on average, fewer births through fecundity impairments (1.8 births per woman) than are actually born (2.3 births per woman) and the average numbers of births prevented by impaired fecundity increase steadily with age. Unlike the younger brides, however, the impact of fecundity impairments on childbearing at each age either equals or exceeds the impact of birth control. For example, at ages 25-29 and 30-34 birth control and fecundity impairments each avert 0.3 and 0.6 births respectively, while at ages 35-39 birth control averts 0.7 and fecundity impairments 0.9 births per woman.

Table 7.2.4 presents the percentages of implied marital fecundity ascribable to fertility and to births averted through birth control or fecundity impairments. As for women who married before age 25, the proportion of implied marital fecundity attributed to fertility declines from one age group to the next, although older brides actually realized a higher proportion of their implied fecundity at each age. Since marriage came relatively late in life for these women, it is possible that many were conscious that they could not afford to postpone childbearing much longer. Indeed, many would have commenced childbearing at an age when the younger brides were close to

TABLE 7.2.4: PERCENTAGES OF AVERAGE IMPLIED MARITAL FECUNDITY OF WOMEN MARRIED BETWEEN AGES 25 AND 34 ASCRIBABLE TO FERTILITY, BIRTH CONTROL AND FECUNDITY IMPAIRMENTS

	AGE			
	25-29	30-34	35-39	Total
Fertility	55	47	24	40
Birth Control	23	27	33	29
Fecundity Impairments other than Birth Control	22	26	43	31
Total	100	100	100	100
Implied Marital Fecundity	1.29	2.21	2.22	5.72

completing their families. It is noteworthy, therefore, that the relative contributions of fecundity impairments within age groups vary little with age at marriage. On average, women married between the ages of 25 and 34 averted 22 per cent of their implied marital fecundity through fecundity impairments at ages 25-29 and 26 per cent at ages 30-34. Corresponding percentages for women married before age 25 are 19 and 27. Thus, the higher proportions of marital fecundity realized at these ages by the older brides occur principally because these women made less use of contraception. Indeed, birth control accounts for 23 and 27 per cent of their implied marital fecundity at ages 25-29 and 30-34, as compared with 37 and 49 per cent of the marital fecundity of the younger brides.

At first sight, it might seem peculiar that the estimated number of births prevented by fecundity impairments among the older brides slightly exceeds that among the younger brides in both relative (43 to 38 per cent) and absolute (0.94 and 0.77 births) terms at ages 35-39. The explanation for this finding is two-fold. First, the birth interval model cannot attempt to measure the prevalence and degree of clinical subfecundity in the sample. Rather, a woman's fecundity is said to be impaired if, in the absence of the reported use of birth control, her birth intervals exceed the model intervals. Secondly, it is likely that some of the contraceptive use after reaching age 35 of the women who married before age 25 was unnecessary because they unknowingly became subfecund or infecund while using birth control to limit their families. In other words, for women in their late thirties (and, indeed, to a lesser extent at younger ages as well) birth control may include a small component due to fecundity impairments.

Since the application of the birth interval model in this section does not differentiate women according to year of marriage, any period and cohort differences in age-specific contraceptive use have been masked. Moreover, the analysis provides no indication of parity-specific patterns of birth control. In the following sections, we shall employ the model to examine various aspects of contraceptive use and patterns of family formation amongst the members of different marriage cohorts.

7.3 CONTRACEPTIVE EFFECTIVENESS

Chapter Three revealed that women who married between 1951 and 1960 had higher levels of contraceptive use at each parity than women married before 1951, and that not insignificant proportions of the more recently married switched to more efficient contraceptive methods, such as oral anovulants and newer forms of IUDs, as their parities increased *and* as these methods became widely available. The examination of cohort fertility patterns in Chapter Four revealed, however, that while the distributions of family sizes at the time of the survey of the members of these two broad marriage cohorts were very similar, the members of the earlier cohort tended to have longer intervals between marriage and first birth and between first and subsequent births.

Examinations of the proportions of couples using specific contraceptive methods at particular parities or during particular years provide no indication of the effectiveness with which methods were used. For example, differences in the proportions of women in the 1951-60 and 1961-71 marriage cohorts who used reliable contraception, such as the pill, at the lower parities may reflect changes in both attitudes toward and patterns of family formation. On the other hand, that higher proportions of women in the most recent marriage cohort initiated efficient contraception at low parities may reflect nothing more subtle than greater access to such methods. Ideally, we would use multiple decrement techniques, either alone or in conjunction with model birth intervals (Potter, 1967; Wolfers, 1969, op.cit.), to estimate the use-effectiveness of different contraceptive methods during different periods. There are two reasons why this approach cannot be used here. The first is that the numbers of couples using particular forms of birth control in any given period are small; the second is that the Melbourne data do not allow us to distinguish between pregnancies resulting from deliberate discontinuation of contraception. Instead, we shall rely exclusively on an application of the birth interval model to estimate the contribution of different contraceptive methods in depressing potential marital fertility.

Table 7.3.1 presents the average proportions of implied marital fecundity averted by different classes of contraception controlling for parity and the period in which birth intervals commenced. The results are expressed as proportions of implied fecundity rather than numbers of births averted per year of observation because estimates of the latter sort would be affected by differences in the age distributions of women using different contraceptive methods. For example, consider two women both of whose observed birth intervals are 60 months but whose model age-specific birth intervals are 20 and 30 months respectively. Under the assumptions of the model the younger, and more fecund, woman would be said to avert two births and the older, and less fecund, woman to avert one birth over the period of observation. In relative terms, however, the younger woman averts only two-thirds of her implied marital fecundity while the older woman averts one-half of hers. In other words, since the model ascribes lower fecundity to the older woman, she would be expected to avert fewer births over the same period of observation than the younger woman even if they were using contraception equally well. By presenting the table in relative terms, therefore, we attempt to control for the effects of differences in ages.

When constructing the table, the 1946-55 and 1966-71 periods were chosen to ensure a reasonable homogeneity in the availability of contraceptive methods balanced against the constraints of sample size. Contraceptive methods have been grouped into three broad categories whose constituents might be thought to have similar ranges of efficiency. Modern methods

TABLE 7.3.1: AVERAGE PERCENTAGES OF IMPLIED MARITAL FECUNDITY AVERTED BY CONTRACEPTION, CONTROLLING FOR YEAR OF COMMENCEMENT OF BIRTH INTERVAL AND PARITY

	YEAR OF COMMENCEMENT OF BIRTH INTERVAL							
	1946-55 Parity				1966-71 Parity			
Contraceptive Method	0	1	2	3	0	1	2	3
Modern								
Average percentage	24	32	37	73	57	50	78	79
(N)	(8)	(11)	(13)	(7)	(204)	(167)	(147)	(75)
Mechanical and Chemical								
Average percentage	20	22	53	61	51	35	70	77
(N)	(137)	(170)	(156)	(71)	(19)	(37)	(39)	(26)
Traditional								
Average percentage	25	30	48	51	29	45	62	72
(N)	(96)	(136)	(123)	(76)	(61)	(134)	(151)	(90)
Total								
Average percentage	22	26	51	57	51	47	70	76
(N)	(241)	(317)	(292)	(154)	(284)	(338)	(337)	(191)

subsume intrauterine devices (including the Gräfenberg ring) and oral anovulants. Mechanical and chemical methods comprise condoms, spermicides and the diaphragm. The last mentioned has been included in this group rather than the former because its high degree of theoretical effectiveness may be off-set to some extent by the difficulties that many women encounter with it in practice. Traditional methods include rhythm, voluntary abstinence, withdrawal and douching.

Birth intervals in which more than one contraceptive method was used were excluded from the analysis. When compiling the table, both closed and open birth intervals were used. In the former case, the period of observation is closed by the next birth. In the latter case, the period of observation is truncated by the woman's estimated age at next confinement if she were pregnant at interview or the least of estimated age at infecundity, exact age 40 and age at interview if she were not.

In birth intervals commencing between 1946 and 1955, the average proportions of implied marital fecundity averted by contraception increase with parity regardless of the method employed. Nevertheless, the relative impacts of the different classes of contraception vary from one parity to the next. In the first and second birth intervals, the average proportions of fecundity averted by users of modern and traditional methods are very similar while the proportions averted by users of mechanical and chemical methods are somewhat less. For example, at parity one couples using modern methods averted 32 per cent of their fecundity on average, while couples relying on traditional methods averted 30 per cent and those using mechanical and chemical methods averted only 22 per cent. At parity two, the relative placement of the different methods changes: overall, couples using mechanical and chemical methods averted the greatest proportion of implied marital fecundity (53 per cent), followed closely by those using traditional methods (48 per cent) and then by those using modern methods (37 per cent). Only at parity three do modern contraceptive methods prove more effective than mechanical and chemical methods, and both of these to be more effective than traditional methods.

A different pattern emerges in the average proportions of implied fecundity averted by different classes of contraception in birth intervals commencing after 1965. The proportions of fecundity averted by traditional methods again increase with parity, but at each parity the estimate exceeds the corresponding estimate for the earlier period. For example, traditional contraceptive methods averted 25 and 30 per cent of implied fecundity in first and second intervals commencing between 1946 and 1955 while they averted 29 and 45 per cent in corresponding intervals commencing after 1965.

Only if the first birth interval is ignored can the average proportions of fecundity averted by modern or mechanical and chemical methods be said to increase with parity. Indeed, couples using either of these classes of contraception averted greater proportions of their fecundity at parity zero than they did at parity one. Moreover, the proportion of fecundity averted during the first interval is in each case more than double the proportion averted during first birth intervals commencing between 1946 and 1955. For example, couples using mechanical and chemical contraceptives at parity zero averted 20 per cent of their implied fecundity in intervals commencing in the earlier period but 51 per cent of their implied fecundity in intervals commencing after 1965.

That modern contraceptives were used most frequently in birth intervals commencing after 1965 and that they averted the greatest proportions of implied fecundity at each parity suggests that couples wishing to space early births or to prevent later ones were most likely to adopt easily used and highly efficient methods (principally the pill) as they became widely available. That couples using mechanical and chemical methods averted greater proportions of their implied fecundity in all birth intervals commencing in the later than in the earlier period indicates, however, that the impact of birth control on fertility depends on more than the type of contraception employed.[1] Indeed, that users of traditional methods averted greater proportions of their fecundity at the higher parities than the lower parities in each period, that they averted greater proportions than users of mechanical and chemical methods in first and second birth intervals commencing between 1946 and 1955 and in second birth intervals commencing after 1965, and that they averted greater proportions at each parity in the later than the earlier period suggest that the relative efficiencies of different contraceptive methods tend to be of less practical importance than the motivation with which they are used.

1. This is not to deny the possibility that improvements in the qualities of contraceptives, such as condoms and spermicides, may have reduced user failure rates.

7.4 PATTERNS OF FAMILY BUILDING

In this section we apply the model to examine patterns of family formation among members of broad marriage cohorts. In light of the finding that the motivation with which contraception was used was at least as important as the type of contraception used, no distinction will be made between contraceptive methods in the following analyses: birth intervals will be characterized simply according to whether contraception was employed.

Table 7.4.1 presents the average proportions of implied marital fecundity averted at given parities according to use or non-use of contraception at that and at the subsequent parity, controlling for year of marriage. For example, the first entry in the table shows that the 272 women who married between 1929 and 1950 and who used no contraception before the first birth and again used none after reaching parity one averted, on average, 19 per cent of their implied fecundity during the interval between marriage and first birth. The entry directly below this one shows that the 136 women who used no contraception before the first birth but adopted contraception thereafter failed to realise 10 per cent of their implied marital fecundity while at parity zero.

Each of the estimates shown in the table contains either explicitly or implicitly a component due to subfecundity. The sizeable proportions of potential fertility unrealized by non-contraceptors at each parity point to the existence of fecundity impairments. On the other hand, a woman who adopted contraception when she first became exposed to the risk of contraception may have had little idea of her fecundity and, hence, little idea of whether in fact she needed to take contraceptive precautions. Similarly, at the higher parities a woman who had always spaced her births by contraception may not have been aware of the gradual onset of secondary sterility unless she suspended contraceptive precautions in order to become

TABLE 7.4.1: AVERAGE PERCENTAGES OF FECUNDITY AVERTED AT PARITY i BY WOMEN WHO PROGRESSED TO PARITY i+1 ACCORDING TO USE OF CONTRACEPTION AND YEAR OF MARRIAGE

	YEAR OF MARRIAGE					
	1929-50 Parity i		1951-60 Parity i		1961-71 Parity i	
Parity i+1	No Contraception	Contraception	No Contraception	Contraception	No Contraception	Contraception
1						
No Contraception	19	61	13	55	9	35
(N)	(272)	(9)	(233)	(10)	(162)	(18)
Contraception	10	28	7	25	5	22
(N)	(136)	(299)	(138)	(296)	(213)	(419)
2						
No Contraception	19	52	11	35	9	27
(N)	(177)	(16)	(139)	(4)	(59)	(9)
Contraception	15	28	8	19	3	16
(N)	(66)	(386)	(76)	(401)	(58)	(385)
3						
No Contraception	28	50	14	46	13	42
(N)	(106)	(9)	(72)	(6)	(12)	(4)
Contraception	16	31	17	24	8	12
(N)	(35)	(275)	(49)	(298)	(18)	(130)
4						
No Contraception	23	59	9	39	-	-
(N)	(51)	(9)	(42)	(9)		
Contraception	20	28	9	25	-	-
(N)	(18)	(146)	(18)	(155)		

pregnant. Thus, some of the measures of potential fertility averted by contraception may be over-estimated.

A general pattern appears almost without exception at each parity and in each marriage cohort. Among women who used no contraception at a given parity, those who adopted it at the next tended to have averted smaller proportions of their fecundity during the previous interval. In each marriage cohort, almost all of the women who used contraception at one parity continued to use it if they reached the next parity, but overall the few who did not continue using contraception tended to have averted the greatest proportion of their implied fecundity during the previous interval. As one might expect, contraceptors averted greater proportions of fecundity at each parity than non-contraceptors, although in some cases the differences are small. For example, in the 1929-50 marriage cohort contraceptors at parity two who continued using contraception after reaching parity three averted on average 31 per cent of their implied fecundity at parity two; the corresponding estimate for women who used contraception at neither parities two nor three is 28 per cent.

While this general pattern holds at almost every parity in each of the three marriage cohorts, the proportions of fecundity averted either through contraception or through fecundity impairments decrease with marriage duration at the time of the survey. Thus, the members of the 1929-50 marriage cohort who used contraception neither before nor immediately after the first birth averted on average 19 per cent of their implied marital fecundity at parity zero, while similar women in the 1951-60 cohort averted 13 per cent and those in the most recent cohort nine per cent. Similarly, continuous contraceptors between parities two and three in the 1929-50 cohort averted 31 per cent of their fecundity at parity two, while similar women in the 1951-60 cohort averted 24 per cent and those in the most recent cohort 12 per cent. There are two explanations for this decline. First, as found in Chapter Four, women who married during 1951-60 tended to have spaced their births more closely than did women who married either earlier or later.[1] Secondly, since women who married after 1960 had relatively short marriage durations and only those who had progressed from one parity to the next contributed to the estimate shown in the table, these estimates do not incorporate the experience of women who were delaying first or higher-order births at the time of the survey.

The estimates shown in Table 7.4.1 pertain only to women who progressed from one parity to the next, that is, they employ only closed birth intervals. Table 7.4.2 indicates the proportions of women in each marriage cohort who had not made such progressions by the time of the survey.

Almost all of the members of the 1929-50 and 1951-60 marriage cohorts bore at least one child, nearly 90 per cent bore at least two children and approximately 60 per cent bore at least three. In the 1929-50 cohort, only three per cent of those who bore no children had ever used contraception, while in the 1951-60 marriage cohort only ten per cent of the nulliparous women had ever used contraception. Similarly, 44 per cent of primiparae in the 1929-50 cohort, and 40 per cent of primiparae in the 1951-60 cohort, used no contraception after reaching parity one. This indicates the impact

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1. Among women married before 1951, those who continued to use contraception from one parity to the next averted similar proportions of their fecundity at each parity, which implies that their birth intervals actually increased: in contrast, continuous contraceptors in the 1951-60 cohort averted similar proportions of their fecundity in the first, third and fourth birth intervals but a smaller proportion in the second birth interval, suggesting that they were attempting to bear their first and second children more closely together than their subsequent births.

TABLE 7.4.2: PROGRESSION FROM ONE PARITY TO THE NEXT ACCORDING TO YEAR OF MARRIAGE

	YEAR OF MARRIAGE										
	1929–50 Parity (i)				1951–60 Parity (i)				1961–71 Parity (i)		
	0	1	2	3	0	1	2	3	0	1	2
Percentage of cohort reaching parity	100.0	96.1	86.6	57.0	100.0	95.6	87.6	60.0	100.0	75.7	47.6
Conditional probability of remaining at parity i	0.04	0.10	0.34	0.47	0.04	0.08	0.31	0.47	0.24	0.37	0.68
Percentage of total currently at parity i	3.9	9.5	29.5	27.0	4.4	8.1	27.5	28.4	24.3	28.1	32.3
Percentage currently at parity i who used contraception at this parity	3.4	43.7	73.6	71.6	9.7	40.4	72.3	82.1	66.3	56.8	79.3
Number of women in marriage cohort	745				708				1073		

of either extremely depressed fecundability or true infecundity on fertility.[2] In each cohort, women at parities two and above at the time of the survey were much more likely to have used contraception after their most recent birth.

The experience of women who married after 1960 is vastly different from that of the members of the two earlier marriage cohorts. For example, 24 per cent had never borne a child and fewer than half had borne at least two children by the time of the survey. Thus, the figures in Table 7.4.1 that refer to the most recently married are based on the experience of far smaller proportions of the original cohort than are those pertaining to women who married before 1961. This partly reflects the relatively short durations of marriage of the most recently married women. That is, those who had made the transition from one parity to the next would have had to have moved relatively quickly; many of those who were not using contraception at the time of the survey would have either been waiting to conceive or already pregnant. On the other hand, that two-thirds of the childless women used contraception immediately after marriage and that 57 per cent of those with only one child used contraception after the first birth indicates that many of these women were choosing to postpone the first birth or to space subsequent births.

Table 7.4.3 links the percentages of implied marital fecundity averted at one parity to the percentages averted at the next according to use or non-use of contraception for women married between 1929 and 1950. Rows labelled A in the table contain the conditional probabilities of using contraception at a given parity according to whether contraception was

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2. Indeed, in an analysis of the Melbourne data, Young (1979, op.cit.) reported that among women aged at least 32 years at the time of interview, 76 per cent of those with no surviving children and 79 per cent of those with only one surviving child cited medical causes for their low fertility.

TABLE 7.4.3: FECUNDITY AVERTED AT PARITY i (f_i) BY FECUNDITY AVERTED AT PARITY i+1 ACCORDING TO CONTRACEPTIVE USE AT EACH PARITY, WOMEN MARRIED BETWEEN 1929 AND 1950

		PARITY i					
		No Contraception			Contraception		
Parity i+1		f_i=0	0<f_i≤50	50<f_i	f_i=0	0<f_i≤50	50<f_i
1							
No Contraception							
	A	0.61	0.73	0.81	0.00	0.02	0.08
	B	24	20	48	-	100*	57*
	C	19	16	19	-	-	0*
	D	0.06	0.05	0.39	-	1.00*	0.71*
Contraception							
	A	0.39	0.27	0.19	1.00	0.98	0.92
	B	38	40	39*	28	31	38
	C	34	36	33*	26	24	30
	D	0.06	0.07	0.09*	0.03	0.09	0.11
Total		241	110	57	93	129	86
2							
No Contraception							
	A	0.69	0.73	0.84	0.01	0.03	0.10
	B	25	49	69	0*	45*	78*
	C	17	32	43*	0*	25*	0*
	D	0.10	0.25	0.52	0.00*	0.50*	0.89*
Contraception							
	A	0.31	0.27	0.16	0.99	0.97	0.90
	B	40	55	83*	45	57	76
	C	33	34*	0*	29	31	38
	D	0.11	0.32	0.83*	0.22	0.38	0.61
Total		114	92	37	94	214	94
3							
No Contraception							
	A	0.68	0.78	0.84	0.00	0.03	0.06
	B	35	43	68	-	61*	40*
	C	20	27	17	-	22*	-
	D	0.22	0.29	0.70*	-	0.50*	1.00*
Contraception							
	A	0.32	0.22	0.16	1.00	0.97	0.94
	B	56*	79*	54*	63	63	71
	C	17*	23*	42*	34	32	25
	D	0.47*	0.73*	0.20*	0.43	0.46	0.62
Total		60	49	32	76	122	86

A Conditional probability of contraceptive use at parity i+1 according to contraceptive use and percentage of fecundity averted at parity i.

B Average percentage of fecundity averted at parity i+1 according to percentage of fecundity averted at parity i and contraceptive use at each parity.

C Average percentage of fecundity averted at parity i+1 according to percentage of fecundity averted at parity i and contraceptive use at each parity among women who progressed to parity i+2.

D Conditional probability of remaining at parity i+1 according to percentage of fecundity averted at parity i and contraceptive use at each parity.

* Calculation based on fewer than 20 cases.

used at the previous parity and the percentage of fecundity averted at that parity. For example, the first entry in the table shows that women who used no contraception and averted no births at parity zero had a probability of 0.61 of again using no contraception if they progressed to parity one. Similarly, the probability that fertile women who used contraception and averted no more than half their fecundity before the first birth continued using contractption after reaching parity one is 0.98.

Rows labelled B contain the average percentages of fecundity averted at parity i+1 according to the percentage of fecundity averted at parity i and contraceptive use at each parity. Thus, women who used no contraception and averted no births at parity zero and who again used no contraception after reaching parity one averted, on average, 24 per cent of their implied fecundity at parity one. Women who used contraception and averted up to half their fecundity at parity zero and who continued using contraception after bearing their first child averted 31 per cent of their fecundity at parity one.

Rows labelled C are similar to those labelled B except that they pertain only to women who later moved to the next higher parity. For example, women who bore at least two children, averted no births at parity zero, and used no contraception before the first or the second birth averted an average of 19 per cent of their fecundity at parity one. This is less than the entry immediately above it in the table, which is the average percentage of fecundity averted by women irrespective of whether they ever again bore a child.

Rows labelled D contain the conditional probabilities of progressing no further than parity i+1. Thus, the probability that women who used no contraception and averted no births at parity zero, and again used no contraception at parity one, remained at parity one is 0.06. Similarly, those who used contraception and averted up to half their fecundity at parity zero and who used contraception at parity one remained at this parity with probability 0.09.

A distinction exists between fecundity averted by contraception and fecundity averted in birth intervals in which contraception was used. In the majority of cases these measures will be the same, but for some women fecundity averted in intervals in which contraception was used will actually contain a component due to involuntary foetal wastage. Conversely, in some cases estimates of fecundity averted in birth intervals in which no contraception was used will contain a component caused by induced abortion. In Section 7.2 intervals that yielded births averted by voluntary as well as involuntary causes contributed data to measures of births averted by both birth control and fecundity impairments. Since our present concern is with experiences from one parity to the next, estimates of fecundity averted in each birth interval are distinguished simply according to use or non-use of contraception.

Among fertile members of the 1929-50 marriage cohort who used no contraception before the first birth, the likelihood of using no contraception after reaching parity one increases with the proportion of fecundity averted at parity zero. Thus, the probability that non-contraceptors who averted no births at parity zero again used no contraception at parity one is 0.61, while corresponding probabilities for those who averted up to half and more than half their implied fecundity are 0.73 and 0.81 respectively. For non-contraceptors who averted none or no more than half their fecundity at parity zero, both the average proportions of fecundity averted at parity one (24 and 20 per cent) and the probabilities of remaining at that parity (0.06 and 0.05) are very similar. In contrast, non-contraceptors who averted more than half their fecundity at parity zero averted an average of 48 per cent of their fecundity after bearing a child, and two out of every five such women bore only one child. The average percentages of fecundity averted at parity one by non-contraceptors who went on to bear a second child, however, are virtually undifferentiated according to what happened before the first birth.

Since the probability of non-contraceptors at parity zero not using contraception at parity one increases with fecundity averted at the lower parity, its complement, the probability of non-contraceptors initiating birth control at parity one, decreases with fecundity averted. Like women who used contraception at neither parity, the average percentages of fecundity averted by women who adopted contraception after the first birth and who progressed to parity two are almost undifferentiated according to the proportion of fecundity averted before the first birth. Unlike the members of the former group, however, the probabilities of remaining at parity one are very similar as well.

Few women who used contraception at parity zero failed to continue using it if they reached parity one. Nevertheless, the probability of discontinuing contraception after the first birth rises with the percentage of fecundity averted at parity zero. That most of these women remained at parity one suggests that they stopped using contraception because they did not need it: after discontinuing contraception they may have experienced a long delay before the first birth and, thus, became aware of fecundity impairments.

Among women who used contraception at both parities zero and one, the average percentage of fecundity averted at parity one increases slightly with fecundity averted at parity zero. As with women who used contraception at neither parity, this is due principally to the fact that the likelihood of remaining at parity one also increases with fecundity averted at the lower parity. The average proportions of fecundity averted at parity one by contraceptors who ultimately progessed can be seen to be very similar.

In the table, estimates based on fewer than 20 cases have been starred. An asterisk indicates not only that the estimate of fecundity averted may be unstable but that the transition is an improbable one. For example, contraceptors at one parity rarely become non-contraceptors at the next. Similarly, it is rare for a non-contraceptor who averted more than half her implied fecundity at one parity to adopt contraception at the next.

At the higher parities some patterns persist and some new patterns appear. The likelihood that non-contraceptors did not adopt contraception at the next parity always increases with fecundity averted at the lower parity. Moreover, the probability of those who used no contraception at successive parities bearing no more children also increases with the percentage of fecundity averted at the lower parity. These patterns illustrate the gradual onset of secondary sterility.

Non-contraceptors at parities one and two who progressed to the next parity were more likely to remain unprotected than to adopt contraception. The average proportions of fecundity averted at parities two and three by women who adopted contraception at these parities tends to increase with fecundity averted at parities one and two respectively. This is due principally to substantial increases in the probabilities of progressing no further. For example, among women who used no contraception and averted no fecundity at parity one but adopted contraception after reaching parity two, the probability of remaining at parity two is 0.11. The corresponding probability for those who averted more than half their implied fecundity at parity one is 0.83.

The rarest progression is contraceptive use at one parity followed by no contraceptive use at the next. It is difficult to see any regular pattern in the average proportions of fecundity averted at the various parities amongst such women. Nevertheless, it is clear that the probability of discontinuing contraceptive protection is linked with fecundity averted at the previous parity and that, at each parity, these women had the highest probability of progressing no further.

In contrast, continued use of contraception from one parity to the next is the commonest pattern to emerge in the table. Among women who used contraception at both parities zero and one, the probability of remaining at parity one increases with the proportion of fecundity averted at parity zero. This pattern persists and is strengthened at the higher parities. Thus, among women who continued using contraception after bearing a second child, those who averted none of their fecundity at parity one had a probability of 0.22 of progesssing no further. Corresponding probabilities for those who averted up to 50 per cent and more than 50 per cent of their implied fecundity at parity one are 0.38 and 0.61. No general pattern emerges in the average percentages of fecundity averted at one parity by contraceptors who moved to the next. Part of the reason for this may be that the 1929-50 marriage cohort is rather broad, encompassing as it does women who married during the Depression, the War and the immediate post-War period. As seen in Chapter Four, while the completed family sizes of women who were married in different years over the period were very similar, some variations in their childspacing patterns did occur.[3]

Table 7.4.4. presents information linking experiences from one parity to the next of women who married between 1951 and 1960. The patterns to

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3. See, for example, Table 4.4.2.

TABLE 7.4.4: FECUNDITY AVERTED AT PARITY i (f_i) BY FECUNDITY AVERTED AT PARITY i+1 ACCORDING TO CONTRACEPTIVE USE AT EACH PARITY, WOMEN MARRIED BETWEEN 1951 AND 1960

		PARITY i					
		No Contraception			Contraception		
Parity i+1		f_i=0	0<f_i≤50	50<f_i	f_i=0	0<f_i≤50	50<f_i
1							
No Contraception							
	A	0.58	0.69	0.82	0.01	0.01	0.11
	B	14	20	48	24*	0*	59*
	C	10	10	13*	24*	0*	4*
	D	0.04	0.11	0.46	0.00*	0.00*	0.57*
Contraception							
	A	0.42	0.31	0.19	0.99	0.99	0.89
	B	32	29	32*	16	20	34
	C	26	27	14*	15	16	22
	D	0.08	0.03	0.20*	0.01	0.06	0.18
Total		242	102	27	97	147	62
2							
No Contraception							
	A	0.61	0.73	0.67*	0.01	0.01	0.04
	B	25	27	47*	100*	16*	50*
	C	14	18	10*	–	16*	0*
	D	0.12	0.11	0.42*	1.00*	0.00*	0.50*
Contraception							
	A	0.39	0.27	0.33*	0.99	0.99	0.96
	B	57	83*	83*	38	52	75
	C	31	65*	0*	21	24	29*
	D	0.39	0.50*	0.83*	0.21	0.37	0.64
Total		145	52	18	154	196	55
3							
No Contraception							
	A	0.62	0.59	0.50*	0.01	0.02	0.04
	B	18	33	71*	0*	25*	33*
	C	9	10*	0*	0*	25*	0*
	D	0.12	0.26	0.71*	0.00*	0.00*	0.67
Contraception							
	A	0.38	0.41	0.50*	0.99	0.98	0.96
	B	49	64*	71*	49	66	91
	C	27*	36*	0*	25	26	27*
	D	0.31	0.44*	0.71*	0.33	0.55	0.89
Total		68	39	14	109	127	68

A Conditional probability of contraceptive use at parity i+1 according to contraceptive use and percentage of fecundity averted at parity i.

B Average percentage of fecundity averted at parity i+1 according to percentage of fecundity averted at parity i and contraceptive use at each parity.

C Average percentage of fecundity averted at parity i+1 according to percentage of fecundity averted at parity i and contraceptive use at each parity among women who progressed to parity i+2.

D Conditional probability of remaining at parity i+1 according to percentage of fecundity averted at parity i and contraceptive use at each parity.

* Calculation based on fewer than 20 cases.

emerge in this table are, in most instances, similar to those that emerged in Table 7.4.3; but the cohort is narrower and its members are more homogeneous with respect to family formation than were women who married earlier.

Amongst women who used no contraception at parities zero and one, the probabilities of not using contraception after reaching the next higher parity tend to increase with fecundity averted at the lower parity. For example, the probability that women who used no contraception and averted none of their fecundity before the first birth did not use contraception after reaching parity one is 0.58; for those who failed to realize up to half and more than half of their fecundity at parity zero, these probabilities rise to 0.69 and 0.89 respectively. That this pattern is actually reversed among non-contraceptors who reached parity three could represent a change in the pattern of progression of non-contraceptors. A more likely explanation, however, is that it is an artifact of the data: in comparison with non-contraceptors in the 1929-50 marriage cohort who progressed from parity two to parity three, those in the present cohort tend to have been women who averted no births at parity two.[4] On the other hand, that a non-contraceptor at parity two had not reached parity three by the time of the survey does not preclude the possibility of her doing so later. Thus, even though marriage duration is at least ten years, the average times spent at parity two will have been considerably shorter and a censoring bias that selects for the most fecund non-contraceptors may be operating.

As in the 1929-50 cohort, the average proportions of fecundity averted at one parity by non-contraceptors tend to rise with fecundity averted at

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4. In the 1929-50 marriage cohort 43 per cent of the non-contraceptors at parity two who progressed to parity three averted no fecundity at the lower parity, while in the 1951-60 cohort this figure rises to 56 per cent.

the previous parity, and this is due principally to increases in the likelihood of progressing no further according to fecundity averted at the previous parity. For example, amongst non-contraceptors at parity one who averted no fecundity at parity zero, the average proportion of fecundity averted after the first birth is 14 per cent and the probability of bearing no more children is 0.04; amongst those who averted more than half their implied fecundity at parity zero, the average proportion averted at parity one is 48 per cent and the probability of progressing no further is 0.46.

Among women who used contraception only after bearing the first child, the probability of remaining at parity one appears to bear no relation to the proportion of fecundity unrealized before the first birth. As in the 1929-50 marriage cohort, however, among women who used no contraception and then adopted it after reaching parity two or parity three, the probability of remaining at that parity is positively related to the proportion of fecundity averted during the previous birth interval. Once more, no clear pattern emerges in the average proportions of fecundity averted by those who moved to the next parity.

The discontinuation of contraception again proves to be rare and, generally, to be prompted by knowledge, whether tentative or medically confirmed, of impaired fecundity.

Finally, contraceptive use at consecutive parities is the commonest pattern to emerge in the table. Almost all of the women who used contraception at one parity continued to use it if they progressed to the next. Having reached the next higher parity, the average proportions of fecundity averted by contraceptors is closely tied to the fecundity averted in the previous birth interval. This is due almost entirely to the strong tendency for women who averted a large proportion of their fecundity in the previous interval to progress no further; the average proportions of fecundity averted at parities one, two and three by contraceptors who later moved to the next higher parity are almost undifferentiated according to the proportion of fecundity averted in the previous protected birth interval. For example, among women who used contraception both before and after the first birth and who bore at least two children, those who averted none of their fecundity at parity zero averted, on average, 15 per cent at parity one while those who averted up to half and more than half at parity zero averted 16 and 22 per cent.

The last two tables are complicated but so, one might argue, is the behaviour they attempt to capture. The identification of women according to current use or ever-use of contraception may be a useful starting point for further analysis but such categories are not immutable. Indeed, even a classification that defines some non-contraceptors as subfecund gives the impression that there are three distinct groups of women: non-contraceptors who bear few children because of fecundity impairments; non-contraceptors who bear many children simply because they are non-contraceptors; and contraceptors who plan and bear small families. The discussion over the last few pages suggests that such divisions are a gross over-simplification of patterns of family formation.

In the 1929-50 and 1951-60 marriage cohorts, whose members had largely completed their childbearing by the time of the survey, there are many indications of the effects of fecundity impairments on ultimate family size. Indeed, four per cent of the women in each marriage cohort never bore children and, of these, non-contraceptors account for 96 and 90 per cent respectively. In both cohorts, the probability of non-contraceptors bearing only one child increases with the proportion of fecundity unrealized before the birth of this child. This pattern continued at the higher parities, where women who averted more than half of their fecundity at one parity tended to be substantially more likely to progress no further than the next parity. Such women may have been subfecund to start with and, after taking a long time to bear a child, may have found, while waiting to bear another, that their already depressed fecundity had been further depleted by factors associated with age. A further indication of fecundity impairments is provided by the high probabilities that those few contraceptors at one parity who discontinued contraception at the next bore no more children.

In both the 1929-50 and 1951-60 marriage cohorts, slightly more than half of the women who later bore children used no contraception before the first birth. Since few contraceptors at one parity discontinued contraceptive protection at the next, the progression from no contraception at one parity to contraception at the next virtually represents the initiation of contraception. In the 1929-50 cohort, the probability of initiating contraception falls from one-third to one-quarter between parities one and three. This suggests that, quite irrespective of fecundity unrealized in birth intervals in which no contraception was used, women who initiated contraception were more likely to do so early rather than later in marriage. In contrast, among women who married between 1951 and 1960, the probabilities of initiating contraception at parities one, two or three are, in each case, close to two-fifths. Thus, while these women were equally likely to adopt contraception at one parity if they had not used it at the previous one, they were more likely to initiate contraception than were women who married earlier.

In both marriage cohorts, the initiation of contraception is related not only to parity but to the proportions of fecundity averted in the last unprotected birth interval. The smaller the proportion of unrealized fecundity in the last birth interval, the higher the probability of initiating contraception. Thus, while non-contraceptors who experienced long delays between marriage and first birth and between subsequent births may have seen little reason to impose artificial restraints on their fecundity, many of those who experienced short intervals between births obviously did.

Once women initiated contraception they were likely to have continued using it, but the use of contraception does not necessarily imply that births were averted. Indeed, at parity zero 30 per cent of contraceptors in the 1929-50 marriage cohort and 32 per cent of contraceptors in the 1951-60 cohort averted no births. At parity one the corresponding proportions are 23 and 38 per cent. Some of these women would have had characteristic birth intervals shorter than those of the model and, thus, could have averted fecundity which we cannot detect. Others may have had contraceptive failures. Still others may have used contraception for only a short time, such as during the immediate post partum period, in order to ensure the delay of the next conception no more than a few months; or have disliked the method they adopted and discontinued its use.

It is unlikely that a non-contraceptor who averted much of her fecundity in one birth interval averted little of her fecundity in the next. Amongst contraceptors, however, there is no reason why such a pattern should occur. Although contraception suppresses fecundability, it is not analogous to impaired fecundity because it is applied with motivational intent. The first manifestation of this intent is, of course, the initiation of contraception; the second is its continued use.

By grouping contraceptors at one parity according to the proportion of fecundity averted at that parity, we distinguish a fairly homogeneous group of women. At the next parity, however, the spacing patterns of these women diverge: some of those whose previous birth intervals were long will have wished to bear two children in rapid succession, while others may have striven for a birth interval of similar length to the previous one. Others with a short initial birth interval will have attempted to have delayed longer before the birth of the next child. In each of these patterns contraceptive failure may have produced a birth sooner than was initially desired, while fecundity impairments may have extended the birth interval longer than expected after contraceptive precautions were removed to allow conception. It is hardly surprising, therefore, that in the 1929-50 and 1951-60 marriage cohorts the average proportions of fecundity averted by contraceptors who progressed are largely independent of the proportions of fecundity averted at the previous parity.

The importance of personal motivations, perhaps dictated by outside circumstances, for fertility control is evidenced by the fact that both the means and variances of the birth intervals of women married between 1929 and 1950 actually exceeded those of women married between 1951 and 1960.[5] As a smaller proportion of women in the 1929-50 cohort used contraception, those who did use it must have done so with great effect. This is especially striking since these women would have had access to fewer and less reliable methods of birth control than women who married during the later period.

The final use to which contraception is put, and the one most usually associated with it, is the limiting of completed family size. Amongst the members of both cohorts who used contraception from one parity to the next, the probability of bearing no more children after reaching parities one, two or three increased both with parity and with fecundity averted at the previous parity. In other words, the more children a woman had borne and the longer her penultimate birth interval the more likely she was to terminate childbearing.[6] Thus, the use of contraception to curtail child-

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5. See Chapter Four.

6. Various American studies have concluded that the efficiency with which (Footnote continued on next page.)

bearing was not independent of the extent to which contraception was used to space previous births. This suggests that those who used contraception successfully to space births found it easier to use contraception to limit family size than did contraceptors who averted little of their fecundity earlier in marriage. Conversely, some of the contraceptors whose births were spaced relatively closely may have intended to curtail childbearing after a second or third birth but had their intentions frustrated by contraceptive failure.

Other women did not use contraception to space births but adopted it solely to curtail childbearing. Amongst such women the probability of initiating terminal contraception also increased both with parity and with fecundity averted in the last closed birth interval. This pattern is similar to the one which emerged among continuous contraceptors but the reason for the pattern is different. Many of the women who averted substantial proportions of their fecundity while not using contraception initiated contraception to ensure no further births. Moreover, such women would have been able to use relatively inefficient methods or to use contraception less rigorously than their more fecund peers to achieve the desired effect. Just as some contraceptors may have become unsuccessful limiters, some contraceptors, regardless of whether they had used contraception during previous birth intervals, may have become unwitting limiters. That is, by adopting contraception for spacing purposes, a subfecund woman may have lessened her chances of bearing as many children as she would have wished by

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6. (Footnote continued from previous page.)

couples employ contraception tends to increase as their actual family sizes approach their reproductive ideals. See, for example, Sagi et al. (1962), Potter et al. (1962), Westoff et al. (1963, op.cit.) and Bumpass and Westoff (1970, op.cit.). If responses to questions about desired family size are mere reiterations of the number of children actually borne, such conclusions may be tautological. For example, a fecund contraceptor who bore only three children must have used contraception well after her third birth, regardless of how well she used contraception earlier in marriage.

protecting herself from conception during the remainder of her potentially fertile life.

Finally, 25 per cent of the members of the 1929-50 marriage cohort and 15 per cent of the members of the 1951-60 cohort never used contraception. While Tables 7.4.3 and 7.4.4 go no further than parity three, 91 per cent of the ever-users in the first cohort, and 87 per cent of the ever-users in the second, initiated contraception before parity four.

In the 1929-50 marriage cohort, the probabilities that women who had never used contraception reached parities one, two and three are 0.85, 0.67 and 0.45 respectively; the probabilities for ever-users are 0.99, 0.93 and 0.61. The fact that ever-users were more likely to have progressed from one parity to the next than were never-users indicates that, while some non-contraceptors either wanted large families or were unwilling to use contraception, a considerable proportion of those who never used contraception suffered impaired fecundity. A similar finding emerges in the 1951-60 cohort, where the probabilities of never-users progressing to parities one, two and three are 0.73, 0.50 and 0.33 and the corresponding probabilities for ever-users are 0.99, 0.84 and 0.65. While the probabilities of progressing for ever-users are virtually identical in the two cohorts, those for never-users are smaller, parity for parity, in the 1951-60 than in the 1929-50 cohort. This does not mean that non-contraceptors who married in the 1950s were more likely to have suffered fecundity impairments, but it does suggest that fecund women in the 1951-60 marriage cohort were more likely to have adopted contraception. Thus, since the composition of the never-user groups changed between the cohorts, the role played by fecundity impairments in depressing the fertility of non-contraceptors was greater in the 1951-60 than in the 1929-50 cohort.

Table 7.4.5 presents information linking contraceptive use and

TABLE 7.4.5: FECUNDITY AVERTED AT PARITY i (f_i) BY FECUNDITY AVERTED AT PARITY i+1 ACCORDING TO CONTRACEPTIVE USE AT EACH PARITY, WOMEN MARRIED BETWEEN 1961 AND 1971

		PARITY i					
		No Contraception			Contraception		
Parity i+1		f_i=0	0<f_i≤50	50<f_i	f_i=0	0<f_i≤50	50<f_i
1							
No Contraception							
	A	0.42	0.46	0.58*	0.02	0.04	0.08
	B	34	36	50*	0*	41*	64*
	C	6	9	13*	0*	2*	10*
	D	0.33	0.38	0.43*	0.00*	0.40*	0.60*
Contraception							
	A	0.58	0.54	0.42*	0.98	0.96	0.92
	B	43	50	49*	39	38	44
	C	22	35	2*	15	11	12
	D	0.35	0.32	0.60*	0.37	0.38	0.51
Total		282	81	12	123	254	60
2							
No Contraception							
	A	0.44	0.63	0.75*	0.00	0.04	0.03
	B	46	63	78*	-	79*	0*
	C	7	22*	-	-	14*	0*
	D	0.42	0.70	1.00*	-	0.75*	0.00*
Contraception							
	A	0.56	0.38	0.25*	1.00	0.96	0.97
	B	69	57*	100*	62	73	82
	C	18*	15*	-	12	14	6*
	D	0.73	0.50*	1.00*	0.64	0.73	0.81
Total		81	32	4	160	197	37

A Conditional probability of contraceptive use at parity i+1 according to contraceptive use and percentage of fecundity averted at parity i.

B Average percentage of fecundity averted at parity i+1 according to percentage of fecundity averted at parity i and contraceptive use at each parity.

C Average percentage of fecundity averted at parity i+1 according to percentage of fecundity averted at parity i and contraceptive use at each parity among women who progressed to parity i+2.

D Conditional probability of remaining at parity i+1 according to percentage of fecundity averted at parity i and contraceptive use at each parity.

* Calculation based on fewer than 20 cases.

proportions of fecundity averted at consecutive parities by women who married after 1960. It is naturally difficult to interpret results pertaining to the most recently married women because their marriage durations tend to be short. The effects of short marriage durations are manifested in several ways. In the first place, only three-quarters of the members of the cohort contribute information to the table, the remaining quarter having borne no children by the time of the survey. Among fertile women a selection for fast movers is evidenced by a preponderance of non-contraceptors at parities zero and one who averted none of their implied fecundity before progressing to the next higher parity. Censoring bias is further evidenced by the small proportions of fecundity averted at parities one and two by contraceptors as well as non-contraceptors who reached parity two or parity three.

The proportion of ever-users of contraception in the 1961-71 marriage cohort, 86 per cent, is almost the same as the proportion of ever-users in the 1951-60 cohort despite the fact that women in the earlier cohort had, on average, about three times as long to initiate contraception. As discussed in Chapter Three, far greater proportions of the most recently married women initiated contraception either at the outset of marriage or after the first birth than did women in the earlier cohort. Moreover, as shown in Table 7.4.5, it is rare that contraceptive precautions, once adopted, were discontinued. This suggests that the most recently married women were more concerned with postponing and spacing births than were members of the 1951-60 cohort.

Although patterns of family formation early in marriage clearly started to change in the early 1960s, the logic of contraceptive use bore many similarities to that demonstrated in the earlier cohorts. In particular, amongst the most recently married women the use of contraception at one parity was not independent of fecundity averted at the previous parity. Thus, non-contraceptors at parities zero and one who progressed to the next higher parity were most likely to adopt contraception if they averted little of their implied marital fecundity. Similarly, contraceptors at parity zero who averted much of their fecundity were less likely to continue using contraception after the first birth than were those who averted little of their fecundity.

Unprecedentedly easy and efficient contraception was available to the members of the 1961-71 marriage cohort right from the beginning of marriage. It has already been argued that the motivation with which contraception is used is as important as the theoretical efficiency of the method employed. For example, Table 7.3.1 demonstrated that the average proportions of fecundity averted by traditional methods in birth intervals commencing after 1965 increased from 29 to 72 per cent between parities zero and three. This table also indicated, however, that those who were keen to delay early births were most likely to have adopted the easiest and most efficient contraceptive methods available.

The advent of new contraceptive methods, such as the pill, could affect patterns of family formation by increasing the number of options open to women. For example, while one might consider that the use of efficient contraception naturally implies an element of spacing between births, Keyfitz (1977) discussed how the availability of "surer" contraception could actually serve to reduce intervals between births by allowing women to compress childbearing into the shortest possible span. The latter pattern could entail increases in the numbers of contraceptors discontinuing contraception in order to bear two, or even three, children in rapid succession before re-adopting contraception to terminate childbearing.

As more couples come to adopt contraception to space early births, the likelihood of using contraception unnecessarily also increases. That is, the more successful a woman is in postponing childbearing, the greater the probability that she will encounter problems in conceiving when she wishes to bear a child. Since the chances of successful postponement are greater amongst users of oral contraceptives, the probability of encountering difficulties in conceiving is even greater. Indeed, there exists minor evidence that some women experience delays in the return of ovulation after discontinuing oral contraception and that, in a few cases, anovulation is permanent.[7] Thus, it is possible that a greater emphasis on the spacing of births could result in a greater proportion of couples having smaller families than they would like although their fertility goals may be modest.

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7. For example, two or three per cent of users of oral contraceptives may develop post-pill amenorrhoea (British Medical Journal, 1976). Of 894 Australian patients who complained of infertility, Grant (1973) derived incidences of untreated anovulation of at least one year's duration of four per cent for never-users of orals but nine per cent for users. He also speculated that oral contraceptives increase the probabilities of early foetal losses and abnormal ovarian action in some women. On the other hand, Harrison and Murphy (1974) considered that women who demonstrated problems in conceiving after using the pill may have developed them in any case.

7.5 CONCLUSIONS

One major conclusion to be drawn from the analyses presented in this chapter is that a division of women of childbearing age according to fecundity status and ever-use of contraception may be of little assistance in examining patterns of family formation. Whether women use contraception to space births or to limit their families, or whether they never use contraception at all, is not independent of previous experience. Rather, decisions to use or not to use contraception are taken sequentially.

A non-contraceptor at one parity is more likely to become a contraceptor at the next if she realized most of her marital fecundity in the last unprotected interval. Conversely, a woman may never adopt contraception because she is subfecund rather than because she wishes to have a large family. Among continuous users of contraception no clear relation emerges between the proportion of fecundity averted at one parity and the proportion of fecundity averted at the next.

It is thus difficult to distinguish intended and achieved patterns of family formation. Some women may wish to space their births widely apart but have shorter birth intervals than preferred through contraceptive failure. Others may become infecund while trying to space births and, thus, become unintentional limiters. Still others may have longer than preferred birth intervals because of fecundity impairments.

CHAPTER EIGHT

CONCLUSIONS

> [We] have been reluctantly, but inevitably, driven to the conclusion that the people - led astray by false and pernicious doctrine into the belief that personal interests and ambitions, a high standard of ease, comfort, and luxury, are the essential aims of life, and that these aims are best attained by refusing to accept the consequences which nature has ordained shall follow from marriage - have neglected, and are neglecting, their true duty to themselves, to their fellow countrymen, and to posterity.

Royal Commission on the Decline of the Birth-Rate and on the Mortality of Infants in New South Wales (1904)

> Grave warnings will not frighten potential parents into having children. It is true, of course, that we will perish sooner or later if we do not populate Australia sufficiently. Out extinction may be brought about in two ways. We may be conquered by a more virile people and gradually die out just as the Australian aborigines are doing at the present time. ... [The] other way ... is by our failure to reproduce ourselves in sufficient numbers.

Victor Wallace - "Women and Children First" (1946)

> "Many people apparently have decided that they want smaller families or no families at all", he said.
>
> "It appears as though immediate economic considerations and social attitudes are determining our population growth to a very great extent.
>
> "We certainly should ask why marriage and having babies are less fashionable than they were.
>
> "If, in some senses a main purpose of life is to reproduce the species, many people in industrialised societies have abandoned that purpose".

The Honourable M.J.R. MacKellar, Minister for Immigration and Ethnic Affairs, as reported in *The Canberra Times* 13 November 1979

1971 marked the end of an era of relatively high period fertility, and the beginning of a decline in birth rates that does not yet appear to have ended. The Melbourne survey was therefore conducted at an opportune time: from the data it provides, we can take stock of childbearing behaviour to the time of the survey, and see if this behaviour holds any clues to future developments.

Almost all the Melbourne respondents were fecund at marriage. While there were variations in the timing of the onset of sterility, two-thirds of women could be expected to be fecund at least until the age of 35. Even bearing in mind that a small percentage of fecund women had very low fecundability, and that about one-sixth of all conceptions reportedly ended in foetal death, it is clear that the average completed family size of about three children was not achieved principally through the intervention of physiological factors, but by the well-nigh universal use of contraception.

Great changes, not only in the availability but in the acceptability of contraceptives, have taken place since the 1930s. While natural methods of birth control, such as rhythm and withdrawal, have always been "available" (if known), and condoms and, to a lesser extent, the diaphragm and Gräfenberg ring were all available at the beginning of the period, the very acceptability of older methods increased over time although newer methods tended to supplant them. For example, use of barrier methods waned after the introduction of the contraceptive pill in the early 1960s. Whatever the methods used, however, contraceptive use was found to be tied to fecundity: a woman proved more likely to adopt contraception after a short birth interval than a long birth interval and likely to discontinue the use of contraception only after a particularly long birth interval. Most women who used contraception did so before parity three. For many users, the use of contraception to curtail childbearing was linked to the success with which it had already been used to space births. The complexity of the relation between fecundity and contraceptive use is underlined by the finding that ever-users who had completed their families were actually more likely to progress from one parity to the next (that is, to bear slightly more children) than women who had never used contraception at all.

Contraceptive use was independent of neither year of marriage and calendar period nor broad social grouping. Whatever the social group examined, the incidence of contraceptive use increased over time. Native-born non-Catholics and immigrants from countries other than Southern Europe had the highest levels of contraceptive use, and tended to seize on the most efficient methods as they become available. Native-born Catholics and Southern Europeans had similar levels of contraceptive use although a considerable proportion of the former adopted the contraceptive pill when it became available, while members of the latter group reacted to the contraceptive revolution by increasing their reliance on withdrawal.

In light of these findings, it is striking that multivariate analyses performed on the members of different broad marriage cohorts did not uncover substantial differences in current family sizes. It is true that some attributes, such as those associated with Roman Catholicism, had an augmenting effect on fertility while others, such as labour force participation at the beginning of marriage, had a diminishing effect; but the overall variance explained solely by social characteristics was extremely low. One might speculate that the importance of fertility differentials in modern industrialized societies is less than is commonly supposed: in traditional "high-fertility" societies one might expect fertility to be determined primarily by physiological factors, while in modern "low-fertility" societies in which few people want many children and almost all use contraception, the main point of similarity between women with large families may be their actual fertility, rather than any easily definable *social* (as opposed to *demographic*) characteristic. Indeed, it may be only in transitional societies, in which modern values and aspirations compete with traditional norms, that one can define distinct social groups whose fertility is markedly different.

There are only slight variations from one marriage cohort to the next in average completed family size, although there are noticeable differences in the spacing of births. Women married before 1951 exhibited not only longer average birth intervals than women married between 1951 and 1960, but also greater variation in the lengths of birth intervals. Given that a slightly smaller proportion of women in the earlier cohort used contraception, and that fewer methods were available to these women, it is clear that, notwithstanding the effect of possible temporary marital separations caused by the War, a significant number of women in this cohort must have been using contraception extremely efficiently. Women married during the 1950s compressed their childbearing into a shorter span by bearing their children more closely together, but they did not ultimately bear more children than the women married earlier. In contrast, the patterns of family formation exhibited by women married after 1960 hark back to those of the women married before 1951, with not only a lengthening of average birth intervals but a greater heterogeneity in spacing patterns as well. While one-third of the members of the most recent cohort had borne two children by the time of the survey, one quarter had not borne any children at all; and this was caused less by the relatively short marriage durations of these women than by the widespread deferral of the first birth. Analysis of the childbearing patterns of the most recently married women suggested that they might bear, on average, slightly fewer children than did women who married earlier. Given a strong aversion to childlessness and one-child families, this would be brought about by a greater proportion of women bearing two or three children rather than by an increase in the proportion of women bearing no children or at most one child.

During the decades spanned by the Melbourne data, Australia witnessed dramatic social and economic upheavals and important technological innovations: the economic depression of the 1930s; the Second World War; post-War economic recovery heralding the heightened mass prosperity of the 1950s and 1960s; the influx of non-British migrants, especially Southern Europeans; the introduction of television in the late 1950s; the contraceptive revolution of the 1960s; and expanded higher education and increasing female labour force participation during the same period. Marriage and fertility rates did not remain static in the face of these developments: the "marriage boom" of the 1940s, which was brought about by increases in the proportions marrying and a decline in the average age at marriage, foreshadowed the post-War "baby boom". The latter involved increasing age-specific fertility rates and lasted until 1961. Neither of these "booms" is reflected dramatically in the Melbourne data. In the first place, the design of the Melbourne sample precluded any examination of marriage patterns. Secondly, cohort analyses obscure dramatic changes in period fertility rates. Nevertheless, the "baby boom" is reflected in the reproductive histories of some of the Melbourne respondents. In particular, cumulative marital fertility curves indicated that women married during the Depression and the War tended to be recouping earlier deferred fertility at a time when women married during the 1950s were bearing children in relatively quick succession. The decline in the crude birth rate after 1961 reflected declines in age-specific fertility, and especially legitimate, age-specific fertility rates. Given the compression of the active child-bearing span of women married during the 1950s, and the prolongation of the birth intervals of women married during the 1960s, it would appear that the stage was set for declines in the crude birth rate even without corresponding declines in completed family size.

The popular explanation for the decline in fertility since 1961 is the introduction of the pill. On the other hand, fertility rates plummeted during the Depression, a time when the contraceptive methods widely available were relatively primitive or somewhat cumbersome to use, and pill usage was far from universal in the later period. Moreover, while many women who wished to space their births undoubtedly employed the most efficient methods available to them, we have seen that the effectiveness of contraception in practice, as measured by fecundity averted, depends as much on the motivation with which it is used as the method chosen. What was novel about the contraceptive pill was that it allowed its users to plan their lives, and in particular their working lives, confident as never before that they could bear children in accordance with their own plans; rather than that their lives outside the family would be determined by the occurrence and timing of their births. It has also been pointed out that "as an ever larger proportion of newly married women continues working, the domestic culture of being a full-time mother and housewife begins to disintegrate." (Cosford et al., 1976, p.109)

By the time of the survey oral contraceptives had attracted much unfavourable publicity. Bertuch and Leeton (1971) reported that, of the 96 articles on oral contraceptives published by two leading Melbourne newspapers in 1970, "80 were adverse in that they mainly outlined the risks involved in taking the drug or described isolated cases where complications had possibly arisen as a result of oral contraceptive therapy." (p.1069) Amongst contraceptors in the Melbourne sample there is evidence to suggest that use of the pill had reached a plateau by 1966-67, and that it may even have begun to decline amongst the native-born by 1970-71 (Caldwell and Ware, op.cit.). Just as the advent of oral contraceptives in the 1960s was not the underlying cause of the declines in fertility rates, it is unlikely that a decline in the reliance on the pill would cause an increase in the birth rate. Indeed, age-specific marital fertility rates have been dropping steadily since 1971.

A series of semi-structured interviews instigated by the Department of Demography of the Australian National University and carried out in 1975 and 1976 in various Australian centres (Melbourne, Sydney, Canberra and rural Riverina) offered much sociological evidence that attitudes to marriage and childbearing had changed even since 1971. Married respondents emphasised material aspirations both for themselves and their children, as well as the need for their children to be well educated. They stressed the importance of companionship both within marriage and within the family. Most were working outside the home, either to supplement the family income or because they felt they should work. Women married since 1971 often expressed the feeling that the real decision associated with childbearing was to *stop* using contraception, rather than to use it in the first place. A recurrent theme, however, was that children have not gone out of fashion. Most of the respondents, if childless, expected to have children, and this generally meant two children (Cosford et al., op.cit.).

Fertility declines in the 1970s have occurred, but not in the wake of such obviously dramatic events as the 1929 Wall Street crash or the Second World War which caused substantial variations in period fertility rates in the past. Undoubtedly, there have been demonstrable attitudinal changes toward working mothers and toward children themselves: acceptance and approval of the working mother of not only pre-school but primary-school children has increased to such an extent that it may be the mother who chooses to stay at home who feels the need to justify her decision; perhaps as a compensation, those couples who do have children may be becoming increasingly "child-centred", with more financial and emotional outlays on children (Ruzicka and Caldwell, op.cit.).

The late 1960s and early 1970s saw a marked rise in the proportions of young people staying on at school or progressing to some form of further education or training. Bearing in mind that this generation had high material aspirations it is likely that the deferral of employment also led to the deferral of marriage. One factor that has been insufficiently appreciated is a creeping economic recession whose burden has been carried largely by the young. These young are potential marriers and parents but, in the knowledge that aspirations both for themselves and for their future children may be out of reach, many may be deferring marriage or, if not marriage, parenthood. Indeed, there is already some evidence for a reversal in the long-standing trend toward declining ages at first marriage and increasing proportions ever-married (ibid.). Such a reversal, coming after the postponement of childbearing seen in the late 1960s, may have contributed greatly to the fertility declines already observed in the 1970s and may continue to effect fluctuations in future period fertility rates.

We have seen in earlier marriage cohorts that variations in the tempo of childbearing did not lead to significant variations in average completed family sizes. In a like manner, an increasing tendency for couples to postpone childbearing need not imply a substantial decline in completed family size unless an erosion of what has been in the past a strong aversion to childless or one-child families leads to an increase in the proportion of couples with fewer than two children; or unless substantial proportions of women postpone childbearing to an age at which they are hesitant to undertake a pregnancy.

APPENDIX 3A

TABLE 3A.1: MAIN FAMILY PLANNING METHODS USED BY YEAR OF MARRIAGE AND PARITY, WOMEN MARRIED DURING 1929-50

	YEAR OF MARRIAGE											
	1929-39				1940-45				1946-50			
	Parity				Parity				Parity			
Birth control method	0	1	2	3	0	1	2	3	0	1	2	3
No birth control	56.2	44.4	33.3	32.9	57.3	34.9	23.8	19.2	55.6	37.7	27.4	27.0
Infecund†	5.9	0.7	2.3	1.1	2.7	2.7	2.2	0.7	3.5	1.7	1.9	1.0
Sterilization	0.0	0.7	0.0	0.0	0.0	0.4	1.3	2.1	0.3	0.3	0.6	1.0
Oral anovulant	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.4
IUD††	0.7	1.4	1.6	1.1	1.2	2.0	3.5	4.1	1.4	2.5	2.5	4.3
Diaphragm	3.3	4.9	7.0	9.9	4.6	5.9	11.9	9.6	6.2	9.0	11.8	11.4
Spermicides	6.5	9.7	10.9	9.9	10.0	11.8	12.3	10.3	5.9	6.5	8.1	9.5
Condom	6.5	9.7	9.3	6.6	9.6	11.8	12.3	13.7	8.4	11.0	13.1	9.0
Rhythm	3.9	5.6	8.5	9.9	3.8	7.8	9.7	15.7	7.3	11.5	13.7	16.7
Traditional†††	13.7	19.4	20.9	26.4	8.1	13.3	15.9	16.4	6.8	12.2	15.3	12.9
Two or more methods	2.0	2.8	5.4	1.1	1.9	7.8	6.2	8.2	4.3	7.3	4.7	4.8
Method not specified	1.3	0.7	0.8	1.1	0.8	1.6	0.9	0.0	0.3	0.3	0.3	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(N)	(153)	(144)	(129)	(91)	(260)	(255)	(227)	(146)	(370)	(355)	(321)	(210)

† Includes husband sterile.
†† Includes Gräfenberg ring.
††† Withdrawal, abstinence and douching.

TABLE 3A.2: MAIN FAMILY PLANNING METHODS USED BY YEAR OF MARRIAGE AND PARITY, WOMEN MARRIED DURING 1951-60

	YEAR OF MARRIAGE							
	1951-55				1956-60			
	Parity				Parity			
Birth control method	0	1	2	3	0	1	2	3
No birth control	50.8	33.4	23.2	19.5	54.6	36.9	22.0	15.3
Infecund†	4.7	0.6	0.9	1.0	4.9	1.9	0.6	1.3
Sterilization	0.0	0.0	0.9	0.5	0.0	0.0	0.3	1.3
Oral anovulant	0.0	0.6	2.2	8.6	1.0	3.1	11.7	17.9
IUD††	0.8	0.9	0.6	1.9	1.6	1.7	1.9	4.9
Diaphragm	8.3	14.2	13.0	10.5	9.9	9.2	6.2	3.1
Spermicides	4.4	5.8	7.3	7.1	4.7	3.6	4.3	4.9
Condom	7.4	9.6	11.4	10.5	4.7	5.0	8.3	8.9
Rhythm	7.4	12.8	12.7	13.3	6.8	8.6	12.0	16.5
Traditional†††	10.7	15.1	19.3	17.1	7.6	15.5	21.3	13.8
Two or more methods	5.2	6.4	7.9	10.0	4.2	14.2	11.1	12.1
Method not specified	0.3	0.6	0.6	0.0	0.0	0.3	0.3	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(N)	(364)	(344)	(316)	(210)	(384)	(360)	(324)	(224)

† Includes husband sterile.
†† Includes Gräfenberg ring.
††† Withdrawal, abstinence and douching.

TABLE 3A.3: MAIN FAMILY PLANNING METHODS USED BY YEAR OF MARRIAGE AND PARITY, WOMEN MARRIED DURING 1961-71

	YEAR OF MARRIAGE							
	1961-65				1966-71			
	Parity				Parity			
Birth control method	0	1	2	3	0	1	2	3
No birth control	41.5	19.1	12.2	9.5	39.9	26.0	15.3	11.5
Infecund†	4.7	0.5	0.5	0.0	4.3	0.2	0.0	0.0
Sterilization	0.0	0.0	0.5	1.3	0.2	0.2	1.2	3.8
Oral anovulant	18.3	24.6	23.6	23.6	32.1	27.9	27.6	30.8
IUD††	0.6	1.8	5.1	9.5	1.1	3.2	9.2	0.0
Diaphragm	0.9	1.6	1.1	1.4	0.8	1.2	0.6	0.0
Spermicides	1.9	2.1	3.0	0.7	0.6	0.5	1.2	0.0
Condom	4.3	5.7	5.9	4.7	2.0	4.4	6.7	7.7
Rhythm	8.8	12.6	16.2	20.9	4.3	8.9	11.8	19.3
Traditional†††	11.1	19.0	19.2	18.9	6.0	16.5	17.8	23.1
Two or more methods	7.7	12.8	12.4	9.5	8.7	10.5	8.0	3.8
Method not specified	0.2	0.2	0.3	0.0	0.0	0.5	0.6	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(N)	(467)	(436)	(370)	(148)	(651)	(408)	(163)	(26)

† Includes husband sterile.
†† Includes Gräfenberg ring.
††† Withdrawal, abstinence and douching.

APPENDIX 4A

As discussed in Chapter Four, in a sample many of whose members are interviewed before the end of the childbearing span, the lengths of intervals between births are not independent of the time of interview. In particular, the shorter a woman's duration of marriage, the shorter her closed birth intervals are likely to be. This bias can be reduced, although not eliminated completely, by using double-decrement tables[1] to combine information on intervals between births (or, in the case of the first birth, the interval between marriage and first confinement) with information on intervals since the last birth (or marriage). The general method employed to construct fertility decrement tables is as follows:

Let N_x^i = the total number of women of parity i under observation at the beginning of the x^{th} month since the attainment of parity i, or since marriage when i=0.

B_x^i = the number of women of parity i experiencing a confinement (i.e. progressing to parity i+1) between months x and x+1 since the attainment of parity i.

I_x^i = the number of women of parity i interviewed between months x and x+1 since the attainment of parity i.

Now, assuming that both births and interviews are distributed uniformly over the interval x to x+1 months, the independent probability of progressing from parity i to parity i+1 during the interval is

$$b_x^i = \frac{B_x^i}{N_x^i - \tfrac{1}{2}I_x^i} \quad \text{where } i \geq 0,\ x \geq 0 \qquad (1)$$

1. See Mertens (op.cit.).

The cumulative probability of still being at parity i at the end of month x since the attainment of parity i is

$$Q_x^i = \prod_{j=o}^{x} (1 - b_j^i) \tag{2}$$

and its complement $P_x^i = 1 - Q_x^i$ (3)

is the probability of moving from parity i to parity i+1 by the end of month x.

Given estimates of the birth probabilities, b_x^i , it is also possible to calculate standard functions analogous to the l_x, L_x, T_x, etc. columns of the life-table, although such functions have not been included in the fertility decrement tables presented here. It will also be noted that the tabulations make use of intervals of six and twelve months rather than the single months employed in the derivations.

TABLE 4A.1: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN MARRIAGE AND FIRST BIRTH FOR WOMEN MARRIED DURING 1929-50

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	621	18	0	0.029	0.971	0.029	0
6	603	148	0	0.245	0.733	0.267	6
12	455	125	0	0.275	0.531	0.469	12
18	330	66	0	0.200	0.425	0.575	18
24	264	102	0	0.386	0.261	0.739	24
36	162	45	0	0.278	0.188	0.812	36
48	117	36	0	0.308	0.130	0.870	48
60	81	24	0	0.296	0.092	0.908	60
72	57	15	0	0.263	0.068	0.932	72
84	42	6	0	0.143	0.058	0.942	84
96	36	3	0	0.083	0.053	0.947	96
108	33	8	0	0.242	0.040	0.960	108
120+	25	9	0	0.360	0.026	0.974	120+

TABLE 4A.2: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN FIRST AND SECOND BIRTH FOR WOMEN MARRIED DURING 1929-50

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	605	0	0	0.000	1.000	0.000	0
6	605	5	0	0.008	0.992	0.008	6
12	600	70	0	0.117	0.876	0.124	12
18	530	101	0	0.191	0.709	0.291	18
24	429	153	0	0.357	0.456	0.544	24
36	276	89	0	0.322	0.309	0.691	36
48	187	59	0	0.316	0.212	0.788	48
60	128	26	0	0.203	0.169	0.831	60
72	102	14	0	0.137	0.145	0.855	72
84	88	12	0	0.136	0.126	0.874	84
96	76	9	0	0.118	0.111	0.889	96
108	67	7	0	0.104	0.099	0.901	108
120+	60	14	24	0.253	0.074	0.924	120+

TABLE 4A.3: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN SECOND AND THIRD BIRTH FOR WOMEN MARRIED DURING 1929-50

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	559	0	0	0.000	1.000	0.000	0
6	559	3	0	0.005	0.995	0.005	6
12	556	51	0	0.092	0.903	0.097	12
18	505	54	0	0.107	0.807	0.193	18
24	451	78	0	0.173	0.667	0.333	24
36	373	63	0	0.169	0.555	0.445	36
48	310	39	1	0.126	0.485	0.515	48
60	270	21	1	0.078	0.447	0.553	60
72	248	15	0	0.060	0.420	0.580	72
84	233	13	1	0.056	0.396	0.604	84
96	219	11	4	0.051	0.376	0.624	96
108	204	11	1	0.054	0.356	0.644	108
120+	192	19	45	0.107	0.318	0.682	120+

TABLE 4A.4: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN THIRD AND FOURTH BIRTH FOR WOMEN MARRIED DURING 1929-50

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	378	0	0	0.000	1.000	0.000	0
6	378	2	0	0.005	0.995	0.005	6
12	376	19	2	0.051	0.944	0.056	12
18	355	25	1	0.071	0.878	0.122	18
24	329	55	0	0.167	0.731	0.269	24
36	274	32	3	0.117	0.645	0.355	36
48	239	17	1	0.071	0.599	0.401	48
60	221	14	1	0.063	0.561	0.439	60
72	206	12	0	0.058	0.528	0.472	72
84	194	6	5	0.031	0.512	0.488	84
96	183	5	5	0.028	0.498	0.502	96
108	173	5	8	0.030	0.483	0.517	108
120+	160	11	40	0.077	0.446	0.554	120+

TABLE 4A.5: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN FOURTH AND FIFTH BIRTH FOR WOMEN MARRIED DURING 1929-50

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	203	0	1	0.000	1.000	0.000	0
6	202	2	2	0.010	0.990	0.010	6
12	198	12	0	0.061	0.930	0.070	12
18	186	17	0	0.091	0.845	0.155	18
24	169	29	0	0.172	0.700	0.300	24
36	140	14	1	0.100	0.630	0.370	36
48	125	13	3	0.105	0.563	0.437	48
60	109	9	1	0.083	0.517	0.483	60
72	99	1	5	0.010	0.511	0.489	72
84	93	2	3	0.022	0.500	0.500	84
96	88	3	4	0.035	0.483	0.517	96
108	81	3	2	0.038	0.465	0.535	108
120+	76	3	31	0.052	0.441	0.559	120+

TABLE 4A.6: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN MARRIAGE AND FIRST BIRTH FOR WOMEN MARRIED DURING 1951-60

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	576	18	0	0.031	0.969	0.031	0
6	558	160	0	0.287	0.691	0.309	6
12	398	113	0	0.284	0.495	0.505	12
18	285	78	0	0.274	0.359	0.641	18
24	207	92	0	0.444	0.200	0.800	24
36	115	46	0	0.400	0.120	0.880	36
48	69	20	0	0.290	0.085	0.915	48
60	49	9	0	0.184	0.069	0.931	60
72	40	10	0	0.250	0.052	0.948	72
84	30	8	0	0.267	0.038	0.962	84
96	22	2	0	0.091	0.035	0.965	96
108	20	0	0	0.000	0.035	0.965	108
120+	20	5	10	0.314	0.024	0.976	120+

TABLE 4A.7: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN FIRST AND SECOND BIRTH FOR WOMEN MARRIED DURING 1951-60

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	561	0	0	0.000	1.000	0.000	0
6	561	7	0	0.012	0.988	0.012	6
12	554	112	1	0.202	0.788	0.212	12
18	441	118	0	0.268	0.577	0.423	18
24	323	153	1	0.474	0.303	0.697	24
36	169	65	1	0.386	0.186	0.814	36
48	103	27	2	0.265	0.137	0.863	48
60	74	15	2	0.205	0.109	0.891	60
72	57	12	1	0.212	0.086	0.914	72
84	44	4	1	0.092	0.078	0.922	84
96	39	0	3	0.000	0.078	0.922	96
108	36	4	4	0.118	0.069	0.931	108
120+	28	3	13	0.145	0.059	0.941	120+

TABLE 4A.8: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN SECOND AND THIRD BIRTH FOR WOMEN MARRIED DURING 1951-60

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	520	0	1	0.000	1.000	0.000	0
6	519	4	0	0.008	0.992	0.008	6
12	515	60	0	0.117	0.877	0.123	12
18	455	74	1	0.163	0.734	0.266	18
24	380	90	2	0.237	0.560	0.440	24
36	288	45	1	0.157	0.472	0.528	36
48	242	34	4	0.142	0.405	0.595	48
60	204	18	9	0.090	0.369	0.631	60
72	177	15	10	0.087	0.336	0.664	72
84	152	14	18	0.098	0.304	0.696	83
96	120	5	13	0.044	0.290	0.710	96
108	102	7	16	0.074	0.269	0.731	108
120+	79	2	7	0.026	0.261	0.739	120+

TABLE 4A.9: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN THIRD AND FOURTH BIRTH FOR WOMEN MARRIED DURING 1951-60

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	368	0	4	0.000	1.000	0.000	0
6	364	1	2	0.003	0.997	0.003	6
12	361	29	4	0.081	0.917	0.083	12
18	328	35	5	0.108	0.818	0.182	18
24	288	58	16	0.207	0.649	0.351	24
36	214	25	12	0.120	0.571	0.429	36
48	177	15	13	0.088	0.520	0.480	48
60	149	15	18	0.107	0.465	0.535	60
72	116	11	17	0.102	0.417	0.583	72
84	88	2	15	0.025	0.407	0.593	84
96	71	2	13	0.031	0.394	0.606	96
108	56	2	15	0.041	0.378	0.622	108
120+	39	2	34	0.230	0.291	0.709	120+

TABLE 4A.10: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN FOURTH AND FIFTH BIRTH FOR WOMEN MARRIED DURING 1951-60

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	197	0	5	0.000	1.000	0.000	0
6	192	1	5	0.005	0.995	0.005	6
12	186	23	5	0.125	0.870	0.130	12
18	158	20	3	0.128	0.759	0.241	18
24	135	18	10	0.138	0.654	0.346	24
36	107	7	10	0.069	0.609	0.391	36
48	90	6	12	0.071	0.565	0.435	48
60	72	5	11	0.075	0.523	0.477	60
72	56	4	15	0.082	0.480	0.520	72
84	37	3	7	0.090	0.437	0.563	84
96	27	3	7	0.128	0.381	0.619	96
108	17	1	5	0.069	0.355	0.645	108
120+	11	1	6	0.125	0.310	0.690	120+

TABLE 4A.11: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN MARRIAGE AND FIRST BIRTH FOR WOMEN MARRIED DURING 1961-71

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	893	46	29	0.052	0.948	0.052	0
6	818	170	37	0.213	0.746	0.254	6
12	611	114	32	0.192	0.603	0.397	12
18	465	107	27	0.237	0.460	0.540	18
24	331	129	41	0.415	0.269	0.731	24
36	161	61	18	0.401	0.161	0.839	36
48	82	26	10	0.338	0.107	0.893	48
60	46	9	9	0.217	0.084	0.916	60
72	28	11	4	0.423	0.048	0.952	72
84	13	1	5	0.095	0.044	0.956	84
96	7	0	0	0.000	0.044	0.956	96
108	7	1	3	0.182	0.036	0.964	108

TABLE 4A.12: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN FIRST AND SECOND BIRTH FOR WOMEN MARRIED DURING 1961-71

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	675	0	46	0.000	1.000	0.000	0
6	629	8	43	0.013	0.987	0.013	6
12	578	86	38	0.154	0.835	0.165	12
18	454	80	31	0.182	0.683	0.317	18
24	343	149	42	0.463	0.367	0.633	24
36	152	56	21	0.396	0.222	0.778	36
48	75	24	17	0.361	0.142	0.858	48
60	34	7	4	0.219	0.111	0.889	60
72	23	2	8	0.105	0.099	0.901	72
84	13	3	4	0.273	0.072	0.928	84
96	6	2	4	0.500	0.036	0.964	96

TABLE 4A.13: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN SECOND AND THIRD BIRTH FOR WOMEN MARRIED DURING 1961-71

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	417	0	35	0.000	1.000	0.000	0
6	382	1	39	0.003	0.997	0.003	6
12	342	34	39	0.105	0.892	0.108	12
18	269	39	36	0.155	0.753	0.247	18
24	194	36	42	0.208	0.597	0.403	24
36	116	18	35	0.183	0.488	0.512	36
48	63	8	28	0.163	0.408	0.592	48
60	27	5	17	0.270	0.298	0.702	60
72	5	1	2	0.250	0.223	0.777	72

TABLE 4A.14: FERTILITY DECREMENT TABLE, INTERVAL BETWEEN THIRD AND FOURTH BIRTH FOR WOMEN MARRIED DURING 1961-71

x	N_x	B_x	I_x	b_x	Q_x	P_x	x
0	142	0	17	0.000	1.000	0.000	0
6	125	1	26	0.009	0.991	0.009	6
12	98	7	14	0.077	0.915	0.085	12
18	77	6	14	0.086	0.836	0.164	18
24	57	7	18	0.146	0.714	0.286	24
36	32	3	16	0.125	0.625	0.375	36
48	13	3	8	0.333	0.417	0.583	48
60	2	1	1	0.667	0.139	0.861	60

APPENDIX 5A

TABLE 5A.1: PARITY DISTRIBUTIONS BY YEAR OF MARRIAGE AND AGE AT MARRIAGE

	YEAR OF MARRIAGE													
	1929-50 Age at Marriage				1951-60 Age at Marriage					1961-71 Age at Marriage				
Parity	<20	20-24	25-29	30-34	<20	20-24	25-29	30-34	≥35	<20	20-24	25-29	30-34	≥35
0	2.6	2.6	7.7	16.7	1.1	3.3	8.5	25.0	72.2	15.4	28.9	23.4	25.7	75.0
1	8.7	6.8	17.7	33.3	6.2	7.5	11.9	12.5	27.8	33.9	26.4	23.4	30.2	10.0
2	29.1	29.2	33.1	16.7	26.4	26.4	33.8	37.5	-	32.2	30.0	41.9	30.2	5.0
3	23.4	30.3	21.5	33.3	28.1	30.5	22.9	16.7	-	15.1	11.6	10.6	11.2	5.0
4	15.8	15.1	10.8	-	18.0	18.3	10.2	8.3	-	3.4	2.9	0.7	2.3	5.0
5	11.2	10.1	5.4	-	11.8	8.0	5.9	-	-	-	0.2	-	-	-
6+	9.2	5.9	3.8	-	8.4	6.0	6.8	-	-	-	-	-	-	-
Total (N)	100.0 (196)	100.0 (425)	100.0 (130)	100.0 (18)	100.0 (178)	100.0 (398)	100.0 (118)	100.0 (24)	100.0 (18)	100.0 (298)	100.0 (595)	100.0 (141)	100.0 (43)	100.0 (20)
Average family size	3.37	3.09	2.42	1.67	3.31	3.09	2.63	1.71	0.28	1.57	1.34	1.42	1.35	0.55
Standard deviation	2.23	1.55	1.46	1.11	1.58	1.59	1.62	1.24	0.45	1.03	1.11	0.98	1.05	1.12

TABLE 5A.2: MEANS, 95 PER CENT CONFIDENCE LIMITS AND MEDIANS OF CLOSED BIRTH INTERVALS (IN MONTHS) BY AGE AT MARRIAGE AND BIRTH ORDER FOR WOMEN MARRIED DURING 1929-50†

		AGE AT MARRIAGE			
Birth Order		<20	20-24	25-29	30-34
1	Mean	27.8±4.2	28.6±2.5	32.0±4.6	36.9±23.8
	Median	17.3	20.0	24.8	22.5
	(N)	(191)	(414)	(120)	(15)
2	Mean	39.2±4.3	39.5±2.8	39.2±4.6	
	Median	29.3	32.8	34.1	
	(N)	(174)	(385)	(97)	
3	Mean	50.4±7.5	44.9±3.8	43.8±6.0	
	Median	35.1	37.0	40.0	
	(N)	(117)	(261)	(54)	
4	Mean	49.3±8.6	47.2±5.7	30.9±5.9	
	Median	35.8	36.5	28.0	
	(N)	(71)	(132)	(26)	
5	Mean	39.7±8.6	43.8±7.5	43.8±8.9	
	Median	30.0	34.0	45.0	
	(N)	(40)	(68)	(12)	

† Birth intervals with fewer than ten cases not shown.

TABLE 5A.3: MEANS, 95 PER CENT CONFIDENCE LIMITS AND MEDIANS OF CLOSED BIRTH INTERVALS (IN MONTHS) BY AGE AT MARRIAGE AND BIRTH ORDER FOR WOMEN MARRIED DURING 1951-60†

		AGE AT MARRIAGE			
Birth Order		<20	20-24	25-29	30-34
1	Mean	21.6±2.5	24.7±2.3	28.5±5.0	21.9±8.3
	Median	17.4	17.3	21.8	16.5
	(N)	(176)	(385)	(108)	(18)
2	Mean	29.9±3.2	30.6±1.9	32.1±4.0	25.5±5.3
	Median	24.8	25.8	26.3	28.5
	(N)	(165)	(355)	(94)	(15)
3	Mean	36.3±4.3	38.3±3.1	33.7±5.5	
	Median	26.4	30.6	30.0	
	(N)	(118)	(250)	(54)	
4	Mean	35.5±6.2	39.0±4.3	35.2±9.8	
	Median	28.5	30.6	30.8	
	(N)	(68)	(129)	(27)	
5	Mean	35.2±9.1	36.1±7.0	36.2±12.9	
	Median	22.5	25.5	30.8	
	(N)	(36)	(56)	(15)	

† Birth intervals with fewer than ten cases not shown.

TABLE 5A.4: MEANS, 95 PER CENT CONFIDENCE LIMITS AND MEDIANS OF CLOSED BIRTH INTERVALS (IN MONTHS) BY AGE AT MARRIAGE AND BIRTH ORDER FOR WOMEN MARRIED DURING 1961-71†

		AGE AT MARRIAGE			
Birth Order		<20	20-24	25-29	30-34
1	Mean	17.3±1.7	24.3±1.6	20.2±2.3	23.0±4.5
	Median	13.1	20.8	18.2	20.0
	(N)	(252)	(423)	(108)	(32)
2	Mean	30.2±2.8	27.3±1.4	28.7±3.6	27.1±6.6
	Median	26.4	26.9	23.8	24.8
	(N)	(151)	(266)	(75)	(19)
3	Mean	29.3±3.6	26.1±3.0	29.5±8.3	
	Median	26.4	21.7	24.0	
	(N)	(55)	(87)	(16)	
4	Mean	33.7±15.3	25.9±5.2		
	Median	36.0	24.0		
	(N)	(10)	(18)		

† Birth intervals with fewer than ten cases not shown.

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