SPATIO-TEMPORAL TRENDS OF FERTILITY DECLINE IN NEWFOUNDLAND 1966-1981

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BY

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To Bird Dog
and
Big Boo

ABSTRACT

Age-specific fertility rates are not available for Newfoundland because the birth registration record does not include the age of the mother. However, age-specific fertility rates can be estimated from the administrative records of the hospital. This study estimates age-specific fertility rates and a number of derivative indexes from hospital records for prescribed areas on the island for the census years 1966 through 1981. The findings of this study reveal a large degree of spatial variation in fertility in 1966. The subsequent fifteen years are a period of extensive decline in fertility as rates converge toward a much lower family size norm. The spatio-temporal patterns of fertility decline reveal that Catholicism has presented a formidable barrier to the adoption of family limitation. The findings also reveal very significant spatial differences in teenage fertility rates and marriage patterns based on religion and the urban-rural distinction.

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PREFACE

This thesis addresses a significant and nagging gap in our understanding of fertility in Newfoundland. The absence of maternal age in the birth record has been an unfortunate impediment to our understanding of fertility and the progress of its decline in the twentieth century. The inadequacy of the vital registration system has been an especially unfortunate hindrance to research in this area. This thesis is an attempt to fill that gap as best it can within the unavoidable limitations of this study.

One limitation is the fact that small populations represent a statistical problem. Rates based on small numbers are less stable; more highly subject to the impact of chance factor. This limitation is dealt with by confining the investigation to the observation of large and/or consistent differences among populations. The more subtle differences are assumed to be insignificant.

Another limitation is the late date at which the study necessarily begins due to the absence of age-specific fertility rates prior to 1966. This absence makes it impossible to establish with certainty regional patterns of

fertility before the proliferation of modern methods of birth control in the mid-1960s. Thus this study necessarily begins when the impact of these methods has already begun to make itself felt. As unfortunate as this limitation may be, existing statistics surely are not rendered irrelevant by the absence of earlier records.

Finally, this study is geographically confined to the island portion of the province; it excludes Labrador. The greater part of Labrador is a distinctly different place from the island of Newfoundland. My social and working experience as well as my more limited travelling experience has been of the island and unfortunately not of Labrador as well. Hopefully, a similar study for Labrador will be undertaken by someone more familiar with it.

INTRODUCTION

> "Age-specific fertility rates are not available in Newfoundland so the extent of early motherhood is not documented."
> (McKilligan, 1978, p.1252)

> "Age-specific fertility rates are not published in the province and no studies on family size are available. There is a need to document some of these factors more clearly in order to demonstrate desire for and distribution of family planning services."
> (Hughes and McKilligan, 1981, p.4)

> "One of the most obvious needs is for the compilation of statistics which will give us a clear picture of the situation with regards to needs and delivery of services so that a future policy can be determined."
> (The Family Planning Association of Newfoundland and Labrador, 1973, p.30)

> "Attitudes are developed from early childhood; knowledge and behaviour are developed from adolescence; and fertility decisions are made continuously throughout the major portion of adult years. It is hoped that increased research and service will be done, so that we may understand and manage our fertility more effectively."
> (Johnson, 1981, p.97)

Fertility research in Newfoundland has been seriously restricted by the absence of maternal age in the birth record. This parameter is necessary for the computation of age-specific fertility rates which are "vital for fertility research and demographic estimates and projections" (Perreault et al., 1982, Abstract). Clearly, there is a need for a study of fertility based on a demographically more sophisticated measure than the vital registration

system can provide. A study of age-specific fertility fulfills both an academic need to increase our collective knowledge of human reproductive behaviour as well as a compelling desire to understand the dynamics of fertility decline as they are manifest in the specific and interesting case of Newfoundland.

This study examines spatio-temporal patterns of fertility decline in Newfoundland from 1966 to 1981 by the estimation of age-specific fertility rates from hospital records of delivery. This spatio-temporal approach is part of a tradition of fertility research which aims to understand causation.

To this end, this thesis is organized as follows. Chapter One, (Theoretical Context), establishes a theoretical framework for the study. Chapter Two, (Methodology, Data Assessment and Compilation), describes how the prescribed parameters of fertility are measured and discusses the origin and reliability of the data on which the methods rely. Chapter Three, (Overview), examines general provincial trends in fertility between 1966 and 1981 and discusses the general trend of the prescribed parameters of fertility through the fifteen-year period in question, establishing a contextual framework for the analysis of fertility for specific areas. Chapter Four, (Analysis and

Discussion), briefly describes some of the more salient settlement, transportation and religio-cultural features of the island, and then analyzes and discusses the larger and/or more consistent patterns and trends of fertility and marriage. Finally, Chapter Five draws conclusions from the observations of the previous chapter in a discussion of the most salient hypotheses of fertility decline and their application to the case of Newfoundland.

CHAPTER 1

THEORETICAL CONTEXT

The first attempt to establish a theory of fertility decline dates back to 1945 when Frank Notestein developed the Demographic Transition Theory. Generalizing from the European demographic experience, Notestein characterized three stages of transition, as defined by fertility and mortality levels. The first stage was characterized by high fertility and high mortality. As society does not have the means or knowledge to reduce high mortality, fertility must necessarily be high if the community is to survive. It is kept high by pronatalist societal props such as "religious doctrines, moral codes, laws, education community customs, marriage habits and family organizations" (Notestein in Caldwell, 1976, p.323) that are "highly institutionalized and slow to change" (Teitlebaum, 1975, p.430).

The second stage is characterized by population growth; the result of a fall in mortality which in turn resulted from improvements in medicine and hygiene. High fertility, however, persists since the props and the traditional social institutions remain intact. The third stage describes the gradual voluntary reduction of fertility which arrests population growth. This decline of fertility

cannot occur until pronatalist social and economic institutions have been weakened. At first, this decline in fertility is achieved by traditional methods of birth control, and eventually by more efficient forms of modern contraception.

Notestein believed that the extended agrarian family was the strongest promoter of pronatalist ideas and that the decline of fertility was the result of the weakening of the extended agrarian family and its ultimate replacement by the individualistic nuclear urban family. He recognized a number of other significant and often inter-related causes of fertility decline such as secularisation, education, improved health, alternatives to marriage and childbearing for women, and the growth of "huge and mobile city populations" (Notestein in Caldwell, 1976, p.323). These developments serve to erode not only the extended family but other traditional and pronatalist social and economic institutions.

Since the development of this apparently simple theory, many people have sought to test its validity to the ends of more closely defining the causes of the secular decline of fertility. Economists and sociologists have been especially involved in such research. While the economic and sociological approaches each offer only a partial

explanation of why fertility declined, both schools have made significant contributions to the development of the Demographic Transition Theory. As is true of most questions in the social sciences, a more comprehensive approach lies in a marriage of both disciplines. The works of Harvey Leibenstein, Richard A. Easterlin and Ansley J. Coale represent such a marriage to different degrees. They are responsible for some of the more significant recent contributions to the theory in this question.

Classical economic theory (Becker in Woods, 1979, p.151) states that material acquisitions compete with children for parents' time and money. Accordingly, the single most important cause of the secular decline in fertility is that urbanization and modernization decreased the economic value and increased the cost of children.

Leibenstein (1975) while supporting the economic theory of fertility, places strong emphasis on the fertility depressing impact of growing status ambition; status that comes by way of material acquisition. Though status is very closely related to material wealth the desire for status cannot be said to be strictly economically motivated (Leibenstein in Woods, 1982, p.103). Rising consumption standards and the role of "social copying" has obvious economic consequences; children become more expensive to

have and to take care of. Perhaps equally important, in sociological terms, is that children become less desirable since they possibly represent some degree of material deprivation.

This interpretation of the economic theory of fertility has its roots in the work of Banks (1954) who identified empirical evidence of financial pressure on the English middle classes toward the end of the last century; children were becoming more expensive in the 1870s (Woods, 1979, p.151). Further support was furnished by Lesthaeghe and van de Walle who provided evidence that French upper and middle class couples began to control their fertility in the 1800s "under the pressure of economic and social incentives" (in Woods, 1979, p.150).

Most sociological interpretations of fertility decline reject the idea that the child in society can be regarded as a consumer durable; subject to the law of supply and demand. Sociological theories of fertility emphasize the non-economic value of children, "the social regulation of fertility working through group norms and peer group pressure" (Woods, 1979, p.151), parameters which are subjectively based, difficult to define or measure, and highly interrelated. While the concept of norms was first applied to fertility in the early 1960s by Ronald Freedman,

it is now perhaps best exemplified in Knowledge, Attitude and Practice (KAP) studies. These survey based studies are meant tc uncover what determines 'desired size' of family. When desired family size is smaller than the actual family size, it is expected that fertility levels will procede on their way down. The concept of an ideal or desired family size is a promising conceptual contribution by sociology to the study of causation of fertility decline.

Richard A. Easterlin's (1978) contribution to Transition Theory, combines the social and economic perspectives and thus constitutes a significant departure from the disciplinary approaches. He borrows from classical economic theory the notion that fertility can be modelled as a function of supply of and demand for children but he rates the economic impact on fertility secondary to the stronger influence on family size of societal norms, values, attitudes, and to the motivation and access to the means of birth control.

Easterlin perceives two distinctly different societies; (1) pre-modern, where the demand for surviving children exceeds the supply and where the pattern of fertility is in accordance with the natural fertility schedule (Henry, 1961), and (2) modern, where the supply of surviving

children exceeds the demand and the growing number of unwanted children accentuates the need and brings pressure to bear on the development of more effective, cheaper and accessible contraception. What causes the shift from pre-modern to modern is; "positive changes in, for example, public health, education, urbanisation, material well-being and per capita income", what we may broadly define as modernization (Woods, 1982, p.105). The strength of Easterlin's conceptualization rests in the more balanced relative influence of sociological and economic parameters. On the other hand, "it avoids the issue of distinguishing between the relative influence of structural economic changes and the changes in the value system of a society" (ibid., p.127), and relies on a questionable definition of modernization which "also requires its own highly complex set of causal theories before it can itself be explained" (ibid., p.106).

The most comprehensive recent inquiries into the question of fertility decline have examined the question of human fertility behaviour not only from the sociological and economic perspective, but from the cultural, religious and political perspective. This multidisciplinary approach views the secular reduction of fertility as a response "to a multitude of stimuli" (Woods, 1979, p.141) and emphasizes the cultural differences between groups of people;

differences in religion, tradition, degree of isolation and type of education for example, all of which can have a considerable influence on fertility and all of which operate "in the context of considerable demographic diversity" (Ibid.). This approach has been applied to a number of historical European populations in the Princeton Study (Livi-Bacci, 1967, 1977, Van de Walle, 1974, Knodel, 1974, and Tsubouchi, 1970 among others).

The study of fertility decline in terms of such a large number of parameters has taken two forms: (1) involving the use of multivariate correlation techniques which aim to establish the relative explanatory strength of various cultural, religious and socio-economic correlates of fertility decline, and (2) involving the examination and description of the changing spatial patterns of fertility through a period of secular decline. In studying a current or very recent decline where only period measures of fertility are available, it is necessary to aggregate people into groups large enough to allow for the calculation of reliable indexes and rates of fertility. In using either of the techniques described above the researcher must beware of drawing too many inferences about the behaviour of the individual from the behaviour of the aggregate.

I. MULTIVARIATE CORRELATION TECHNIQUES

The application of multivariate correlation techniques to the question of fertility has stringent data requirements: (i) a very large population sample is required and (ii) a wide variety of cultural, religious and socio-economic variables must be available in aggregations that match those from which fertility rates are computed. Neither of these requirements can be met by the data that are available in the following study of Newfoundland. Despite the inapplicability of this technique to the present case, it is nonetheless worth outlining a number of relevant observations drawn from studies in Canada.

Examples of studies that use multivariate techniques at the national and census tract level are Balakrishnan et al. (1979) and Lapierre-Adamcyk (1979) respectively. Both these studies are significantly different from the present one in that they analyse post transition fertility patterns. This distinction between post-transition and transition patterns must be made since the causal determinants of fertility decline alluded to in all the literature discussed thus far correspond to the observation of fertility rates through a period of accelerated decline. That accelerated decline was largely over in Canada by the mid 1960s. Demographic developments thereafter appear to

be governed by a different process; as current studies indicate, previously strong correlates of fertility cease to predominate (ie:husband's income) and other previously weaker correlates emerge dominant (educational and labour force participation of women). In Newfoundland, on the other hand, as the following study will indicate, the final accelerated decline which likely had its origins in the early twentieth century, as even a cursory look at cohort statistics from the census will indicate, was still in progress between 1966 and 1976. Post-transition demographics in Newfoundland can only be said to start much later as the very decelerated decline between 1976 and 1981 indicates.

Balakrishnan (1979) and Lapierre-Adamcyk's (1979) studies reveal that: (i) As late as 1971 urban-rural differences in fertility persisted in Canada. (ii) Religion continued to be a significant variable for women over the age of thirty whereas for younger women, educational level and labour force participation appear to be more significant (Balakrishan, p.260); (iii) Perhaps the most relevant finding was that, multiple correlation analysis indicated that socio-economic indexes were no longer able to explain variation in fertility by 1971, indicating "a convergence of values and attitudes concerning childbearing and family size" (Lapierre-Adamcyk, 1979, p.84).

Though the use of sophisticated statistical techniques such as multivariate correlation have much to offer the study of causation in fertility decline, it has as well a number of drawbacks that are worth mentioning. (i) An association between two variables does not necessarily provide an explanation of cause and effect. Though cause and effect can sometimes be inferred from the chronological order of change in the related variables, the examination of the rate of change of fertility has proven "less amenable to simple correlation or even partial correlation analysis" (Woods, 1979, p.149). (ii) The parameters selected for correlation are themselves so inextricably inter-related, that "any conclusion about the order of importance of the variables in the explanation of variation in fertility must remain tentative" (Lapierre-Adamcyk, 1979, p.85).

II. THE SPATIO-TEMPORAL ANALYSIS OF FERTILITY

This study examines spatial patterns of fertility decline for a number of reasons. (i) The most practical reason for adopting this approach is that the data requirements are mush less stringent. All that is needed are a number of demographic variables which can be aggregated at a reasonable geographic resolution. (ii) The most compelling reason relates to the implicit finding that the fertility

transition in much of Europe produced spatial patterns of fertility reminiscent and strongly suggestive of a process of spatial diffusion of an innovation (ie. smaller family size). The fruitful results of this approach in the Princeton Study constitutes an open invitation to geographers to contribute to the development of theory in the question of reproductive behaviour. (iii) Spatial patterns can sometimes suggest a relationship between fertility and socio-economic or cultural factors indirectly since the latter also vary geographically. An example of such a relationship was suggested by the observation in Europe, for instance, of "regional clusters which tend to correspond more to linguistic groups than to the socio-economic variables central to transition theory" (Teitlebaum, 1975, p.421). At a larger scale, such as at the census tract level, residential segregation based on class or income provide an opportunity to test the economic assumptions about fertility using spatial analysis. Here again, individual behaviour should be clearly distinguished from the aggregate result of individual behaviour. (iv) Physical geography itself may have an impact on fertility by imposing local conditions such as physical barriers which have the effect of segregating communities or inducing physical proximity. Relative location, isolation, or proximity can have a stong bearing on fertility behaviour since motivations for low fertility arise out of

our communication with other people and other ideas. A strong local influence, furthermore, could easily remain undetected through other forms of investigation.

The simple description of spatial patterns has its drawbacks also. Most importantly, fertility behaviour is a manifestation of a combination of variables whose product is greater than the sum of its parts. There are variables which either do not have a geographical component or whose geographical component is lost to the aggregate effect of the complex interaction of variables. The interpretation of spatial differences in fertility, even when very cautious and conservative, is necessarily speculative. On the other hand, as the Princeton Study indicates, the spatial approach has uncovered some consistent and glaringly obvious relationships between fertility and certain geographically manifest parameters.

A brief synopsis of the major findings of a number of cases from the Princeton Study will help to elucidate the important geographical differences and processes of transition which spatial descriptive analysis has disclosed. The two most important findings were: (i) marital fertility and marriage patterns were not uniform in pre-modern society but rather they varied widely through geographical space in regional clusters. (ii) The secular

decline of fertility began at different times and evolved at different paces in different geographical spaces, creating spatial leaders and laggers of fertility decline.

In Italy, for example, Livi-Bacci (1977) observed a very prominent geography of fertility decline; the strongest control of fertility was practised in the north west and then gradually spread through Central Italy, during the last years of the nineteenth century. The south of Italy was the last to undergo decline. Urban/rural differences are evident in Italy as early as 1871. More difficult to explain is the earlier arrival of fertility decline to the more mountainous and less accessible areas in the eastern portion of the Po Valley, than to those areas affording better mobility and communication. Also unexplained is the fact that the most highly urbanized of the southern provinces, Napoli, exhibits the highest fertility in the South, or the fact that Sicily's fertility decline preceded Sardegna's by fifty years.

In France (van de Walle, 1974), fertility was generally lower than in the remainder of Europe. Low fertility spread from two largely rural areas, Normandy in the north and the Garonne valley in the south. At the other extreme Van de Walle identifies areas incorporating distinct and related cultural groups which were very late to control

their fertility; the "staunchly Catholic Bretons, the miners in the Nord coalfield; and the peasant farmers in the remote valleys of the Massif, Pyrenees and Alps" (Woods, 1979, p.148), although these patterns remain largely unexplained. In Germany, the Polish Catholic exhibited above average fertility unlike the Danish Protestant who exhibited below average fertility (Knodel in Woods, 1979, p.148). In Japan, where the secular decline did not begin until well into the twentieth century, the fastest decline occurred in the large cities and, thereafter, in the adjacent rural areas. Fertility decline came last to the northern and southern extremities of the country, the islands of Hokkaido and Kyushu.

The greater part of the literature supports the hypothesis that fertility decline does have a space-time function which fits a model of diffusion to a greater or lesser extent: Hanham (1974) for the London area from 1940 to 1965, Demko and Casetti (1970) for the U.S.S.R. from 1871 to 1931, Zdorkowski (1983) for Oklahoma from 1940 to 1970, Tsubouchi (1970) for Japan from 1920 to 1965, Mosk (1979) also for Japan, 1920 to 1960, Livi-Bacci (1977) for Italy from 1860 to 1950s, Van de Walle (1974) for France in the nineteenth century, and Knodel (1974) for Germany from 1871 to 1939. Fertility decline does appear to spread across space and through time in a qualified way. There are areas

where fertility decline begins early and other areas where it begins late; the leaders and laggers which are symptomatic of a process of diffusion (Knodel, 1977, P.219). This results in an increase in the differences between areas during the early stages of a transition and eventually results in a reconvergence around a smaller family size norm. All areas are eventually affected by this apparent wave of fertility decline, though to differing degrees and at differing paces, in rough accordance with a distance-decay function.

A variety of descriptive models have been developed, fashioned after Hagerstrand type models of diffusion, which describe the physical spread of fertility decline (Demko and Cassetti, 1970). Diffusion models have been widely used by geographers to describe and explain the physical spread of a variety of cultural phenomena, from medical innovations to rumours. The basic assumptions of a diffusion model, when applied to fertility decline are as follows: (i) Birth control is regarded as an innovation. This assumption needs qualification; some control of fertility was likely in place to differing degrees throughout pre-transition Europe. In a nineteenth and early twentieth century context, stronger control of fertility is likely to have required faithful use of conventional forms of birth control, both appliance and/or

non-appliance methods. In the context of the baby bust, the very strong control practised by the majority of western nations necessarily implies the use of modern appliance and surgical methods: the contraceptive pill, the intra-uterine device, sterilization and tubal ligation for example. Without these highly effective aids, the extremely low rates of the mid 1970s in Canada and in Newfoundland, would have have been impossible. (ii) It is assumed that strong birth control will be practised first by only a few select innovators and then by a progressively larger number of people as time passes until almost everyone, is practising it; characterized by a typical logistic distribution curve (see Figure 1.a). (iii) It is assumed that the adoption of strong birth control at first increases faster near the center(s) of innovation, usually an urban center, and eventually increases at a faster pace at the periphery (Zdorkowski and Hanham, 1983, p.54). The combined distance-time effect produces a spatio-temporal wave as illustrated in Figure 1.b. This spread results in a 'trickle down' effect characterized by leaders and laggers of fertility decline; leaders being in or near an urban center, laggers being at a distance from the urban center.

Fertility decline appears to be diffusing in a general way, but what it is that is diffusing, is not clear. Is it

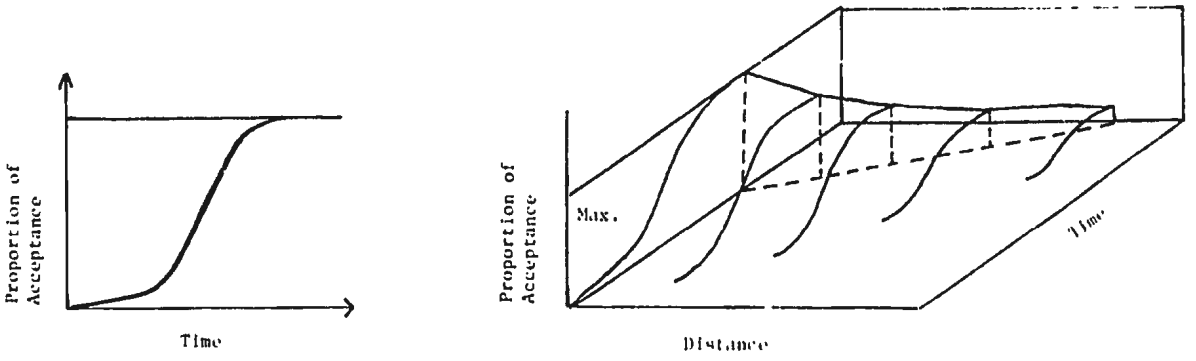


FIGURE 1.a. (left): Cumulative Acceptance of an Innovation in Time. (Source: Morrill, 1968, p.3.)

FIGURE 1.b. (right): Acceptance of an Innovation in Space and Time. (Source: ibid., p.4)

simply the knowledge and/or means of controlling fertility that is diffusing or are spatial patterns reflecting the spread of development and the corresponding demographic adjustment to it? Or is it the idea of a small family size that is diffusing? The repeated observation in the literature that fertility decline often takes place in the absence of new socio-economic forces to which fertility may be adjusting suggests that the spread of development alone cannot account for the spatial patterns in Europe, for instance. Though it is clear from the Princeton Study that some diffusion is in place, exactly what it is that is diffusing proves much harder to define.

The barrage of evidence produced by a growing literature on

fertility leaves much that is unexplained by the Demographic Transition Theory and has led to a number of reviews, reassessments and restatements of that theory (Caldwell, 1976, Coale in Woods, 1982). In 1973, almost twenty years after Notestein's original formulation of the Transition Theory, Ansley Coale devised an inductive restatement of the Demographic Transition Theory in order to explain new evidence pertaining to historical Europe. Coale's restatement consists of three preconditions of transition. The first precondition states that conscious control of fertility must be an acceptable form of behaviour. He names the Hutterites and Amish as examples of cultures that do not meet the first precondition. The second precondition states that reduced fertility must be perceived as economically and/or socially advantageous to the individual couple. Thirdly, effective birth control techniques must be known and accessible; furthermore, there must be "sufficient communication between spouses and sufficient sustained will, in both, to employ them successfully" (Coale in Teitlebaum, 1975, p.421). In short, before fertility can decline, the conscious regulation of fertility must be acceptable, advantageous and technically possible.

Coale's preconditions have since been modified to explain class-specific motivational differences in fertility

control. The second precondition, social and economic advantage, has been separated out into a social choice precondition and and economic necessity precondition (Woods, 1982, p.108). In this way, a distinction can be made between the motivation for fertility regulation among the middle class, a social choice to have a more fashionable small family, and that of the working class, the economic necessity to avoid the cost of high parities (ibid., p.109).

Coale's preconditions incorporate sociological and economic variables but in addition, the independent influence of culture, religion and politics on fertility is implicitly recognized. Even more significant is the fact that Coale's preconditions themselves might be seen to spread through space since acceptability, desirability and the availability of contraceptive aids can all be viewed in the context of diffusion.

In the following study of fertility decline in Newfoundland, the process of fertility decline is examined in the context of a spatial diffusion process as is summarized by the geographical five-stage model of fertility decline (Woods, 1979, p.142). This model is simply a spatio-temporal translation of the typical logistic distribution curve. Depicted in Figure 2, the

model outlines the spatio-temporal path of fertility decline as defined by the general principles of diffusion. It describes five stages in the spatial pattern of fertility through a period of transition from high to low levels.

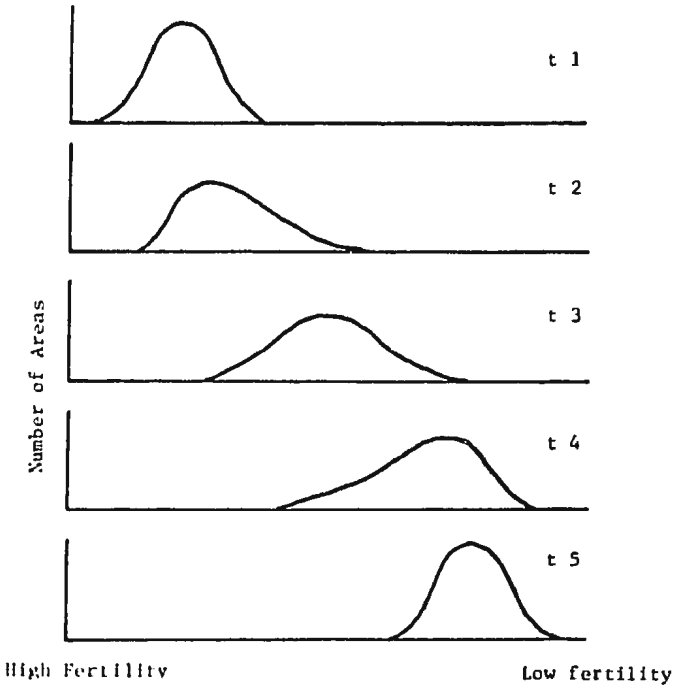


FIGURE 2: The Five Stage Model of Fertility Decline (Source: Woods, 1979, p.142)

The first stage, t1, represents the pre-transition phase. During this stage, fertility levels are high everywhere but exhibit some regional variance. The second stage, t2, represents the introduction of birth controlling behaviour

to a few areas, areas characterized by a lower resistance to a change in family size norms, a greater motivation to limit fertility and/or better means to do so. The degree of variance between areas begins to increase since fertility decline, at this stage, is confined to a few select areas termed 'leading areas' of fertility decline. These few leaders create the positive skew in the distribution which is characteristic of this stage. By t3, birth controlling behaviour is being adopted in an increasing number of areas. The variance of fertility levels is highest during this stage. By t4, low fertility is prevalent in the majority of places. A few areas still resist the change in reproductive norms, causing the negative skew in the distribution which is characteristic of this stage. These areas are termed the 'lagging areas' of fertility decline. Stage 5 represent the restabilization of the spatial pattern of fertility at lower levels. By this stage, t5, even the stubborn resistance of the lagging areas has spent its force. Variance will either return to its pre-decline level or, more likely, remain low.

What conclusions may be drawn about the spatial patterns this study will reveal must necessarily be speculative especially in view of the fact that the settlement geography of the island of Newfoundland presents a

formidable challenge to any model of spatial diffusion. Communities form a scattered pattern along thousands of miles of coastline only recently accessible by road. For the reasons stated above and despite the limitations, spatio-temporal patterns and trends of fertility decline in Newfoundland between 1966 and 1981 are modelled, in the following study, after a five stage model of fertility decline and interpreted, in a qualified way, using a multidisciplinary approach. A description and discussion of the demographic measurements of fertility used in this study and applied to the model follows.

CHAPTER TWO

METHODOLOGY, DATA ASSESSMENT AND COMPILATION

I. METHODOLOGY

I.A. The Elements of Fertility

The Demographic Transition describes a process of accelerated decline of fertility which began approximately one hundred and fifty years ago. The rate of acceleration reached its zenith towards the late fifties and early sixties; a brief period of time aptly coined the 'baby bust' (Grindstaff, 1977). The level of contraceptive sophistication necessary to effect almost complete control over reproduction became increasingly available throughout the 1960s in most developed nations. The postwar expansion of education (Thornton and Freedman, 1983, p.6), the increasing participation of women in the labour force (Thornton and Freedman, p.23), the declining influence of organized religion (Beaujot, 1978, p.10), financial pressures of urban living (Easterlin, 1978), changing views towards women's role in society and at home, increasing awareness of pregnancy-related health risks to older women and for higher order births (IPPF, 1970), and the more frequent dissolution of marriage, have all been cited as

leading causes of the accelerated decline.

The mass use of highly effective forms of birth ontrol obviously results in a drop in the level of fertility. However, the motivation and degree to which women use these highly effective methods depends on a number of conditions, the most significant being age. Demographers have distinguished between two different strategies of fertility control: parity-specific (family limitation) and non-parity specific (birth spacing) birth control. These two strategies of fertility control are reflected in two significantly different age-patterns of childbearing.

This age function of parity-specific control is typified in Kuznet's construct (in Woods, 1979, p.153), outlining the age-specific fertility of two typical populations: (1) a less developed market economy having a total fertility rate (TFR) of 5.94 births per woman and another, a developed market economy, having a total fertility rate of 2.88. Figure 3 depicts the corresponding curves. The first curve is associated with natural fertility; that is, the biologically defined age pattern of childbearing (fecundity) (Henry, 1961). The second curve is associated with the practice of family limitation in developed nations with access to highly effective forms of birth control. Woods explains that it is "by the reduction in the

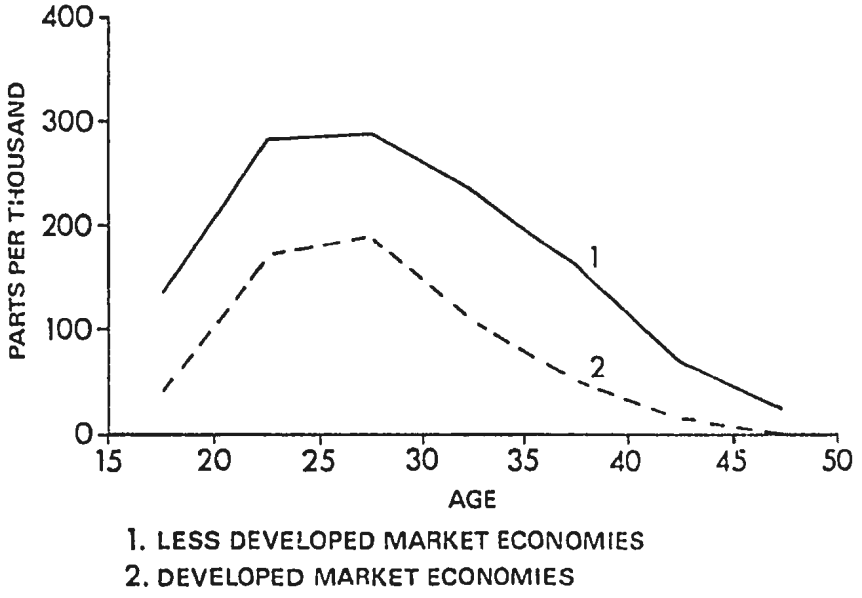


FIGURE 3: Age-specific fertility rates for less developed market economies and developed market economies, 1960s. (Source: Woods, 1979, p.153).

fertility of women over the age of 30, and thus those with higher parities, that countries with the first age pattern of fertility will acquire the second one" (ibid., p.153). Typically, then, parity-specific birth control, or family limitation, involves a purposeful end to childbearing once the desired family size has been achieved. The degree to which this end is met depends, of course, on the form(s) of birth control that are available.

Birth controlling is not always motivated by a desire to limit the size of one's family. Non-parity-specific birth control or birth spacing aims to space births for the

convenience and safety of the child, the mother, or the community at large. Theoretically, there is no conscious intention or explicit effort to limit the total number of children one has; though the consistent practice of birth-spacing does in fact ultimately result in the reduction of family size by reducing fertility across all age groups. Birth spacing in the absence of parity-specific birth control is uncommon though it has been observed in Nigeria and Indonesia where "this practice is explicitly viewed by the population as a deliberate attempt to space births for the benefit of both the child's and the mother's health even when most couples are not attempting to limit the final family size" (Knodel, 1977, p.220).

The age at which women marry is also an important element in the study of fertility as it affects both the level and the age-pattern of childbearing. The pioneering demographer Malthus observed that the age at which people married often found justification in the limits of the resources available to them. In pre-industrial society the postponement of marriage was a common response to economic hardship since marriage was soon followed by parenthood. In this context, a more advanced age at marriage is a form of family limitation, what Malthus terms the "preventative check" on population growth (Wrigley, 1969, p.33). That is, a late age at marriage reduces the chances of having a

very large family. The postponement of marriage not only effects a reduction of family size but, all else being equal, the first third of the age-specific curve of fertility is affected.

As the means and access to highly effective forms of contraception have increased, the importance of marriage patterns to fertility has very noticeably decreased. Given effective forms of contraception, births may be postponed to accomodate other life circumstances. The postponement and spacing of births made possible by effective birth control is most evident in the first and especially the second third of the age-specific curve of fertility. These spacing and postponing strategies are inherently different from the aforementioned non-parity-specific spacing strategies in that the former are practised clearly within the larger context of family limitation. They, unlike the non-parity-specific strategy of birth spacing, affect the age pattern of childbearing by shifting the 'burden' of childbearing from the early twenties to the late twenties and even the early thirties; a widely observed trend in North America and parts of Europe. Though this shift in the modal age of childbearing is associated with post-transition demographic developments, the age-structural changes in fertility were taking place while the accelerated decline was still underway.

The following analysis of fertility in Newfoundland examines spatio-temporal patterns of fertility decline in terms of a number of direct and surrogate measures of five elements of fertility: (1) marital fertility, (2) total or apparent fertility, (3) age at marriage, (4) the fertility of women aged thirty-five years and over, and (5) teenage (pre-marital) fertility.

I.B. The Measures of Fertility

I.B.1. The Total Marital Fertility Rate (TMFR): this rate expresses the number of children that the average married woman would have were she to experience current age-specific marital rates throughout her married life (see Appendix A for computational details). It is a period measure of fertility to be cautiously interpreted within the general confines of applying period measures to examine a dynamic process. In other words, the TMFR does not reflect the actual family size of a married woman since during a period of accelerated fertility decline, her own reproductive behaviour is being modified. This is especially true of the early years of this study: 1966 and 1971. Only towards the later periods, 1976 and 1981, when rates re-stabilize at lower levels, may period measures of fertility, such as the TMFR, begin to approximate what the

actual family size of married women will be, given that rates remain stable.

The TMFR excludes fifteen to nineteen year olds from the population of married women for the reasons mentioned in the upcoming discussion of teenage fertility measures. The strength of the TMFR is that it relates the number of births to that group of women at highest risk of becoming pregnant; the married woman. In this sense, it is a more precise measure of fertility than the total fertility rate.

I.B.2. The Total Fertility Rate (TFR): this rate expresses the number of children that the average woman would have were she to experience current age-specific rates throughout her life (See Appendix A). It is therefore a period measure of apparent or resultant fertility since it incorporates differences in pre- and extra-marital fertility, as well as differences in the age at, frequency and duration of marriage. The TFR, like the TMFR is not a reflection of actual completed family size.

I.B.3. The Proportions Married (Pm): Age at marriage data is not available for the geographical areas corresponding to this study. Spatial differences in the age at which women marry are thus indirectly measured by Pm; the proportion of all 20 to 24 year olds that are married at

the date of the census, expressed as a percentage (see Appendix A). Where Pm values are high, marriage takes place at a young age; where they are low, women postpone marriage until later.

Pm is an important variable in the analysis of fertility in that it may reveal different birth controlling strategies of family limitation (ie: a Malthusian preventative check) that were in place before the introduction and increased access to modern forms of contraception.

I.B.4. The Fertility of Older Women (F_{35}): is a surrogate measure of the degree to which birth controlling strategies are parity-specific in nature. It is simply the sum of the age-specific rates of the three oldest age groups: the 35-39, 40-44 and 45-49 year olds (see Appendix A). A second index, PR_{35}, expresses F_{35} as a ratio (percent) of TMFR (see Appendix A). The reason for this second index is that levels of fertility of older women as measured relative to TMFR may prove to be a better measure of the degree of concavity at the tail end of the fertility curve than are absolute levels. The choice of an absolute measure of fertility among older women, F_{35}, is on the other hand justified by the following reason. The experience of developed nations which provide easy access to modern contraceptive methods is that older women do not only

control fertility to a much greater extent than younger women, but rather that they virtually cease childbearing, outside of the exception or chance pregnancy. It seems perhaps more fitting and significant therefore, at this late stage of the demographic transition, to view the fertility of older women relative to absolute zero, rather than to the TMFR.

I.B.5. The Fertility of Teenagers ($_5f_{15}$): is measured by the age-specific fertility rate of women between the ages of fifteen and nineteen (see Appendix A). The fertility of this age group is probably one of the most difficult to interpret and may itself have some direct bearing on marriage patterns and or consequent marital fertility. The fact of a birth before the age of nineteen may have an impact on consequent fertility. The age at which women marry may furthermore be related to the incidence of teenage fertility. The causal link between marriage and teenage fertility is vague in Newfoundland as teenage pregnancy appears to be reasonably well-tolerated and perhaps even planned as an acceptable means to marriage in the rural context (Faris, 1972; Hughes and McKilligan, 1981; Murray, 1979). In any case, age-specific marital fertility among this age group produces rates which are very near or above unity, indicating a tendency to misreport marital status in the hospital record

(McKilligan, 1978). The analysis of teenage pregnancy must be separated from an analysis of marital fertility both because an individual analysis appears justified and because marital fertility rates would be seriously biased by what seems a clear case of misreporting of marital status and an unclear cause and effect relationship between teenage fertility and early marriage.

The origin and reliability of the census and vital data which form the basis of the measures discussed above is the subject of the following section.

II. ASSESSMENT OF THE DATA

II.A. The Vital Data

Newfoundland is the only province in Canada for which age-specific fertility rates are not available. Elsewhere in Canada these rates have been published since 1921. Without these rates a demographic analysis of current provincial fertility is confined to the use of crude measures of period fertility such as the crude birth rate, the child-woman ratio, or the general fertility rate. None of these are standardized for age-structure, which poses especially severe problems for regional comparison since the age-structure of the population may vary widely from

one area to the next. More importantly, without age-specific fertility data the analysis of the age-structure of childbearing is impossible, and with it, any analysis of the degree to which to which populations exercise parity-specific birth control.

The reason for the absence of age-specific fertility data lies in the provincial birth registration system; Newfoundland's 'Return of Birth' does not record the age of the mother or the birth rank of the infant. In fact, Newfoundland uses the most abridged registration form in the country (see Appendix B), recording only eleven items of information where all other provinces record a minimum of twenty-seven. As such, the vital registration system in this province inhibits most demographic analysis.

In the absence of conventional vital statistics, these data can be produced from an indirect source: hospital admission-separation records of deliveries. Yolande Lavoie of the Demography Division of Statistics Canada was the first to produce estimates of age-specific fertility rates for the province using the administrative records of hospitals (Lavoie, 1976). A hospital record of a delivery records, among other data, the age of the parturient patient being admitted. This serves as an indirect source of age-specific fertility data. Lavoie's (1976) study

encompassed the years 1966 through 1973. Estimates for succeeding years are continued by Perreault et al. (1982). The purpose of both Lavoie and Perreault et al. was to demonstrate the usefulness of administrative records as a source of fertility data.

These two sources of birth data produce five different birth totals for the province as shown in Table 1. Columns 1, 2, and 3 are derived from hospital admission-separation records, constituting the administrative source of birth data, and columns 4 and 5 are derived from the Return of Birth, constituting the conventional source. Differences in compilation and editing are responsible for the discrepancies and a brief discussion of these will establish the reliability of the hospital data relative to the vital statistics.

II.B. The Conventional Source

Provincial annual birth totals result from the collection of the Return of Birth which is the responsibility of the the clergy at the time of baptism. Where possible, this normally takes place within a month of the infant's birth, though in more recent years there has been a trend away from early baptism (personal communication with Head Registrar, Mr. N. Parker, 1985). Clergymen residing in St.

TABLE 1: Birth Totals by Source of the Data

Year	Unpub. data Dept. of Health, Nfld[1]	Unpub. data Stats Canada[2]	Published data Stats Canada[3]	Vital Stats (Fed)[4]	Vital Stats (Prov)[5]
1966	13,402	13,421	13,390	14,084	14,084
1967	12,963	13,001	12,996	12,844	12,844
1968	n.a.	12,944	12,919	12,820	12,820
1969	n.a.	12,524	12,471	13,000	13,000
1970	n.a.	12,578	12,578	12,539	12,539
1971	12,868	13,017	12,929	12,767	12,767
1972	12,689	12,677	12,478	12,898	12,898
1973	n.a.	n.a.	12,098	12,901	11,906
1974	11,503	11,932	11,790	11,504	10,236
1975	n.a.	n.a.	n.a.	11,213	10,166
1976	11,168	11,313	11,211	11,130	10,443
1977	10,633	10,842	10,747	11,110	10,409
1978	10,203	10,403	10,126	10,480	9,525
1979	10,052	10,232	n.a.	10,170	9,581
1980	9,679	9,880	n.a.	10,332	9,332
1981	9,570	n.a.	n.a.	10,130	9,120

1 Statistics Division, Department of Health, Government of Newfoundland and Labrador, courtesy of Eoin O'Brien, Head of Research

2 Institutional Care Section, Health Division, Statistics Canada, (source used by Lavoie (1976) and Perreault et al. (1982)); unpublished article courtesy of Mr. H. Ridler, Executive Council, Newfoundland Statistics Agency.

3 Hospital Morbidity, Statistics Canada, Deliveries, Cat.82-806

4 Vital Statistics Canada, Volume 1, Births, Cat.84-204

5 Report on the Births, Marriages and Deaths in the Province of Newfoundland, Department of Health, Province of Newfoundland and Labrador.

John's, are required to forward the Return within one month of baptism; clergymen from outside St. John's, within three months. If a child is not baptised, which is uncommon, it is the parents' obligation to register the infant through a

registering officer, a clergyman, or by completing a Return themselves with hospital verification of the event. The provincial registry then forwards a copy of all Returns to the federal registry. Returns received after a prescribed cut-off date are not included in the birth total. This cut-off date is established for reasons of expediency since vital statistics are published annually by both the provincial and federal governments.

Herein lies the greatest source of inaccuracy of published birth totals. The vital registration system in Newfoundland allows for inordinate delays between the birth of an infant and his/her registration with the provincial registry. For instance, a child born outside of St. John's during the month of December might not be baptized until January and the Return may not reach the registry for yet another three months. Late registrations are not only excluded from the published total of the year in question, but subsequent publications do not correct for the late registrations of the preceeding year. Consequently, vital statistics underestimate the actual number of annual births since these late registrations number an average of approximately five hundred (personal communication with Mr. N. Parker). For example, in 1973 almost one thousand birth registrations did not arrive on time (Statistics Canada Daily, January 26, 1976).

The unadjusted provincial totals produced by the provincial registry are shown in column 5 and the federal totals are shown in column 4. Prior to 1973, the two totals are the same. After 1973, Statistics Canada, in recognition of the problem of late registrations, began to adjust the provincial count for the probable number of late registrations. Their estimates were based on the performance of the provincial vital registration system over a number of preceding years. These adjustments range from 12.38 percent in 1974 to 6.15 percent in 1979. After 1981, Statistics Canada once again stopped making adjustments in recognizing (based upon Lavoie's findings) that they represented an overstatement of late registration.

II.B.1. The Administrative Source

Hospital admission-separation forms are completed for every person admitted to hospital. This form requires information about patients, such as their age and sex and the reason for admission. The forms are completed by the hospitals and submitted to provincial hospital insurance commissions for administration. The information pertaining to each form is then converted into a computer record to be added to a computer file of hospital morbidity. A copy of this computer file is forwarded to the Health Division of

Statistics Canada in Ottawa. An edited version eventually becomes public through the annual publication Hospital Morbidity, Statistics Canada. Columns 1, 2 and 3 in the previous table (p.40) are derived from those records that state delivery as the reason for admission. Hereinafter the term "hospital morbidity file" refers specifically to records of delivery.

The birth totals in column 1 pertain to a copy of the hospital morbidity file made available to me for this study by the Statistics Division of the provincial Department of Health. They represent the number of live birth hospital deliveries, (as opposed to the number of total births) to residents of the province, screened for double-counted records. Totals in column 2 are derived from the hospital morbidity file kept by the Health Division of Statistics Canada and used by Lavoie and Perreault et.al. and pertain to the number of live and stillbirth deliveries in the province, to residents and non-residents alike, and is not screened for double-counted records. Totals in column 3 are those published in Hospital Morbidity, Statistics Canada, Deliveries. These totals refer to the number of live birth deliveries to residents. This file is screened for double-counted records. The differences between the figures in the first three columns are in large part due to editorial discrepancies in inclusions and exclusions

between hospital based computer data bases. The larger differences between the totals in columns 4 and 5 compared to columns 1, 2 or 3 primarily reflect the effect of late registration.

There is good reason to believe that hospitals records provide a more reliable source of birth data than does the existing vital registration system in Newfoundland. In principle, the administrative requirements of hospitals and of a socialized medical insurance scheme demand that admission records be promptly processed. On the other hand, the existing vital registration system allows for a substantial lapse of time, first between the birth of a child and his/her baptism and then between the baptism and the registration, which translates into a substantial number of late registrations not included in the records. It is this realization that led Statistics Canada to adjust the provincial figures as of 1973. The federally adjusted total in 1974 may indicate that Statistics Canada may have referred to the provincial morbidity file in adjusting for late registration that year. The provincial Head Registrar's estimate that late registrations number approximately 500 per annum suggests that Statistics Canada has over-adjusted for late registration during at least three years, 1977, 1980 and 1981.

Hospital records are only reliable if all births takes place in hospital. It was estimated that by 1966, 97 percent of all births were hospital births, and 99 percent by 1978 (Perreault et al., p.4). Certainly, the degree to which natality would be under-represented due to out-of-hospital deliveries is negligible relative to the under-representation resulting from late registration. Unfortunately, if and how this slight under-representation of births by the hospital record is spatially manifest is unknown (personal communication with Director of Research in the statistics division of the provincial Department of Health, Mr. E. O'Brien, 1985).

That the existing vital registration system produces less reliable data than the hospital morbidity source is evident in current efforts to change the existing vital registration system to a hospital based system "which hopefully will have the effect of registering births when our legislation is ammended to accommodate" (personal communication with Mr. N. Parker, 1985). However this transition is controversial since it involves infringing on the domain of the clergy. Appendix C shows the proposed 'Notice of a Live Birth' intended to form the basis for this new system. The data source that would result from the proposed hospital based system would be superior as a source of vital data to the current hospital source since

each record would pertain to the birth of an individual infant as opposed to the admission of a parturient woman. In addition, the Notice of a Live Birth would also record the age of the mother at parturition, making not only age-specific fertility rates available for Newfoundland but also the rank order of the birth.

Birth data used in this study comes from the morbidity file of the statistics division of the Provincial Department of Health (column 1). This was chosen over the federal file (column 2 & 3) as only in the provincial are deliveries classified by community which is necessary for the study of spatial patterns of fertility. Communities are coded in the form of a Universal Transverse Mercator Reference Point (UTM) for the years 1971, 1976 and 1981, but unfortunately in 1966, the health district represents the smallest geographical unit by which the data is available.

II.C. The Census Data

The estimation of regional age-specific fertility rates requires as its denominator the number of women of childbearing age by age or age group and by place of residence. This information is not published below the census division level. The data used in this study comes from a user tape purchased from Census Operation Division

of Statistics Canada, in which women are classified by five year age groups, by marital status and by census subdivision for the years 1966, 1971, 1976 and 1981.

The greatest limitation of the data is the fact that in accordance with privacy regulations the number of women in each five year age group is rounded to the nearest five (with the exception of 1966). This is a more serious limitation for the calculation of rates for small populations than for large ones and was one of the considerations involved in defining the size of the areal units used in this study. However the margin of error even among the smallest populations is small since the age-specific fertility rates themselves are rounded to two decimal places while single number indicators are rounded to one decimal place. The emphasis is on the observation of large and consistent differences which thus are unlikely to be the product of random statistical error.

III. COMPILATION

lII.A. The Geographical Designation of Comparative Study Units

The first question in the compilation process concerns the definition of the geographical units for which to calculate levels. This was also the most difficult, time consuming

and arduous problem to accomodate. Ideally we would like the fertility statistics themselves to draw the divisions along which significant differences occur; let fertility measures reveal fertility 'provinces'. The obvious paradox in this exercise lies in the necessity to group small local populations together in the first place so as to compute those very fertility measures on which the division should be made. That is; in order to compute a reliable measure of fertility, a sizeable population is required. Many of the communities in Newfoundland are too small in population to produce a statistically reliable measure of fertility. Statistics based on such small numbers leave too much variation to chance. Striking a compromise between the ideal and the statistical exigencies of the fertility measures was a difficult and laborious process. That process was guided by the following considerations:

1) Study units should aim to reflect existing socio-economic, geographical or religio-cultural units so that inferences about causation may be drawn.

2) Study units should be sufficiently small in order to reveal significant differences in fertility between populations living at close quarters, while remaining sufficiently large to minimize statistical distortions.

3) The boundaries of study units must be constant through time and must therefore incorporate within their borders changes in the boundaries of component census subdivisions

throughout the period.

The first and second consideration made the health district (see Appendix D) or census division an unsatisfactory unit of analysis. Census subdivisions, on the other hand are far too small to support the calculation of rates and their boundaries were not consistent over time. Geographical divisions based on agglomerations of component census subdivisions somewhat akin to the CCA in rural areas, yet isolating the major urban centers was devised. While never previously used by any formal agency as a basis for geographic analysis of Newfoundland, this method best conforms to all three conditions.

III.B. The Data Specifications

The vital data consists of a computer tape provided by the Statistics Division, Department of Health, Newfoundland and Labrador. Each record contains a single delivery event irrespective of outcome by:

1. age of parturient (single years)
2. marital status reported by parturient at hospital
3. Residence of parturient by: a) UTM code
   b) Health District
4. Year (1966, 1967, 1971, 1972, 1974, 1976-1981)

The census data consists of a Census User Tape provided by Statistics Canada, Operations Division, which listed the female population of Newfoundland by:

1. age (5 year age groups)
2. marital status
3. Residence by SGC (Standard Geographic Code)
4. Year (1966, 1971, 1976, 1981)

III.C. The Compilation Process

Figure 4 illustrates the method used to reconcile the vital data (used in the numerator of the calculations) and the census data (used in the denominator) so that they were geographically, structurally and chronologically compatible.

According to the three conditions outlined above, both sets of data were aggregated into the smallest possible units and age-specific fertility rates were computed. General marital fertility rates (GMFR) were first calculated and plotted to give a preliminary idea of where significant differences in fertility may lie. Aggregations which produced a highly irregular age-pattern of childbearing were rejected as too small and statistically unreliable, and those producing similar plots were aggregated. Census data on religious affiliation and general knowledge about

VITAL DATA	CENSUS DATA
Locate 1500 UTMs on Topo	Convert all old CSD codes to SGC codes
Assign an SGC to each UTM	
Aggregate records on SGC	
Aggregate records on 5 year age groups and marital status	
Compute average number of deliveries: for 1971 = mean 1971/72 for 1976 = mean 1976/77 for 1981 = mean 1980/81/82	

Aggregate compatible files by SGC

Pilot runs to help identify appropriate study areas

Define study areas (see Appendix E,F,G)

Proceed with computation of relevant statistics (see Appendix H,I,J)

Map patterns

FIGURE 4: Compilation Procedure

the primary resource base of different parts of the island were also considered with the aim of creating homogenous geographical units. A total of about twenty pilot runs were undertaken before a final group of thirty-nine geographical units were selected (see Figure 5 and Table 2). Having defined the geographical units, the six relevant measures were calculated for each unit and then mapped.

Before examining the spatio-temporal patterns of fertility decline in Newfoundland between 1966 and 1981, recent trends of fertility decline for the province as a whole are compared to trends in Canada. Then the spatial differences within the province are described and finally the significance of these patterns are discussed in the context of a model of fertility decline.

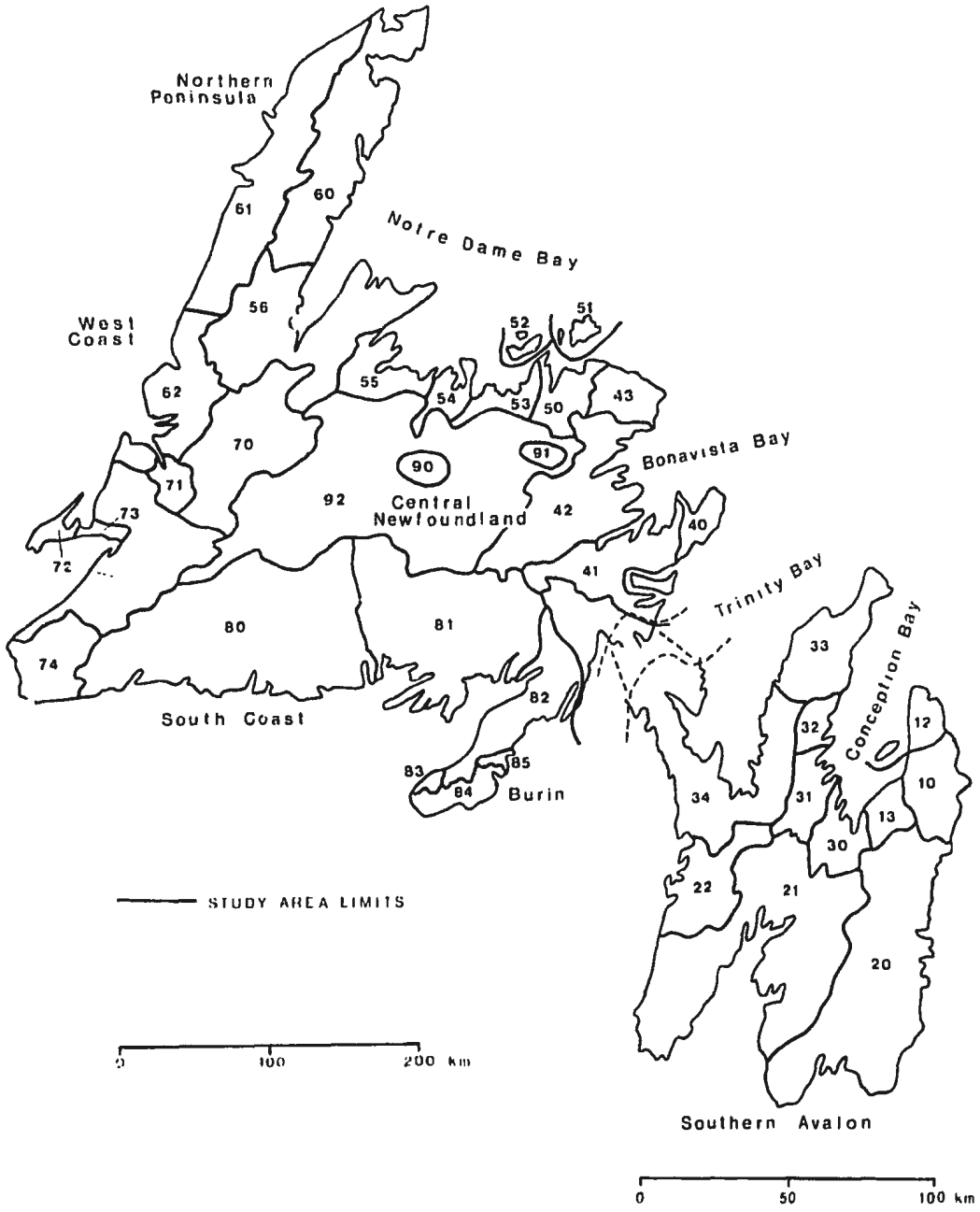


FIGURE 5: Geographic areas used in this study and general region names used throughout the text

TABLE 2: Geographic Areas by Name and Number

AREA NUMBER	NAME
10	St. John's
12	Torbay/Bell Island
13	Conception Bay South
20	Ferryland/Trepassey
21	St. Mary's Bay
22	Placentia/Dunville
30	Holyrood/Marysvale
31	Bay Roberts
32	Carbonear/Harbour Grace
33	Bay de Verde
34	Isthmus
40	Bonavista
41	Clarenville
42	Glovertown/Gambo
43	Wesleyville
50	Carmanville
51	Fogo
52	Twillingate
53	Lewisporte
54	Botwood
55	Springdale
56	Bay Verte
60	St. Anthony
61	The Strait
62	Bonne Bay
70	Deer Lake
71	Cornerbrook
72	Port-au-Port/St. George's
73	Stephenville
74	Channel/Port-aux-Basques
80	Burgeo
81	Baie d'Espoir
82	Upper Burin
83	Grand Bank
84	St. Lawrence
85	Marystown
90	Grand Falls/Windsor
91	Gander
92	Central Newfoundland

CHAPTER THREE

OVERVIEW

I. A COMPARISON OF NEWFOUNDLAND AND CANADA

Prior to Lavoie (1976) and Perreault et al.'s (1981) unpublished reports, little was known about recent trends of fertility in this province. Population projections for Newfoundland, undertaken by the Federal Government, have by necessity relied on the academic assumption that the age-pattern of childbearing in this province was similar to that of the Maritimes. Lavoie and Perreault et al. produced estimates of age-specific fertility rates for the province using an alternate source of vital data. These estimates revealed, among other things, that the age-pattern of childbearing was significantly different from the Maritimes. Women had children at a younger age in Newfoundland; demonstrating the "invalidity in assuming the age-pattern of fertility of other Atlantic provinces for Newfoundland" for the purpose of analysis or for the construction of projections (Perreault et al., p.11). Ultimately, these reports made a number of other interesting observations about reproductive behaviour in Newfoundland as it compares with Canada. In the following section, these observations are summarized and new ones are

made in a comparison of fertility in Newfoundland and Canada.

As Figure 6 indicates, the Crude Birth Rate (CBR) had been falling steeply since the early sixties, in the province as in the nation. Newfoundlanders were in the midst of a 'baby bust', an extraordinary decline in fertility which was endemic to a large part of the western world. In fact, so great was the momentum of declining fertility that even the sudden marriage boom beginning in the late 1960s appears to have had little impact on the spiralling descent. A comparison of age-specific marital and non-marital fertility rates indicates that some very important changes in reproductive behaviour were taking place to Newfoundlanders and Canadians alike (See Figure 7.a/b).

Though both Newfoundland and Canada were experiencing a dramatic decline in fertility, they appear in 1966 to have been at very different stages of their respective declines. The estimated TFR for that year in Newfoundland was 4.55 children per woman compared to Canada's 2.81. Not only were levels higher in Newfoundland, but very young women and women over the age of thirty-four had children relatively more frequently than Canadians or Maritimers of the same age. The modal age of childbearing in Newfoundland was clearly in the 20 to 24 year age group

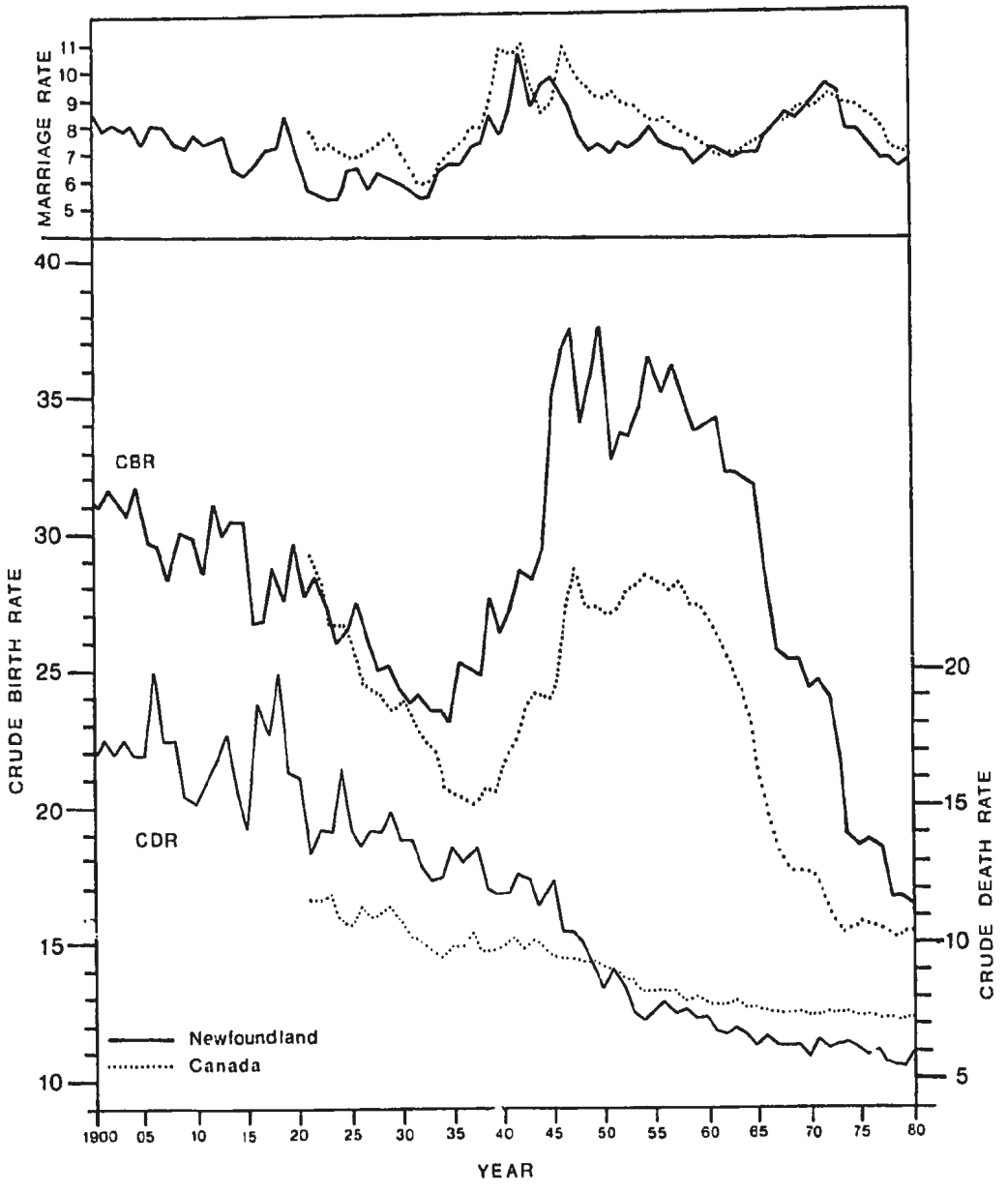


FIGURE 6: Births (CBR), Deaths (CDR) and Marriage Rates (per 1000 persons), Newfoundland, 1900 to 1980, and Canada 1921 to 1980.

(Source: Report on the Births, Marriages and Deaths in the Province of Newfoundland, Department of Health, Province of Newfoundland and Labrador. Vital Statistics, Canada, Births, Deaths and Marriages.

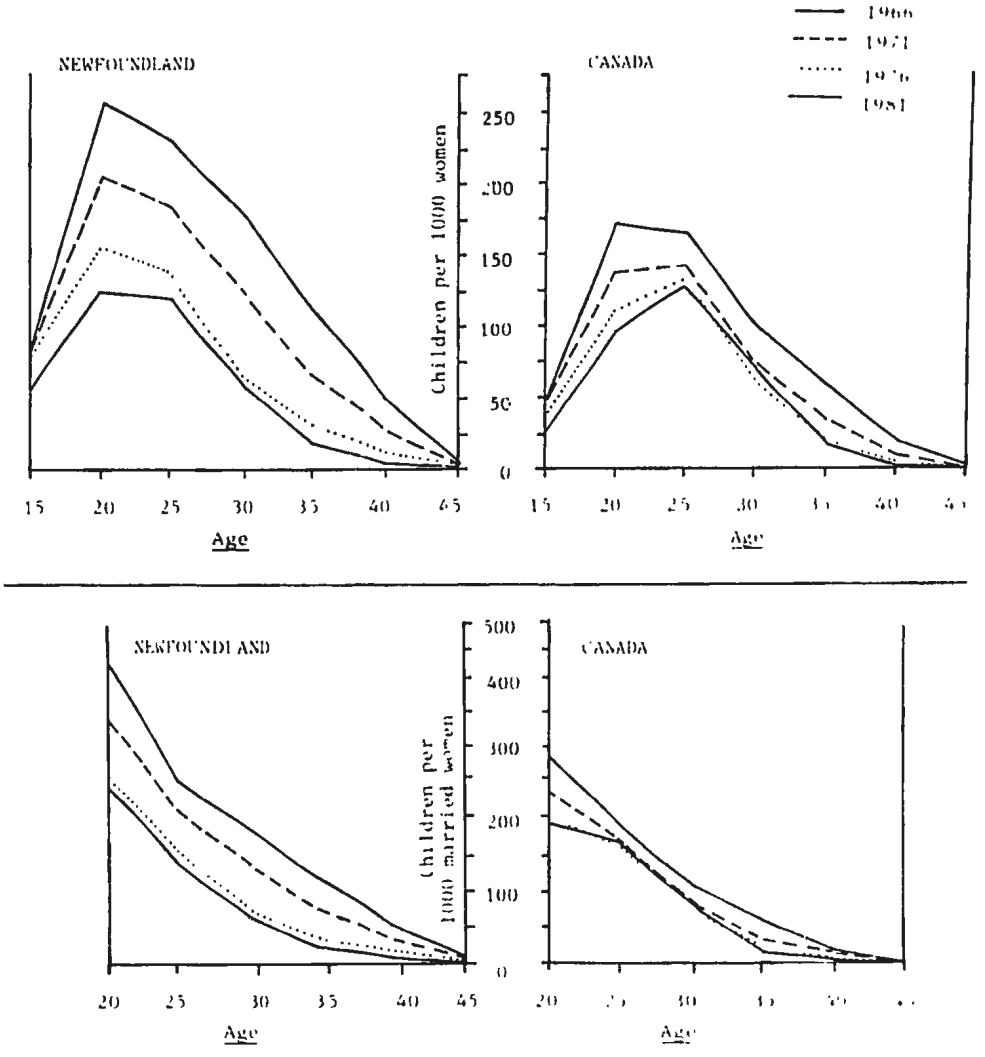


FIGURE 7.a.: (top) Age-specific fertility curves, Newfoundland and Canada, 1966 through 1981

FIGURE 7.b.: (bottom) Age-specific marital fertility curves, Newfoundland and Canada, 1966 through 1981

(Source: Census User Summary Tapes, Statistics Canada (Canadian Data) and Computer Tape, Dept. of Health, Nfld. (Newfoundland data).

whereas in Canada, as in the Maritimes, ${}_5f_{20}$ is about equal to ${}_5f_{25}$. This modal class difference between province and nation seems at least in part due to an earlier age at

marriage among Newfoundland women, positioning them at a high risk of pregnancy at an earlier age than other Canadians.

Birth rates in Newfoundland were rapidly converging with Canada's between 1966 and 1981 (see Table 3). This represents a spectacular drop in fertility in Newfoundland given the high 1966 rates. Change in fertility in the ten years between 1966 and 1976 was dominated by the decline of fertility among older women. Older women (over 34 years) experienced the greatest relative declines in fertility resulting, as Kuznet's model predicts, in an increasing concavity at the tail end of the age-specific curve. Between 1976 and 1981, change was dominated by the shift in the modal age of childbearing from the 20 to 24 year age group towards the 25 to 29 year age group. In Canada, on the other hand, women over the age of thirty-four were, by 1966, already largely avoiding pregnancy past the age of thirty-four. In Canada, the whole period between 1966 and 1981 is dominated by the shift in the modal age of childbearing from an approximately bimodal distribution in 1966 to a unimodal distribution whereby childbearing is most frequent among women in their mid to late twenties.

In 1966, the average Newfoundlander was clearly exerting less control over fertility than the average Canadian. By

TABLE 3: Comparison of Indexes for Newfoundland and Canada, 1966 to 1981

	1966		1971		1976		1981	
	NFLD	CAN	NFLD	CAN	NFLD	CAN	NFLD	CAN
TFR	4.55	2.81	3.44	2.19	2.38	1.83	1.91	1.70
TMFR	5.16	3.32	3.93	2.69	2.67	2.29	2.51	2.31
Pm	58.6	60.0	61.2	55.7	60.8	53.9	50.2	48.0
F_{35}	175.4	85.8	108.9	48.1	49.2	28.5	28.2	25.9
PR_{35}	17.0	12.9	13.9	8.9	9.2	6.2	5.6	5.6
$_5f_{15}$	77.3	48.2	77.5	40.1	73.7	33.4	53.7	26.4
$_5f_{20}$	256.3	169.1	204.3	134.4	155.1	110.3	124.9	96.7
$_5f_{25}$	231.7	163.5	183.7	142.0	135.1	129.9	118.8	126.9
$_5f_{30}$	177.5	103.3	122.0	77.3	67.8	65.6	57.7	68.0
$_5f_{35}$	112.1	57.5	68.5	33.6	21.3	21.1	20.2	19.4
$_5f_{40}$	49.2	19.1	27.6	9.4	12.3	4.3	4.9	3.2
$_5f_{45}$	6.0	1.7	2.9	0.6	1.2	0.3	0.5	0.2
$_5Mf_{20}$	417.2	280.2	333.6	235.5	255.1	199.8	248.4	197.0
$_5Mf_{25}$	254.4	187.3	209.9	168.3	155.8	156.7	143.4	161.5
$_5Mf_{30}$	184.9	112.5	134.2	85.9	74.4	73.9	64.3	79.0
$_5Mf_{35}$	116.7	62.5	75.2	37.0	34.3	23.4	22.2	22.1
$_5Mf_{40}$	52.0	21.0	30.4	10.4	13.6	4.8	5.5	3.6
$_5Mf_{45}$	6.7	2.0	3.3	0.7	1.3	0.3	0.5	0.2

Source: Computer Tape, Dept. of Health, Nfld.

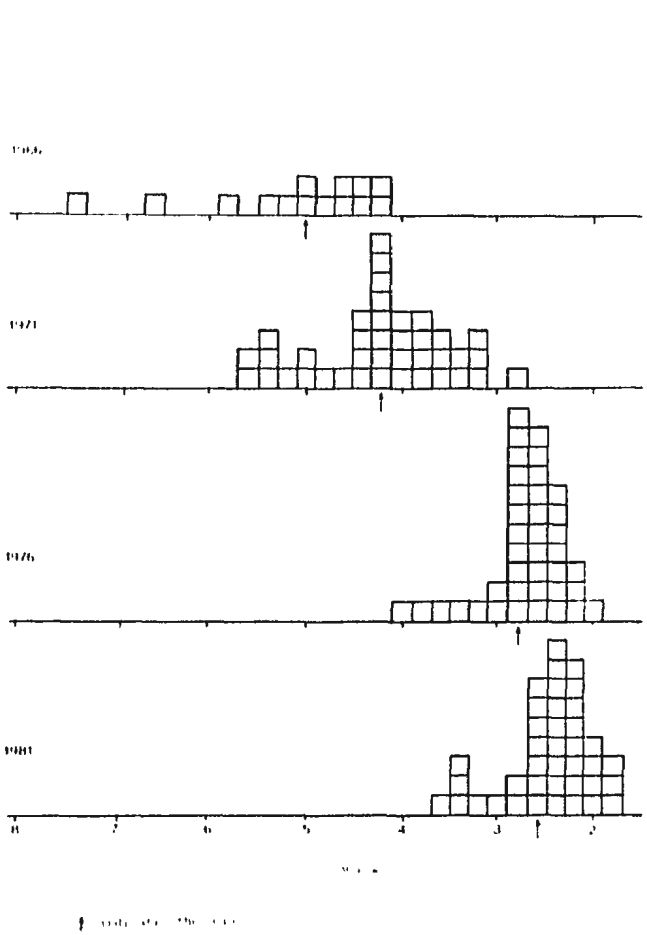
1976, the gap in fertility levels between Newfoundland and Canada was almost closed; the TFR in Newfoundland was 2.38 compared to 1.9 in Canada. The age-pattern of fertility had changed as well between 1966 and 1976. By 1976, the very low fertility of older women in Newfoundland indicated that they, no less than other Canadians, were exploiting new opportunities to control fertility. What remained distinctly different between the two populations throughout the period 1966 to 1981, was (i) the fertility of teenagers; Newfoundland's rate being very notably higher, and (ii) the fertility of the 20 to 24 year age group; likely associated with higher teenage fertility.

The discussion, thus far, has concerned the 'average' Newfoundlander. In fact, the residents of the Avalon Peninsula, who constitute a full 50 percent of the population of the island, is vastly over-represented in the provincial fertility rates. A better understanding of fertility in Newfoundland will emerge from a spatial comparison of fertility patterns within the province. This spatial approach positions local fertility rates within the context of the geographical five-stage model of fertility decline by the compilation of a temporal series of frequency distribution which depict the distribution of study units within the province by TFR, TMFR, ${}_5f_{15}$, Pm, F_{35} and PR_{35}.

II. SPATIAL TRENDS OF FERTILITY WITHIN THE PROVINCE

A temporal series of frequency distributions depicting study units by the aforementioned measures are shown in Figures 8 through 13 (source data of these distributions is provided in Appendix K,L,M,N and O). The geographical five stage model of fertility decline states that at the inception of a fertility transition, most places have high fertility and though levels vary from place to place, the degree of variation is moderate. This describes the first stage (t1). The adoption of a smaller family size norm by a few areas creates a negative skew and a corresponding increase in variance. Variance is at a maximum at the third stage (t3) when a substantial number of areas are adopting a smaller family size norm, a small number are leading in fertility decline and a small number are lagging. Thereafter, the skew becomes a positive one (t4) and variance begins to shrink until the transition ends for all areas and a new lower norm with moderate variance is established (t5) (see Figure 2, p.25).

It is not surprising that by 1966 Newfoundland should appear to be in the middle as opposed to the early stages of the five-stage model of transition; variance being at its highest in 1966 and decreasing thereafter. After all,



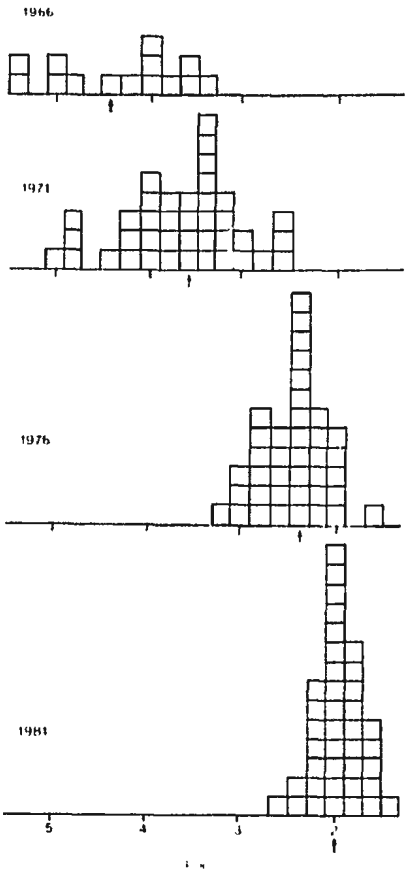
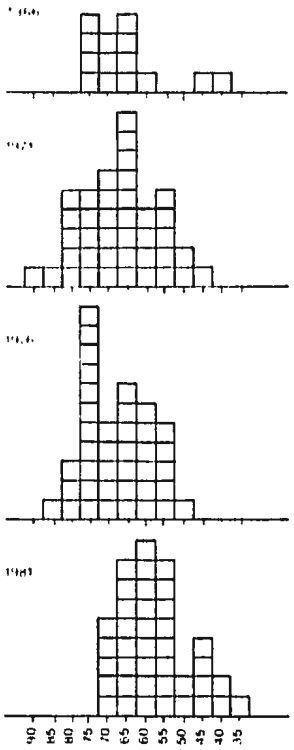


FIGURE 8: (left) Study areas by TMFR, 1966 to 1981 (see Appendix K)
FIGURE 9: (right) Study areas by TFR, 1966 to 1981 (see Appendix L)



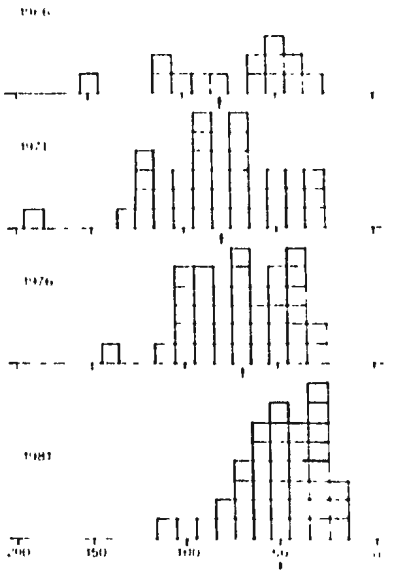


FIGURE 10: (left) Study areas by Pm, 1966 to 1981 (see Appendix M)
FIGURE 11: (right) Study areas by $_5f_{15}$, 1966 to 1981 (see Appendix L)

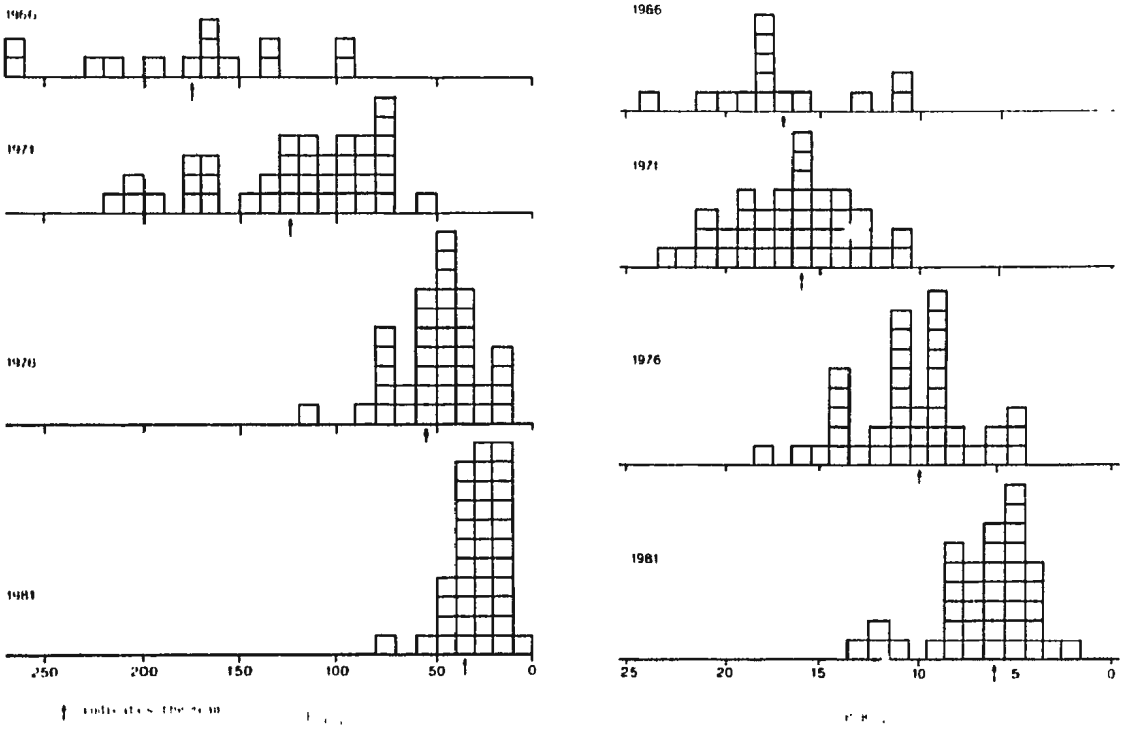


FIGURE 12: (left) Study areas by F_{35}, 1966 to 1981 (see Appendix N)
FIGURE 13: (right) Study areas by PR_{35}, 1966 to 1981 (see Appendix O)

the design of the model is based on a long-term transition which began about one hundred and fifty years ago in Europe. Newfoundland, like the remainder of North America, was undergoing a gradual demographic transition throughout the twentieth century as even a cursory look at cohort census data will indicate. By 1966 it is logical that differences between places should be substantial. The accelerated decline of fertility from 1966 to 1981 is itself the last stage of a process begun long ago.

II.A. The TFR and TMFR

Concealed in the general convergence that took place between 1966 and 1981 of provincial with national rates exists another convergence, operating at a different scale. As the frequency distributions of TFR and TMFR indicate, local fertility rates varied widely in 1966. Between 1966 and 1981, local rates converged around a lower norm. The momentum of that process had largely spent itself by 1976 and the changes of the last five years were fine-tuning by comparison. Another look at Figure 7a. and 7b. (p.58) reveals a similar pattern in the pace of the more general provincial-national convergence. It is interesting that the distribution of TMFR is consistently more variable than that of TFR. As late as 1981, the distribution shows a

tail composed of five or six local rates that create an impression of substantial variance even in 1981. The distribution of local TFRs is more symmetrical, lacking the aforementioned tail. It is also interesting that between 1976 and 1981, the TFR underwent a greater relative change than the TMFR (as the 'pace' ratios of the last column of Table 4 indicates).

II.B. The Fertility of Older Women

In 1966 the distribution of F_{35} is characterized by an even greater variance than that of the TFR and TMFR. The greater variance may in part reflect random statistical error since the base population (number of women over the age of thrity-four) is smaller and therefore more sensitive to chance error. Differences in the rates of older women (F_{35} and PR_{35}) should be cautiously interpreted.

In the natural fertility schedule, older women account for 32% of the TMFR. In the absence of parity-specific birth control, the PR_{35} should approximate this value. In Newfoundland, in 1966, the highest PR_{35} is 24%, the lowest is 11%. This range represents a substantial difference in the degree to which parity-specific birth control is being exercised. It is clear that even those areas where older women account for the highest proportion of the TMFR, some

TABLE 4: Measures of Central Tendency and Dispersion of Indexes, 1966 to 1981

YEAR	RANGE	HIGH	LOW	MEAN	STAN DEV	COEF OF CORR	MDN	% OF TTL CHANGE IN MEAN
TFR								
1966	1.9	5.4	3.5	4.4	.64	15%	4.2	
1971	2.5	5.1	2.6	3.7	.61	17%	3.7	29%
1976	1.5	3.2	1.7	2.5	.34	14%	2.4	50%
1981	1.1	2.6	1.5	2.0	.25	13%	2.1	21%
TMFR								
1966	3.2	7.3	4.1	5.0	.93	19%	4.8	
1971	2.8	5.6	2.8	4.2	.71	17%	4.2	30%
1976	2.1	4.0	1.9	2.7	.43	16%	2.5	58%
1981	1.8	3.5	1.7	2.4	.46	19%	2.4	12%
F35								
1966	175	270	95	175	54	31%	165	
1971	165	220	55	125	43	34%	120	34%
1976	105	120	15	50	21	42%	45	54%
1981	70	80	10	30	14	47%	30	12%
PR35								
1966	13	24	11	17	3.6	21%	18	
1971	12	23	11	14	3.1	22%	14	33%
1976	13	18	5	9	3.1	34%	9	42%
1981	11	13	2	6	2.3	38%	6	25%
5f15								
1966	125	160	35	80	36	45%	67.5	
1971	150	190	40	89	32	36%	90.0	
1976	115	150	35	78	26	33%	75.0	
1981	85	115	30	59	22	37%	60.0	
Pm								
1966	38%	75%	37%	61%	13%	21%	67%	
1971	67%	89%	42%	65%	10%	15%	65%	
1976	36%	84%	48%	66%	9%	14%	67%	
1981	29%	70%	61%	56%	9%	16%	58%	

Source: Computer Tape, Dept. of Health, Nfld.

degree of control seems to be in place, given that Henry's schedules are an accurate portrayal of a control free

fertility schedule (see Figure 14).

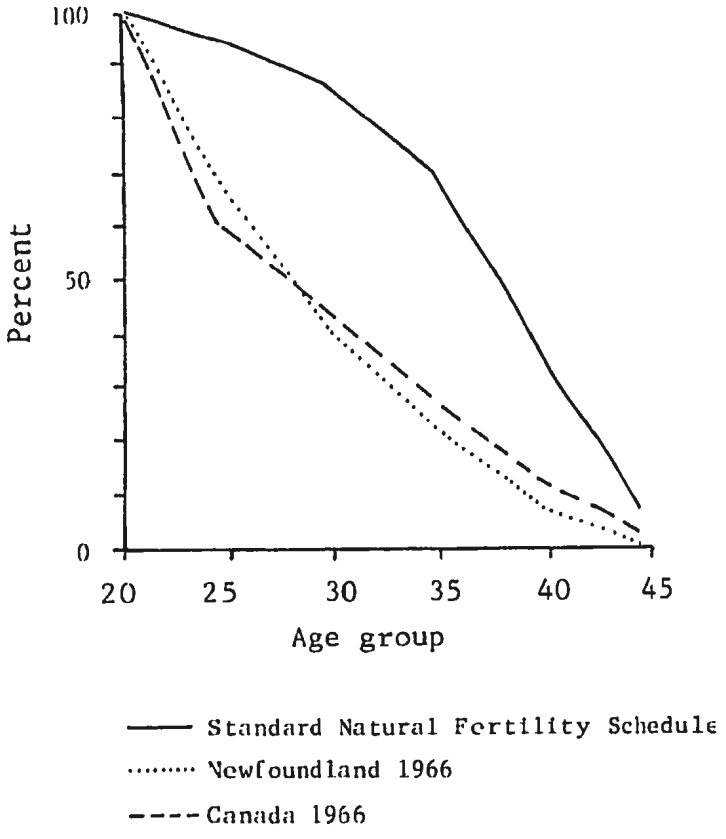


FIGURE 14 : Age-Specific Marital Fertility Rates Expressed as a ratio of the Age-Specific Marital Fertility Rate of Twenty to Twenty-four Year Olds in the Natural Fertility Schedule

(Source: Henry in Woods, 1979, p.119)

In 1971, there are areas where relatively low fertility registers a high PR_{35}; indicating that the birth control in place is not strongly parity-specific. There are also a few places where levels are high, but a strong parity-

specific element is present as indicated by a low PR_{35}, suggesting that older women are stronger controllers of fertility than are younger women. A correlation of TMFR with PR_{35} produces only a weak positive correlation (variance is less than .25) (see Table 5).

TABLE 5 : Association between TMFR and PR_{35} and between $_5f_{15}$ and Pm

Year	n	cal t	tab t .05	tab t .01	H1/HO	r^2
PR_{35} vs TMFR						
1966	14	.82	2.18	3.06	HO	.05
1971	39	3.38	2.02	2.70	H1	.22
I976	39	3.33	2.02	2.70	H1	.23
1981	39	.79	2.02	2.70	HO	.02
Pm vs $_5f_{15}$						
1966	14	2.11	2.18	3.06	H1	.27
1971	39	5.80	2.02	2.70	H1	.48
1976	39	4.40	2.02	2.70	H1	.35
1981	39	3.15	2.02	2.70	H1	.21

Source: Computer Tape, Dept. of Health, Nfld.

The decline of fertility among older women was steepest both in absolute (F_{35}) and in relative terms (PR_{35}) between 1971 and 1976. By 1976, the use of birth control seems to be firmly in place and universal among older women as childbearing at an advanced age has become an infrequent event.

II.C. Teenage Fertility and Age at Marriage

The average teenager in Newfoundland was more likely to become a mother than the Canadian teenager. This remained true throughout the period (1966 through 1981). A high provincial average teenage fertility rate is the product of a very wide range of local rates. In 1966, the highest teenage fertility rate was 160 births per 1000 teenagers; that is, 16 percent of teenagers from this area had a child that year. In other areas during this same period, only 4 percent of teenagers became mothers. This constitutes a very large difference in the degree to which young women become mothers, depending on what part of the island they call home.

There is no clear trend in the provincial teenage fertility rate between 1966 and 1976. It is higher in 1971 than in 1966 and by 1976, it reverts back to 1966 levels. Only after 1976 does a more clearly directed drop take place. However, a closer look at the distributions reveals that in some areas teenage fertility is dropping dramatically throughout the period. In very few places is it increasing and in most places it is barely changing, until after 1976 when it begins to decrease substantially. These wide variations and the generally less dramatic decline of teenage fertility relative to the decline in other age

groups raise questions about the social context in which early motherhood occurs.

Faris, in his ethnography of Cat Harbour in Notre Dame Bay (1972) and Murray in her study of Elliston, Bonavista Bay (1979) observe that premarital conception is a reasonably well tolerated means to marriage and adulthood. The ratios of legitimate births as reported by the teenage parturient in hospital to the census number of married teenage women is frequently above unity or in any case, extremely high. This suggests that marriage in this age group commonly follows pregnancy. In fact, high teenage fertility is significantly though weakly correlated with a high proportion of 20 to 24 year olds that are married (see Table 5, p.70). Spatial differences in the age at which women marry may stem from cultural preference or from economic opportunity but the albeit weak correlation between teenage fertility and the Pm suggests that it may in part merely reflect the degree to which young women are at risk of pre-marital pregnancy. This does not of course explain to what degree teenage pregnancy is the product of deliberation or to what extent it is the product of accident, though the latter seems the more likely case.

Summary

Thus far, the analysis of fertility in Newfoundland has not produced too many surprises. The progression of local fertility rates through the middle to the last stages of the five-stage model of fertility decline was as expected. The increasing concavity of the age-specific curve was in keeping with the predictions of Kuznet's model. On the other hand, the pace by which fertility fell in Newfoundland after 1966 is at least as extraordinary as it was in Quebec, where rates also descended from very high levels in the late 1950s to rapidly converge with the lower national norm. Clearly, this fast pace of strongly parity-specific decline would be very unlikely to ensue in the absence of modern contraceptive aids. This is not to suggest that prior to their introduction to the island Newfoundlanders did not effectively use other conventional forms of contraception, such as the condom, rhythm or withdrawal. In fact, the low TFR and strongly concave age-specific curve of fertility of 1966, relative to the natural fertility schedule, suggests quite the opposite. It is the pace of the decline, however, which dictates that the use of highly effective forms of contraception such as the pill and sterilization, must have increased dramatically between 1966 and 1981.

The limited body of literature that exists on the subject of contraceptive use by Newfoundlanders points out that the first drop in the CBR in the early sixties coincides with the introduction of the contraceptive pill on the island (Hughes & McKilligan, 1981, p.2) If the pill was "widely available" by the mid sixties, as Hughes & McKilligan seem to believe, then it was not being universally used, as the highly variable local fertility rates of the earliest period suggest.

Hughes & McKilligan attribute a second drop in the birth rate, in the early 1970s to the 1972 provincial medical sanction of sterilization as a routine surgical procedure for contraceptive ends and the subsequently rapid increase in the number of these operations which were perfomed (Ibid.). This coincides with the most rapid period of fertility decline among older women between 1971 and 1976.

The fact that the TFR continues to undergo a decline after 1976 which is relatively greater than the decline of TMFR during that same period is in part explained by the fact that it is during this period, 1976 to 1981, that teenage fertility rates were undergoing their greatest decline since 1966. This development would not be reflected by the TMFR, but it would be by the TFR. Local differences in the average age at marriage, as reflected by Pm, may also

contribute to the difference in the variance between the TFR and the TMFR; areas where women marry later may produce an average to low TFR despite a high TMFR. Proportions married, furthermore, only fell between 1976 and 1981, which may again be related to the drop in the teenage fertility rate beginning just prior to that period, between 1971 and 1976.

In the following section, a detailed spatial description of fertility decline is undertaken with the aim of identifying the leaders and laggers of this most recent decline in fertility.

CHAPTER FOUR

ANALYSIS AND DISCUSSION

I. PROLOGUE

A detailed description of the settlement and transportation networks of the island is not in the scope of this study. Rowe (1980) does a commendable job of explaining the evolution of contemporary, as well as historical, spatial patterns of settlement and transportation. Head (1976) provides a more detailed description of this evolution up to the nineteenth century. The most recent trends and changes in settlement and transportation patterns are described by Reid (1980). The latter provides an updated, unique and useful conceptualization of geographical patterns of settlement with special emphasis on the urban system of the island.

Reid's spatial classification of the island is particularly useful for the current study for a number of reasons: (1) it identifies urban areas in terms of the kinds of services provided there and places them within a hierarchy of urban places; defined by service level. The degree of urbanization is much better reflected on the basis of the

level of services than on population size alone. Because the decline of fertility appears to have a strong association with urbanization, Reid's classification is of great value to this study. (2) It provides an excellent description of road transportation networks on the island which identifies the degree of physical isolation from urban centres and other communities. The interesting and contradictory findings in Europe regarding the fertility of isolated areas makes this aspect of Reid's work valuable.

Reid introduces his study with a discussion of the recent shift in Newfoundland. Originally a sea-based transportation network, which was focussed on the bay as a socio-economic unit, it changed to a road-based network which emphasizes the peninsula as a socio-economic unit. The contemporary transportation and settlement pattern on the island consists of a superimposition of twentieth century settlement patterns. These were brought about by the development of the pulp and paper industry and the construction and operation of wartime bases, on the traditional sea-based settlement pattern (see Figure 15). These developments served to centralize the population by concentrating settlement in several urban centres usually located at the bo .om of the peninsulas; centers like Cornerbrook, Stephenville, Grand Falls/Windsor and Gander.

The completion of the Trans-Canada Highway in 1965 and the construction of peninsular roads connecting almost all communities to an urban centre marks the true transition to the contemporary social structure (Reid, 1980, p.xiv). Reid conceptualizes the settlement and transportation network of the island as a linear urban system. It begins in the primate city of St. John's and extends 565 miles along the Trans-Canada to Channel/Port-aux-Basques, joining all service centres to each other. Peninsular roads connect all coastal communities to each other and ultimately feed back into the Trans-Canada at the base of each peninsula where the service centres are located. The peninsulas are thus perceived to be the hinterland of the service centres.

The service centre is classified according to the level of services that it provides as opposed to a classification by population size. In this study, service centres are described in terms of the following hierarchy. Level 1, the highest level, is 'primary wholesale/retail'. St. John's is the only centre in this class. Level 2 centres are 'secondary wholesale/retail'centres; Cornerbrook and Grand Falls/Windsor fall into this category. Level 3 centres are 'complete shopping'; Carbonear and Gander. Level 4 centres provide 'partial shopping'; these are Bay Roberts, Clarenville and Stephenville. Eight other smaller centres, offering a limited range of services classified as

'full convenience' are Bonavista, Channel/Port-aux-Basques, Deer Lake, Dunville/Placentia, Harbour Grace, Lewisporte, Marystown and Springdale (Reid, p.16) (see Figure 15).

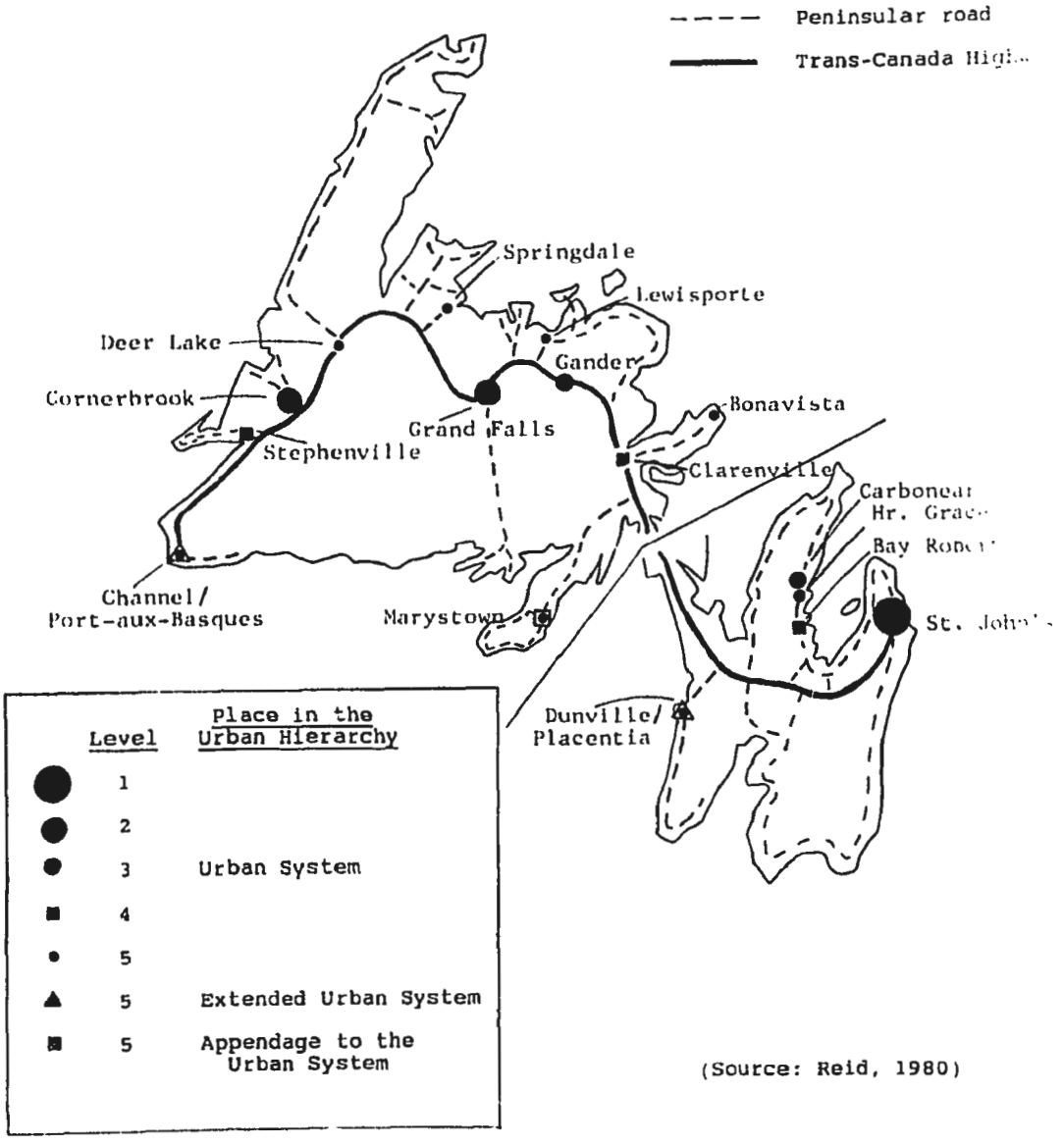


FIGURE 15: Service Centres and the Road Network in Newfoundland (Source: Reid, 1980)

Most of these centres are near or on the Trans-Canada and they and their hinterlands form part of the urban system. Other centres are within reasonable distance of the Trans-Canada but remote from other urban centres; these centres and their peninsular hinterlands form part of the 'extended urban system'. Still other centres are remote from the Trans-Canada but exist within a separate 'mini-urban system' of their own: these areas are classified as appendages to the urban system. Finally, there are peninsulas which do not house any service centres which are, in addition, remote from the main urban system. These areas are classified as 'other peninsulas', lying outside of the urban system altogether (See Figure 16).

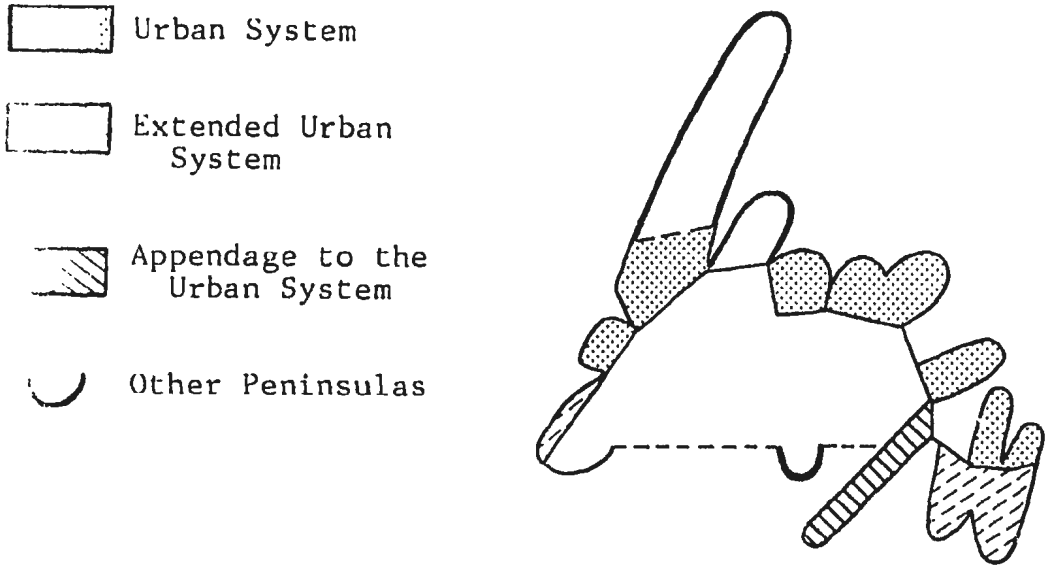


FIGURE 16: The Extended Urban System (Source: Reid 1980)

Figure 17 transposes Reid's spatial classification onto a map of the study units corresponding to this study. The transposition is imperfect because: (i) In Reid's study, Fogo and Twillingate are considered a part of the peninsula serviced by Gander and Lewisporte. A very important difference between them is that Twillingate is connected by road to the mainland whereas Fogo is not. Fogo is thus classified as one of the more isolated areas on the island. (ii) The Ferryland/Trepassey peninsula has also been included in this class although it is somewhat less isolated than Fogo since Ferryland is connected to St. John's by road. It is a fair road distance away from the city and relatively more isolated than the remainder of the Southern Avalon. (iii) The Northern Peninsula which is excluded from Reid's study is here classified as isolated.

Socio-economic data is not available for the designated areas of this study. The island can, however, be divided into Catholic and non-Catholic[1] areas, since this difference does have dramatic implications for the current study. Figure 18 divides the province into areas that are predominately Catholic, religiously mixed (about equal proportions) and predominately non-Catholic. Mixed communities are common in Newfoundland, though often, as in

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1 Almost all Protestant (mainly Anglican, United Church, Salvation Army and Pentecostal).

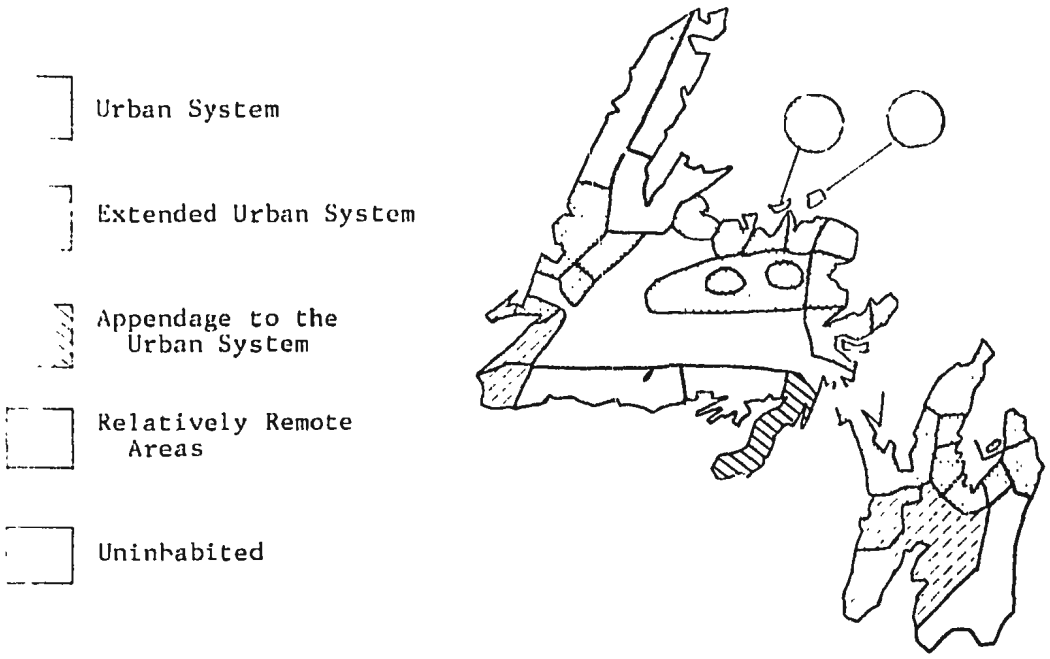


FIGURE 17: The Extended Urban System transposed on the Geographic Areas Pertaining to this Study (Source: author)

Torbay/Bell Island, this mixture actually involves residential segregation within the community itself. The Avalon Peninsula has the greatest concentration of Catholics. In the Southern Avalon, the population is almost wholly Catholic as is the interesting Catholic enclave in Conception Bay; Holyrood/Marysvale. Outside the Avalon, a fair mixture of Catholics and non-Catholics

provided thus far, the analysis of spatio-temporal trends of fertility decline may proceed. In the following section, spatio-temporal trends of total fertility rate, total marital fertility rate, proportions married, and teenage fertility rates are mapped and discussed.

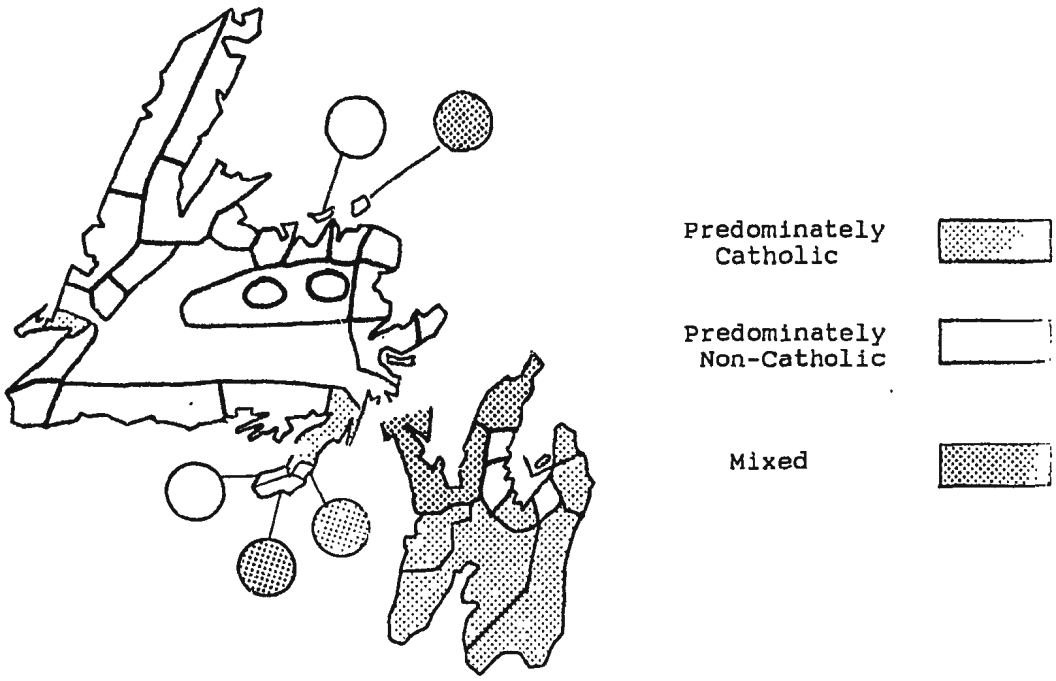


FIGURE 18: Catholic, Mixed, and Non-Catholic areas in Newfoundland (Source: Census Canada)

reside in Fogo and St. Lawrence. Predominately Catholic populations are otherwise found in Stephenville, Port-au-Port/St. George's, Upper Burin and Marystown. The two latter areas are in sharp contrast to the almost wholly non-Catholic community of nearby Grand Bank. In absolute numbers, the largest concentration of Catholics reside in St. John's and to the north, in Torbay/Bell Island.

Given the geographical and religio-cultural context

II. ANALYSIS

Marital Fertility

Figure 19 maps spatio-temporal patterns of marital fertility as expressed by the TMFR. The limited data available for 1966 indicated very high marital fertility in Fogo and in the southern portion of the Avalon Peninsula. Relatively low rates corresponded to Bonavista and to the South Coast. St. John's, the primate city and largest service centre, did not register the lowest TMFR.

By 1971, rates had fallen substantially. Especially significant declines characterized the high fertility areas. Complete coverage in 1971 revealed other high areas: namely Stephenville in the West Coast, Marystown, Upper Burin and a high fertility enclave in Conception Bay; Holyrood. A striking diversity of rates existed even within very confined spaces. For instance, observe the large range of TMFR at the bottom of the Burin, the high fertility enclaves of Holyrood in Conception Bay and Stephenville on the West Coast, and the striking difference between Twillingate and neighbouring Fogo.

All major urban centres, St. John's, Gander, Grand Falls/Windsor and Cornerbrook, exhibited relatively low

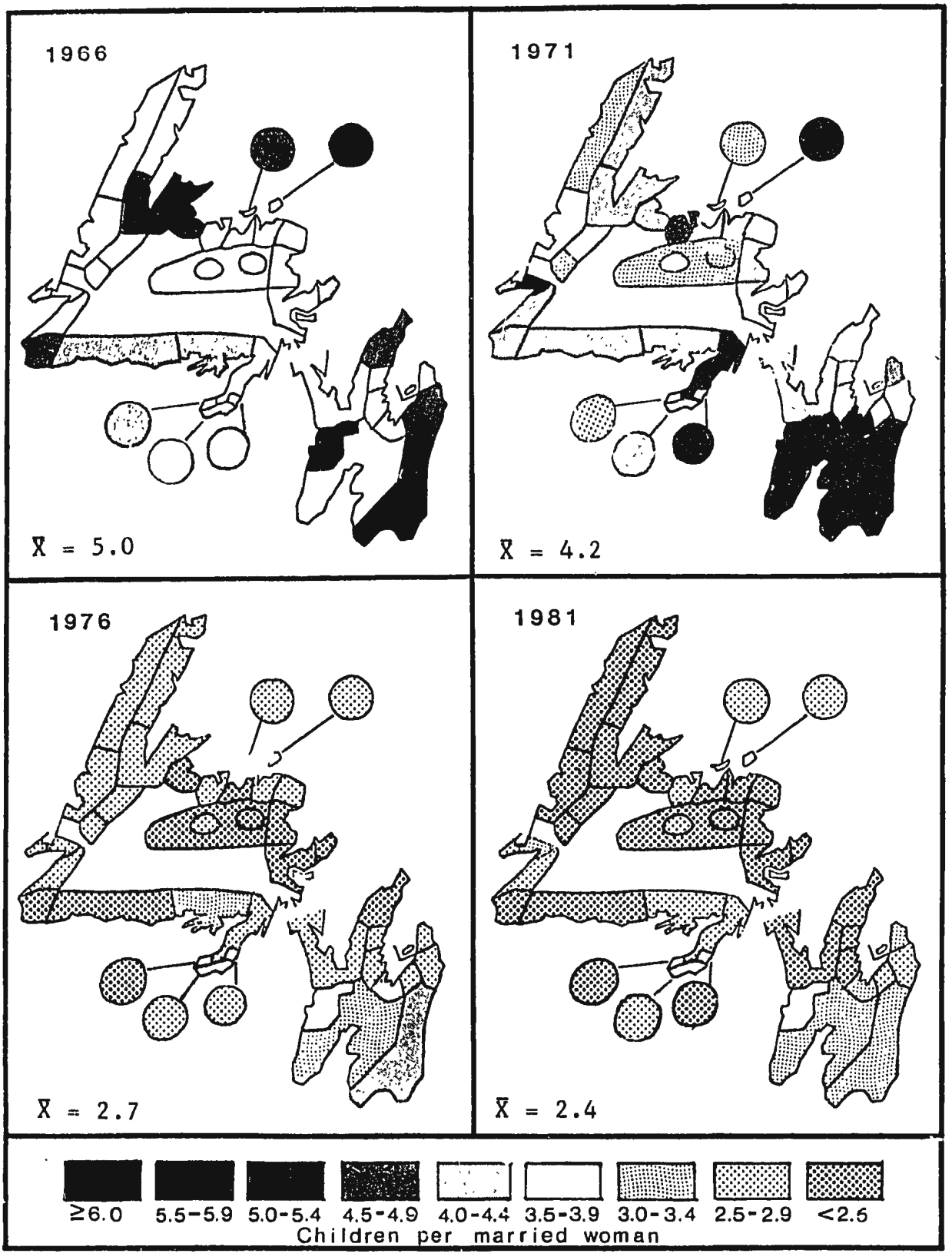


FIGURE 19: Spatio-Temporal Patterns of TMFR, 1966 to 1981

marital fertility: lower in Cornerbrook and Gander than in St. John's. Low rates were not confined just to urban environments; central Newfoundland, the Strait, Twillingate and Grand Bank had among the lowest marital fertility in the province.

By 1976, variance had fallen dramatically. Marital fertility rates had undergone a substaintial convergence; the difference between places were far smaller. Even in the context of this convergence, Holyrood, the Southern Avalon and Bay d'Espoir emerged as areas of higher fertility; Stephenville and Fogo no longer did. This is the only spatial difference that is obvious. Urban-rural differences are not visible, in fact, some of the lowest TMFRs correspond to rural and often remote areas.

The picture in 1981 is not greatly different from that of 1971. Spatial differences were even less substantial; 60 percent of all areas registered a TMFR of less than 2.4. Even given the very narrow range of values of TMFR 1981, the southern Avalon, Holyrood, Stephenville and Torbay continued to have relatively higher rates.

Total Fertility

The relative spatial distribution of TFRs (see Figure 20) in 1966 did not differ markedly from that of TMFRs, with

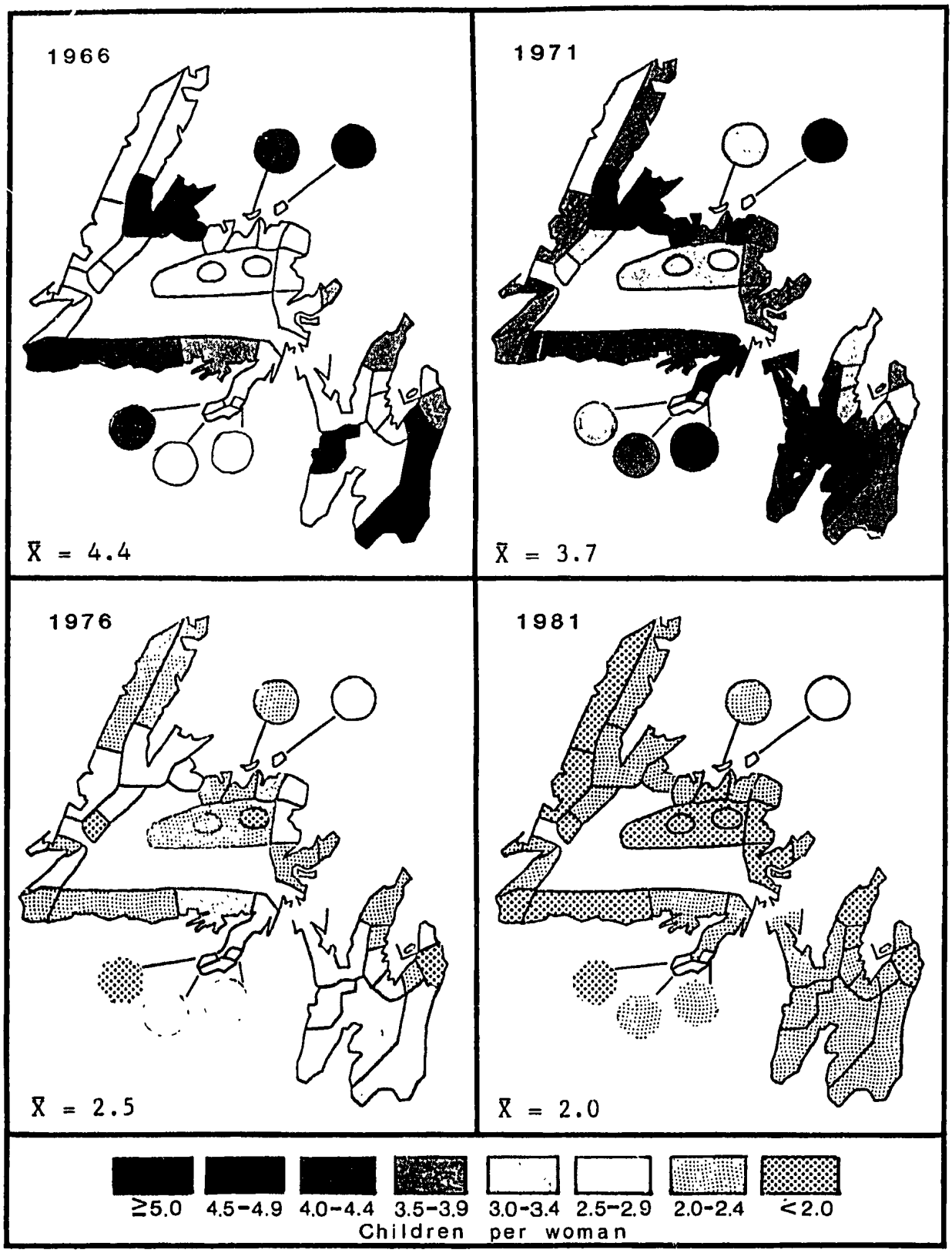


FIGURE 20: Spatio-Temporal Patterns of TFR, 1966 to 1981

the exception of the relatively higher fertility that the TFR suggests for Baie Verte and the South Coast. In contrast, the full coverage of 1971 rates reveals some substantial differences in the patterns of fertility when expressed by TFRs than when TMFRs are used instead.

There was less variation in TFRs than in TMFRs. The southern Avalon which registered a very high TMFR, was not as dominant in the TFR map of fertility, though the latter rates were relatively high. The north-south difference in the Avalon peninsula, so clearly depicted by the TMFR, is not as obvious when using TFRs. Holyrood and Stephenville, the striking enclaves of high marital fertility in Conception Bay and in the West Coast, had only marginally higher TFRs than neighboring communities. In most cases, differences in fertility were generally understated by the TFR relative to the TMFR.

There were, however, a few areas where the TFR indicated even higher relative rates than did the TMFRs. These areas were Upper Burin, Marystown, Carmanville, Fogo and the South Coast. The urban-rural difference in fertility was more prominent in the distribution of TFRs; with the singular exception of the Strait, the lowest TFRs corresponded to urban centres: St. John's, Gander and Cornerbrook.

By 1976, TFRs, like TMFRs, had converged quite substantially; about 50 percent of all areas registered a TFR of under 2.5 children per woman. Rates in Trepassey, Holyrood, Baie d'Espoir and Carmanville were only marginally higher. This convergence entailed a very substantial alsolute decline in most areas though the magnitude of that decline was greatest in Upper Burin, Marystown, Fogo, Carmanville, Stephenville, and parts of the South Coast. St. John's, Gander, Cornerbrook and Grand Bank, exhibited the lowest total fertility. By 1981, only Fogo registered a TFR of over 2.5. Almost 35 percent of all areas registered a TFR of 2 or less. Differences in TFR no longer seemed meaningful.

Marriage Patterns

Marriage patterns and pre-marital fertility are incorporated in the TFR, not in the TMFR. An explanation for large relative discrepancies between the latter, must lie in a difference in the age at which women married and and/or the frequency of premarital (teenage) fertility. The mapping of the proportion of all 20 to 24 year olds that were married produced the patterns shown in Figure 21. The range, 38 percent, is substantial; the highest P_m being 75 percent and the lowest, 37.

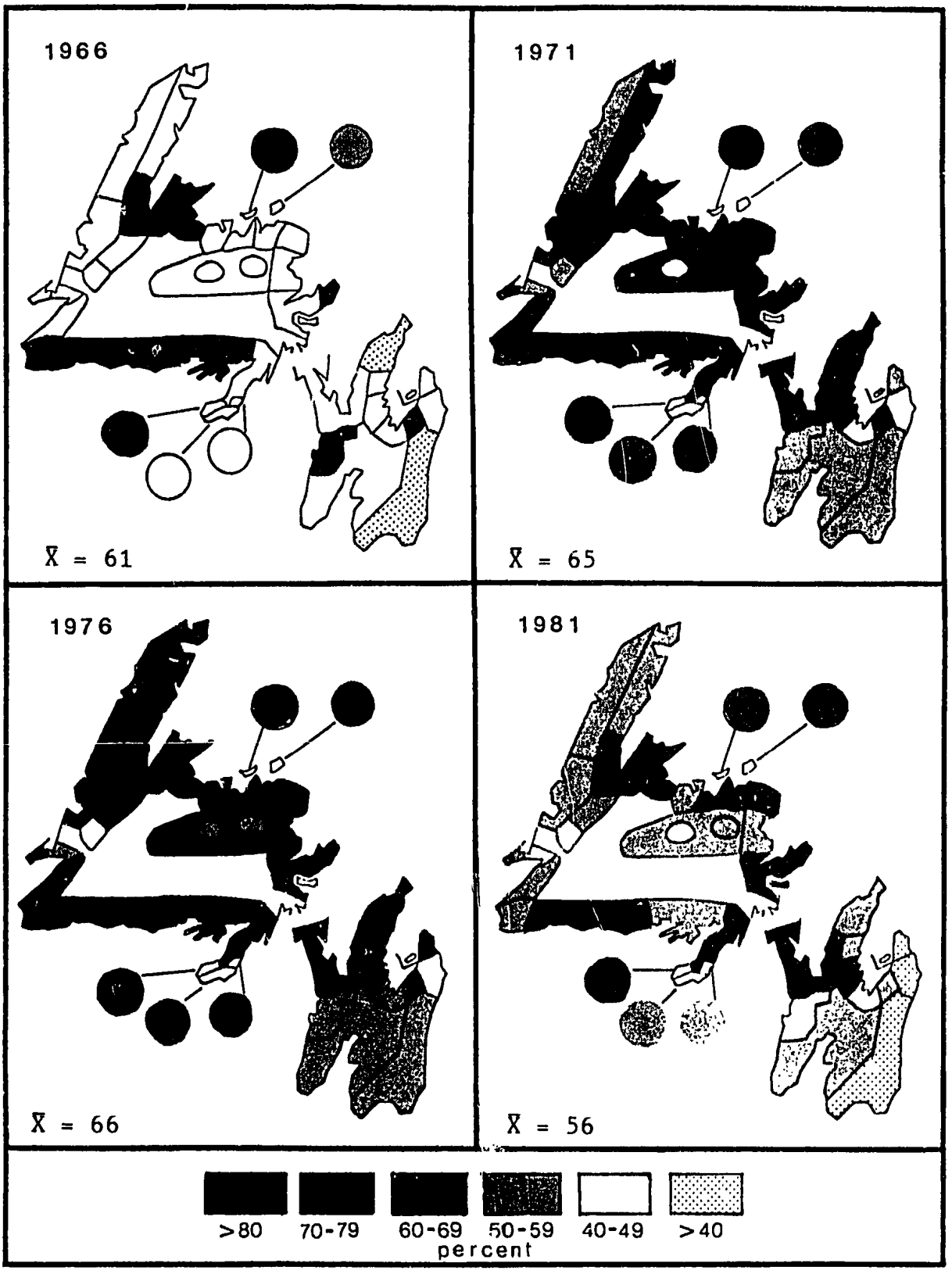


FIGURE 21: Spatio-Temporal Patterns of Pm, 1966 to 1981

In 1966, most areas of the Avalon, as well as Fogo stood in sharp contrast to the rest of the island. Women from these areas married later than other Newfoundlanders. The complete spatial coverage in 1971 shows this pattern again only now, other areas where marriage took place at a significantly older age also emerged. The oldest age at marriage was found in St. John's, Holyrood and Grand Falls, and a marginally younger age was characteristic of the Southern Avalon, Stephenville, Cornerbrook and the Strait. In the remainder of rural Newfoundland, women married relatively early.

The reason why the north-south division, so prominent in the TMFR map of the Avalon, is so much less so in the TFR map, is in large part explained by the low Pm values in St. John's, Torbay, the Southern Avalon and Holyrood. This suggests that women in the Southern Avalon and Holyrood were postponing marriage but controlling fertility only mildly once married. In the Isthmus, where women were marrying early but then praciced greater control once married, the opposite relationship between TFR and TMFR exists. On the TFR map, these very different strategies lie concealed behind similar apparent fertility.

Women married earliest in the Upper Burin, Marystown, Carmanville and the South Coast. Despite what seems

relatively strong control of fertility within marriage in the South Coast, the TFR indicated relatively high fertility. In Grand Bank, as in the South Coast in general, marriage took place early but marital fertility indicated relatively strong birth control. Thanks to the very high marital fertility and early age at marriage in Marystown and Upper Burin, the TFR still remarked the difference between the South Coast and Catholic Burin, but it was muted by the effect of a young age at marriage.

The pattern of Pm in 1976 showed only marginal differences from 1971; what seems a general rise in Pm indicating earlier marriage. These marginal differences between areas are unlikely to be significant. The broader geographic patterns, on the other hand, persisted into 1976, suggesting that they most likely were.

Between 1976 and 1981, Pm dropped almost universally. The decline in Pm was in most places substantial enough to strongly suggest a growing tendency, by the majority of Newfoundlanders, to postpone marriage. Pm in St. John's, Torbay, Holyrood, most of Southern Avalon, Grand Falls, Cornerbrook and Stephenville continued to be among the lowest. By this time, a growing convergence of Pm, and the almost complete convergence of fertility rates made the effect of age at marriage on the TFR, seemingly negligible.

Teenage Fertiltity

Perhaps one of the most interesting aspects of spatial differences of fertility on the island concerns teenage fertility patterns (see Figure 22). As Table 5 (p. 70) indicates, a statistically weak but significant positive correlation existed between teenage fertility rates and Pm. A careful comparison of the teenage fertility ($_5f_{15}$) with the Pm map verifies a weak but visible accordance between both patterns. A low $_5f_{15}$ was typical of the Avalon, outside of the Isthmus. The pattern is not exactly the same for Pm; but certainly the contrast between the greater part of the Avalon and the rest of the island is visible in both maps. Other areas of low $_5f_{15}$, like Cornerbrook, Gander, Grand Falls, Lewisporte and Twillingate are far less accordant. Most of the South Coast registered high $_5f_{15}$ and high Pm. Along the West Coast, in Baie de Verde and Springdale Pm and $_5f_{15}$ patterns are especially similar.

In 1976, the correlation was weaker. A comparative look at the map of $_5f_{15}$ and Pm corresponding to 1976 reveals a very interesting deviation between two measures. Teenage fertility had almost universally declined since 1971. Age at marriage however had essentially remained the same.

Some of the lowest rates of $_5f_{15}$ still corresponded to the

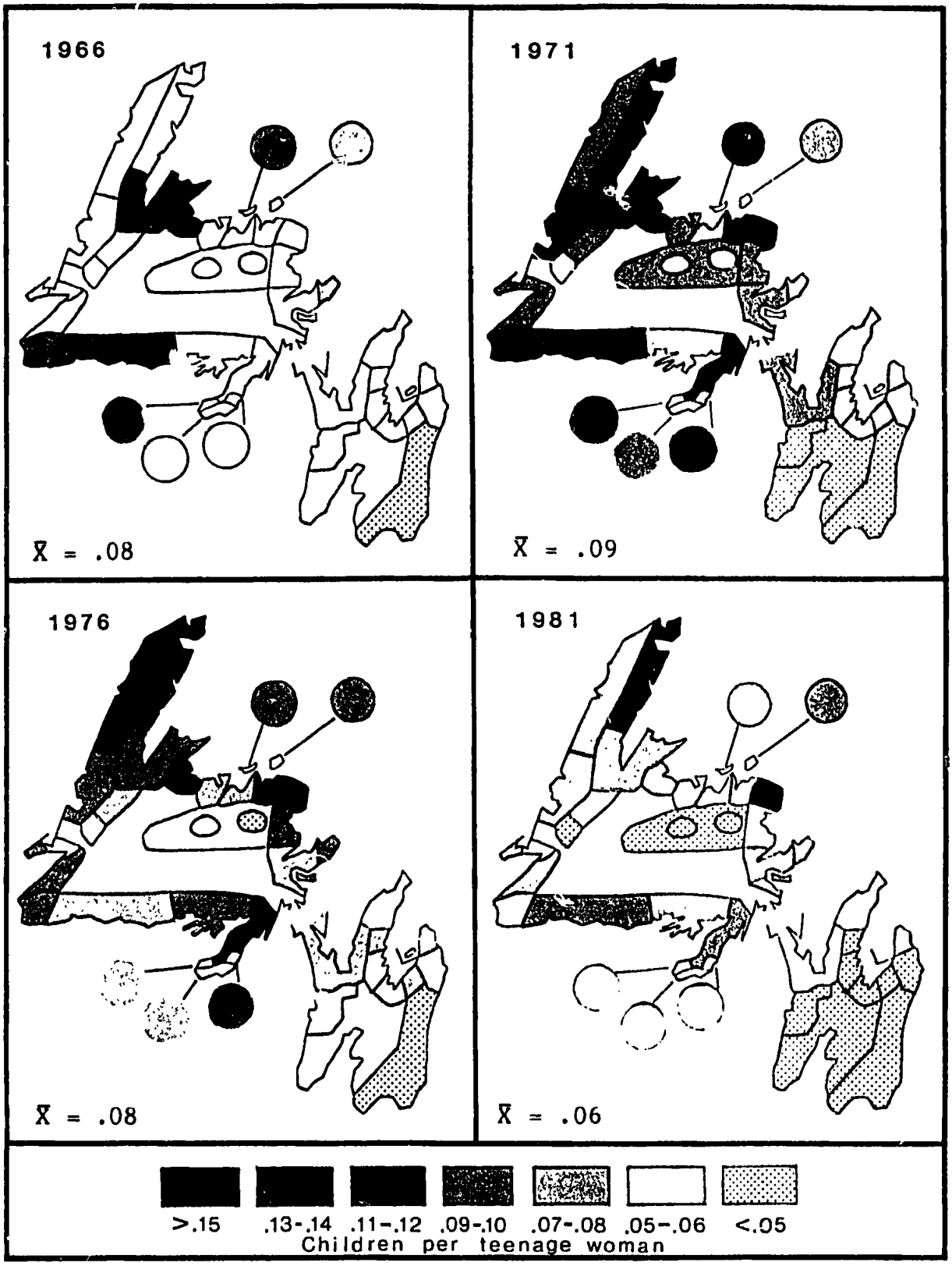


FIGURE 22: Spatio-Temporal Patterns of $_5f_{15}$, 1966 to 1981

greater part of the Avalon, Gander, Grand Falls and Cornerbrook. In addition new areas of low fertility emerged; Central Newfoundland and Stephenville. Areas where a relatively high teenage rates persisted in 1976 were Carmanville, where as many as 15 percent of all teenagers had a child that year, Upper Burin, Marystown, Wesleyville, Springdale and St. Anthony. The greatest relative declines were in Bonne Bay and Grand Bank. The Pm map for 1976 does not reflect these changes. It only reflects the larger tendency for women from the Avalon and urban centres to postpone marriage.

Between 1976 and 1981, teenage fertility continued to decline almost universally. St. Anthony and Wesleyville experienced no further decline and emerged as the areas of highest fertility among very young women in 1981. The lowest $_5f_{15}$s were still concentrated in the Avalon and the larger urban centres (a marginally higher rate was in place in Stephenville). Relatively low rates, however, were also in place in a fair number of rural places; the communities in the Southern Burin, Channel/Port-aux-Basques, and small sections of Bonavista and Notre Dame Bays.

The weakening relationship between Pm and $_5f_{15}$ appears to be in part explained by the differential timing of the decline of $_5f_{15}$ and the rise in the age at marriage. A

drop in teenage fertlity seems to have preceded the drop in Pm. This fact strongly suggests this drop in Pm between 1976 and 1981 was caused by a prior drop in teenage fertility.

The Fertility of Older Women

As previously discussed, family limitation, as opposed to birth spacing, produces an age-pattern of fertility in which the tail of the age-specific curve is concave. In the absence of family limitation, the fertility of older women accounts for a substantial portion of the TMFR. In Henry's Hutterite population, PR_{35} is about 32 percent. Chapter Three stated that the highest PR_{35} in Newfoundland was 24 percent in 1966 and that the majority of areas registered substantially lower ratios. This suggests that family limitation was likely practiced to some degree everywhere on the island.

A correlation of PR_{35} with TMFR indicates a very weak positive association in 1971 and 1976, and none at all in 1966 and 1981. A careful comparison of the two relevant maps for 1966 (see Figure 23) reveals that an accordance between the two patterns was confined to Holyrood, the southern portion of the Avalon, Upper Burin, Marystown, Stephenville and Fogo. This suggests that in these areas,

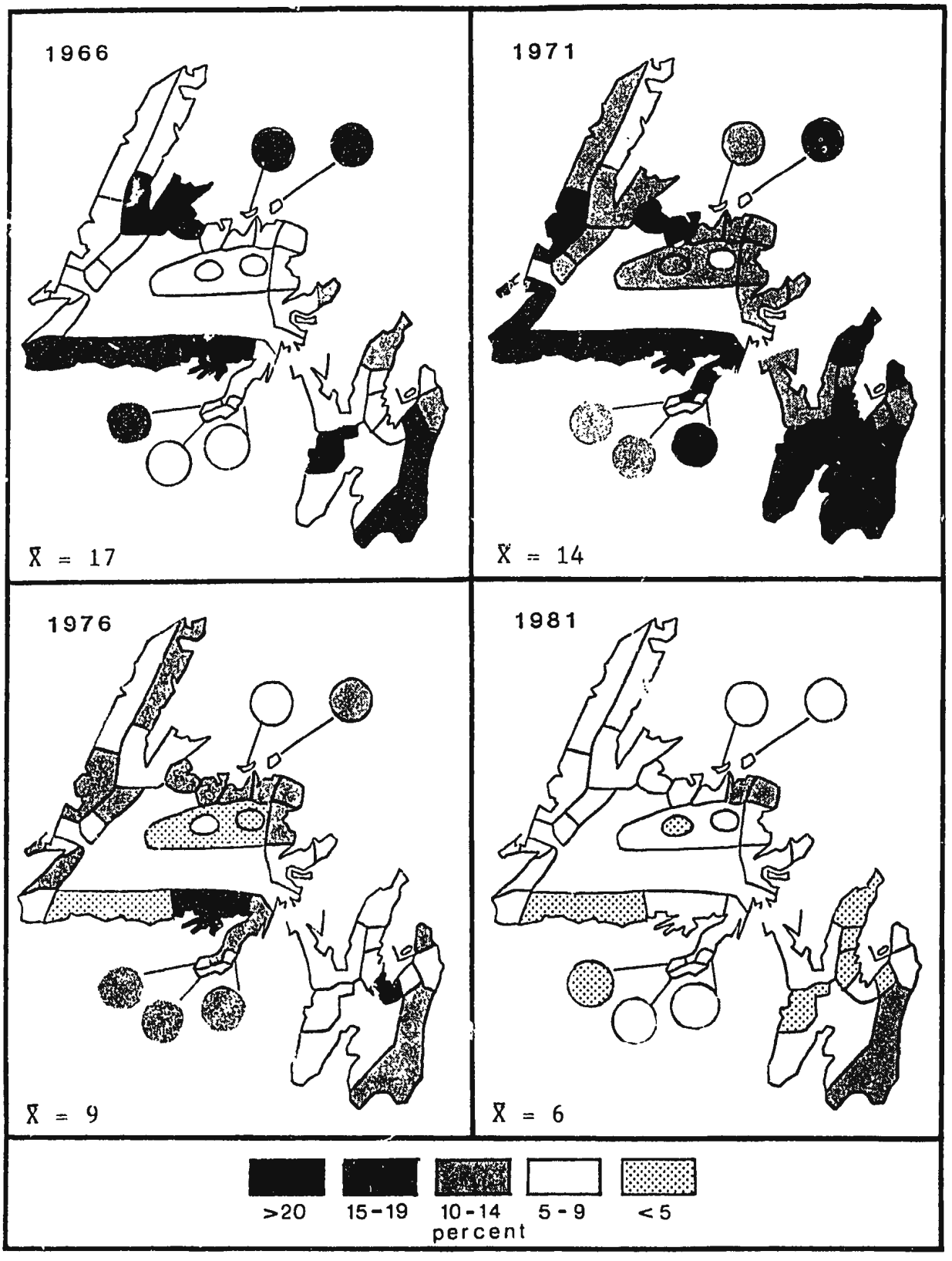


FIGURE 23: Spatio-Temporal Patterns of PR_{35}, 1966 to 1981

older women were still contributing substantially to fertility. Even a cursory look at the age-specific curves (see Appendix P) shows these areas to have a milder concavity than other areas. On the other hand, a relatively weaker concavity does not appear to be confined to areas of high fertility. In the Strait, Bonne Bay, Cornerbrook, Central Newfoundland (excluding Gander) and Twillingate, low TMFRs coexist with high PR_{35}s. This would suggests that though birth control was clearly present, it was not as strongly parity-specific as we would have expected. Marital age-specific curves corresponding to these areas do not confirm this since the tails of these areas are strongly concave. The significance of PR_{35} as a measure of concavity is questionable given the irregularities of schedules based on small populations. For statistical reasons, PR_{35} is not a very revealing index of concavity where rates are low.

It has already been suggested that the subject of the fertility of older women may be more meaningfully approached on terms of its deviation from absolute zero. An examination of absolute levels in the form of F_{35} may help to clarify this question.

By 1971, F_{35} had decreased in almost every area for which 1966 data is available (see Figure 24). Major declines

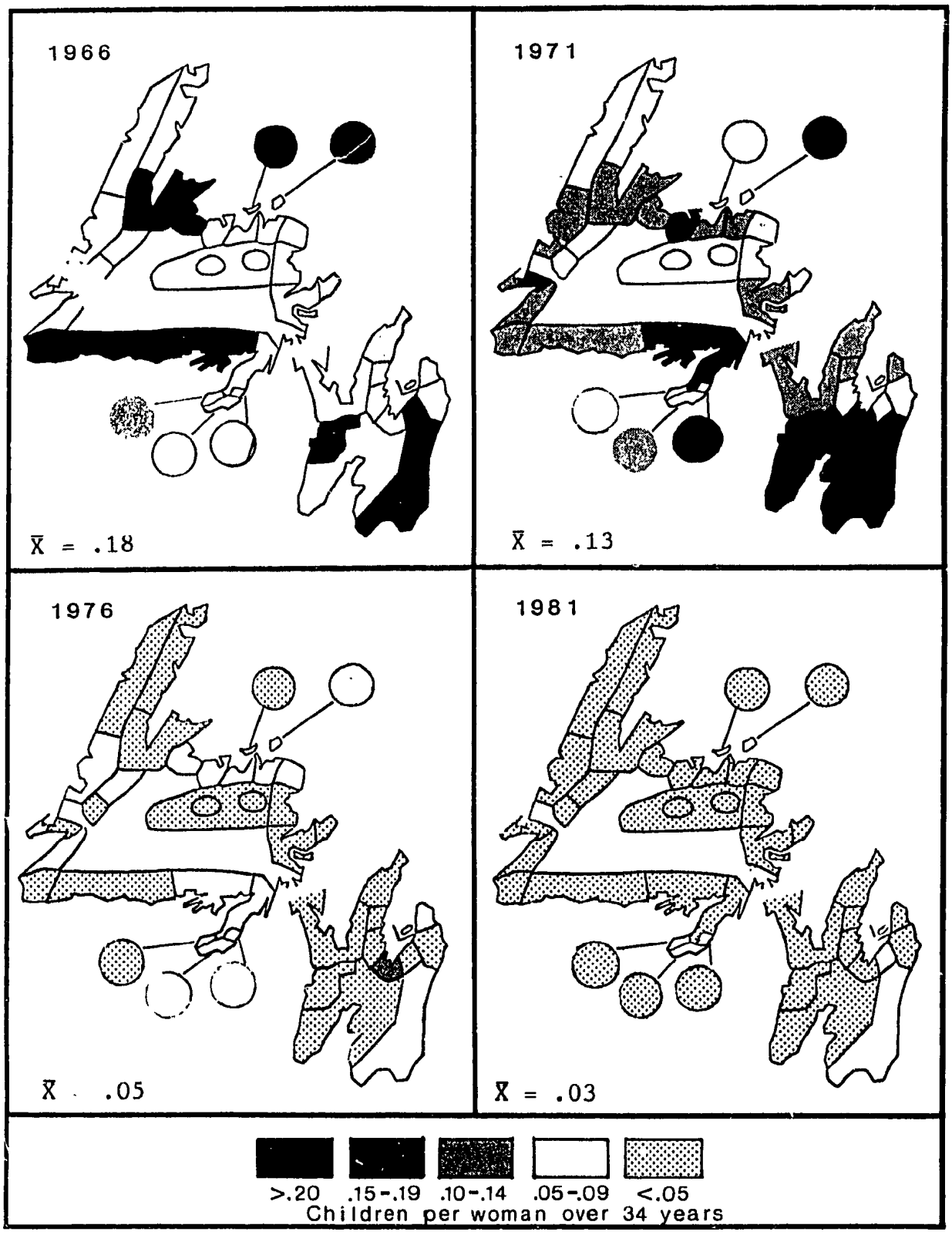


FIGURE 24: Spatio-Temporal Patterns of F_{35}, 1966 to 1981

took place in Baie Verte and Springdale; a disproportionate decline relative to that of TMFR. In Twillingate and the western half of the South coast, there was a swift decline in F_{35} between 1966 and 1971. The decline in the Avalon was far more modest while Fogo experienced no decline at all. In 1971, Upper Burin, Marystown and Fogo had the highest F_{35}; Holyrood, the Southern Avalon, Baie d'Espoir, Botwood and Stephenville were marginally lower. The lowest rates corresponded to St. John's, a few areas in Conception Bay, the greater part of Bonavista Bay, Twillingate, Central Newfoundland, the Northern Peninsula, Cornerbrook, Deer Lake and Grand Bank. These areas, with the exception of St. Anthony in the Northern Peninsula, also had below average TMFRs.

Patterns of TMFR in 1971 show greater correspondence with those of F_{35} than with PR_{35}. The north-south division in the Avalon is apparent in both the F_{35} and the PR_{35} maps, however, the significant differences (i) between Twillingate and Fogo, (ii) between communities in the Southern Burin and (iii) Stephenville and the West Coast appeared dominant in the F_{35} map alone. By 1976, the range of F_{35} was relatively smaller than that of TMFR. Very strong birth control among older women was universal. Only one area fell outside the norm; Holyrood, where rates were marginally higher. This difference was so marginal,

however, that its significance is questionable.

In summary, the most significant findings regarding the fertility of older women are as follows:

(1) Older women from urban places consistently manifested strong control it was equally strong in a number rural areas as well.

(2) Without exception, areas of highest marital fertility registered the highest F_{35} and PR_{35}. There were, on the other hand, areas with high PR_{35} that had a low TMFR.

(3) In some areas, the decline of fertility among older women began earlier than in others. In Baie Verte, Springdale, Twillingate and parts of the South Coast, for instance, rates fell dramatically between 1966 and 1971; in contrast with Fogo, Bay d'Espoir and the Southern Avalon. Rates in 1971 are high in Upper Burin, Marystown and Stephenville by 1971 suggesting that older woman had not yet undergone a significant decline in fertility. In other areas, Baie d'Espoir and Fogo, maritial fertility was already relatively low by 1971; the TMFR had been declining between 1966 and 1971 but the fertility of older women had not.

(4) Lastly, the enormous change in the pattern of F_{35} between 1971 and 1976 is extremely interesting in itself. Differences in F35 are only marginal by 1976. Childbearing at an advanced age had become an infrequent

event everywhere; perhaps mildly more frequent in Holyrood.

In the following chapter, the spatio-temporal patterns just described are discussed at greater length in the context of a number of hypotheses introduced earlier. A number of general conclusions are drawn concerning the spatio-temporal decline in Newfoundland.

CHAPTER FIVE

CONCLUSIONS

In Chapter 2, it is stated that conclusions drawn on the data introduced in this study must be made cautiously, placing emphasis on very substantial discrepancies and on repeated observation. Furthermore, the analysis is by necessity, primarily descriptive. As Chapter Four has demonstrated, the diversity of demographic and nuptial behaviour on the island is very great. The isolation of important discrepancies and consistent trends is not only a complicated task but must unfortunately ignore what are smaller albeit significant discrepancies or patterns between areas or through time. Nonetheless, a number of interesting patterns do emerge which, though not necessarily furnished with explanation, help to direct future research to specific areas. A discussion of these more salient patterns, in the context of a number of hypotheses introduced earlier in the study is the subject of this, the last chapter. In summary, they are (1) the effect of the urban/rural environment, (2) culture (religion) and (3) relative physical isolation or remoteness, on reproductive and nuptial behaviour. In light of these conclusions, the validity of the hypothesis that fertility decline spreads geographically is discussed

in the context of Newfoundland during the period 1966 to 1981.

(1) The Urban/Rural Effect

The most repeated observation of a large fertility differential in the literature concerns that between urban and rural areas. The urban/rural difference is a central theme of the Demographpic Transition. Urbanization has an obvious depressive effect on fertilty.

Though urban centres characteristically exhibit some of the lowest marital fertility, they do not emerge as obvious leaders of fertility decline since as many rural areas register equally low rates. Only when the typical urban effect of low teenage fertility and postponement of marriage are considered do urban areas appear to be leading in the practice of birth control. Even so, the rural Strait, Twillingate, Grand Bank and most of Conception Bay register marginally lower total fertility.

The very limited temporal coverage of fertility patterns makes a conclusion about the urban/rural hypothesis tentative. The patterns of 1971 suggest that fertility decline did not, originate exclusively in urban centres, though they certainly were at the forefront of that

decline. This bears interesting implications in (i) those rural areas which were on par with major service centres in terms of control within marriage and (2) Holyrood and the southern Avalon where marriage takes place late and teenage fertility is as low as in the major urban centres, but where maritial fertility is very high.

Outside of the difference between major service centres and rural areas, the urban hierarchy outlined by Reid (1980) (see Figure 17, p.82) seems to bear little relevance to patterns of fertility. Smaller service centres are as likely to have high marital fertility (Stephenville and Marystown) as low marital fertility (Carbonnear, Bay Roberts, Deer Lake). In the Southern Burin, for instance, fertility rates are much higher in the level 5 service centre, Marystown than in the neighbouring rural communities of Grand Bank and St. Lawrence.

These facts bring into question the definition of urbanization in the Newfoundland context. Only St. John's approaches the national definition of an urban place. It can be argued that, given the constant influx of rural migrants to these small 'urban places', these centres may strongly reflect rural mores and values. The absence of a clear urban/rural division may reflect the inadequacy of the designation 'urban' to the case of Newfoundland.

(2) The Effect of Religion (Catholic/Non-Catholic)

Predominatly Catholic areas are confined to Holyrood/southern Avalon, Marystown/Upper Burin, and Stephenville. Mixed communities characterize the northern remainder of the Avalon (and Fogo island to a lesser extent). The rest of the island is predominatly non-Catholic. This pattern bears a remarkable semblance to the spatial pattern of TMFR amd F35 in 1971. This apparent association between fertility and Catholicism is not very surprising in view of Van de Walle and Knodel's findings; the staunchly Catholic Bretons of France and the Polish Catholics of Germany, registered among the highest fertility rates relative to their respective national average in the nineteenth century (Van de Walle, 1974, and Knodel in Woods, 1979, p.151). This association is also interesting in view of Lapierre Adamcyk's findings in Canada that religion was still a significant variable in the explanation of differential fertility among older, but not younger women. In Newfoundland in 1971, Catholicism appears to have been important to the reproductive behaviour of young and older women alike, as high levels of TMFR and F35 indicate. The pattern of TMFR in the southern Burin in 1971 is especially noteworthy; non-Catholic Grand Bank registered the lowest marital fertility,

religiously mixed St. Lawrence registering an average rate, and Catholic Marystown/Upper Burin registered some of the highest rates on the island. The similar age at marriage and teenage fertility rates of these three areas produce this pattern in total fertility rates as well.

When fertility is mapped using TFR instead of TMFR, only Marystown, the Upper Burin and Fogo emerge dominant. Holyrood, the southern Avalon and Stephenville register a rate marginally higher than the average, in 1971. The explanation for this lies in a difference in the age which women marry and the frequency of teenage pregnancy between Catholics from the Avalon and Stephenville and Catholics from Marystown/Upper Burin; the religiously mixed communities of Fogo fall within the average. Avalon and Stephenville Catholics marry later than Catholics from Upper Burin and Marystown. Avalon Catholics also exhibit the lowest teenage fertility rates in the province. Somewhat higher rates characterize Fogo and Stephenville and very high rates are typical of the Upper Burin and Marystown Catholic population. A later age at marriage is therefore not typical of Catholic communities in Newfoundland but seems confined to Avalon Catholics. The same can be said for low teenage fertility.

Generally then, the 1976 pattern (and the 1971 pattern to a

lesser extent) of Pm confirms the existence of an urban/southern Avalon association with the postponement of marriage and very low teenage fertility. Even as late as 1981, in the context of a general rise in the age at marriage and decline in teenage fertility, the pattern reveals this line of division (though it is obscured by the rising convergence of values). That marriage should more likely be postponed in an urban environment than in a rural one seems obvious. Chapter two has elaborated the reasons for this. If patterns in 1971 and 1976 in part reflect long term demographic tendencies, then the Catholics of Holyrood, the southern Avalon and possibly Stephenville, may have practiced birth control using a noticeably different strategy than other Catholics on the island. The postponement of marriage in these areas may reflect the only or best accepted means of limiting family size; Malthus' preventative check. This check appears to be largely absent in Upper Burin and Marystown. Once married, women in all Catholic areas, as well as the mixed communities of Fogo, manifest relatively high fertility.

There is very compelling evidence, then, that Catholics were having larger families than non-Catholics. This is because the settlement pattern of Newfoundland is characterized by regional clusters of Catholic communities. More interesting though is the compelling evidence that

Burin Catholics were having larger families than Avalon Catholics on account of significant differences in the degree to which marriage was postponed and in the degree to which teenagers were having children.

The Catholic/non-Catholic differences in fertility in 1966 and 1971 is the clearest pattern that emerges from this study. The most interesting aspect of this pattern, however, is its virtual disappearance by 1976. Whatever mechanisms caused this clear difference in reproductive behaviour in 1971 was no longer a strong influence by 1976.

(3) The Effect of Physical Isolation

Reid's (1980) description of settlement patterns and transportation networks defines a number of areas on the island which are considered to be not only outside of the urban system but physically removed from the Trans-Canada Highway. These areas are Trepassey, in the southern Avalon, Fogo and Baie Verte in Notre Dame Bay, the Northern Peninsula, and the South Coast (see Figure 17, p.82). The Burin, though possessing it's own regional service centre, is also relatively remote from other communities on the island. Does this remoteness have an effect on the levels of fertility or the pace of its decline?

TMFR range from very low to very high in remoter areas. Upper Burin, Marystown, the southern Avalon, Holyrood and Fogo have high fertility although, as we have already discussed, these high levels may be related to Catholicism. The South Coast and Northern Peninsula exhibit among the lowest marital fertility in the province; especially low rates correspond to Grand Bank and the Strait. These remote areas appear to have been practising stronger birth control than Grand Falls, and even St. John's. West Coast fertility is significantly lower than the fertility of the most of the South Coast and of Notre Dame Bay, despite the latter's far greater access to the TCH and regional service centres in Central Newfoundland.

The patterns of fertility corresponding to older women reveals a similar range of values; from the very high rates of Fogo, southern Avalon, Upper Burin, Marystown and Bay d'Espoir, to the average rates in parts of the South Coast, to among the lowest rates in the Northern Peninsula. Women from the Northern Peninsula, and specifically the Strait, persistently exhibit nuptial and reproductive behaviour more akin to the large service centres than to other rural and relatively remote areas. In the South Coast and on the Burin, the range of rates is characteristically wide; from Grand Bank's highly

controlled marital rates, frequently lower than in St. John's, to Marystown's strikingly high fertility. Even when the analysis is confined to the South Coast and Grand Bank, there is a formidable difference, for instance, in the degree to which older women control fertility.

Twillingate like Grand Falls, exhibits the lowest fertility in the vicinity. Although Twillingate is attached to Notre Dame Bay by road and Fogo is not, the difference between the two islands is nonetheless striking. Fertility, irrespective of how it is measured is recurrently higher in Fogo than the rest of Notre Dame Bay, whereas the opposite is true of Twillingate. The large difference in rates and pace of decline between these two islands may be due to the relative difference in remoteness and the stronger Catholic influence in Fogo. Relative to the rest of the bay there is a substantially lower rate in Twillingate relative to even St. John's.

The hypothesis that isolated places are likely to lag in the spatial evolution of low fertility is strongly challenged in Newfoundland. Livi-Bacci's finding that fertility decline came earliest to some of the remotest and mountainous areas of Italy, bear strong semblance to the findings in Newfoundland. Furthermore, fertility decline lagged noticeably behind in remote areas that were also

Catholic areas though it is impossible to separate these two aspects here. In conclusion, the effect of physical isolation still appears to be less significant than the element of the Catholic influence.

The Geographical Diffusion of Fertility Decline

Is there evidence in Newfoundland that fertility decline spread geographically? The first problem with this line of inquiry concerns settlement patterns in Newfoundland. The second concerns the very limited temporal coverage the data affords. A concentric distance/decay model of diffusion is not entirely appropriate to the transportation and settlement geography of the island. The likely direction of diffusion outwards from a hypothetical core of innovation is difficult to predict. Patterns of fertility do not indicate clear signs of a geographic diffusion. There are contiguous areas that exhibit similar levels; for instance Central Newfoundland, Bonavista Bay or the greater part of Conception Bay. These belts of similar fertility are not, however, evidence of geographic diffusion. There are clear leader and laggers of fertility decline symptomatic of a diffusion process. If the decline is plotted as a series of frequency histograms, in accordance with the five-stage model of fertility decline, diffusion appears to be in place. If decline is mapped,

however, no clear geographic pattern emerges. The direction of this hypothetical diffusion is not visible. Geographic patterns do indicate areas which were leading in that evolution, though the reasons remain unclear.

The responsiblity for the seeming absence of geographic spread, may in part rest with (i) the very limited time span for which data are available and (ii) the incomplete coverage in 1966. A process of spatial diffusion may have revealed itself if data had been available for years prior to 1966. However, this possibility is purely speculative.

Perhaps the most revealing aspect of the geographical patterns of fertility in Newfoundland is the incredible pace of decline between 1971 and 1976. The strong convergence of rates translates into a melding of patterns. By 1976, the difference between places was less salient than was their semblance. Coale's preconditions state that the decline of fertility will take place only if the notion of family limitation is perceived to be (i) acceptable, (ii) advantageous and (iii) if techniques of birth control are known and accessible. If areas of high fertility in 1971 were high because family limitation was perceived unacceptable or not advatageous, how could norms have changed so dramatically in five years? By 1971, the

enormous pace of the decline experienced by all Newfoudlanders irrespective of religion or residence strongly suggests that the preconditions of perceived acceptance and advantage of family limitation were in place everywhere. To conclude otherwise is to ascribe an inordinately fast pace to the transformation of social and religious values. It seems much more likely that it is the knowledge and access to family limitation techniques that changed dramatically between 1971 and 1976.

The testing of this hypothesis is impossible in light of the paucity of the literature about accessibility and use of birth control in Newfoundland. The work of Hughes and McKilligan (1981) in the Burin and my own experience working at the Planned Parenthood clinic in St. John's, supports the hypothesis that spatial variations of fertility in 1971 may in large part be due to spatial differences in the degree to which Coale's third precondition is in place.

Hughes and McKilligan (1981) posit that the introduction of the pill and the infusion of leadership in the provision of family planning services are 'major factors' in the decline of the birth rate in the mid 1960's. The pill is said to have been 'widely available' by this time (Hughes and McKilligan, 1981, p.2). They attribute a second drop in

the early 1970's to the rapid increase in the number of tubal litigations and sterilizations that were performed following the provincial medical santion of these procedures in 1972. The timing of these developments coincide well with the pace of decline in Newfoundland. If the pill was 'widely available' in 1966 some women were clearly using it more in some areas than in others.

Very little information exists about the degree to which Newfoundlanders use or are knowledgeable about contraception. Hughes and McKilligan's (1981) findings in the Burin and St. John's indicate "a general lack of knowledge" about contraception, much stronger in the Burin than in the city. When asked where they would go to acquire birth control information, half of Burin women said that there was no place to go or that they did not know where to go, and the other half responded that a doctor or a hospital would have information. In St. John's, most women mentioned Planned Parenthood or a doctor and only half as many as in the Burin answered that they did not know where they could go. Even more significantly. In St. John's, only 3 percent of believed that there was no place to get information. In the Burin, as many as 20 percent believed felt the same.

Hughes and McKilligan (1981) confirm that knowledge about

birth control, conventional as well as modern, varies substantially both between urban and rural places as between Catholics and non-Catholics. By inference, these variations in knowlege may account for some of the differences in fertility. On the other hand, they also found that, on average, Catholic women in the Burin wanted larger families than non-Catholics. If this is true of Catholics throughout the province, then the higher rates among Catholics in 1971 may in part reflect this. The massive decline between 1971 and 1976 even in these Catholic areas, however, suggests that high rates in 1971 owe more to the absence of Coale's third precondition than to his first (acceptability of family limitation).

If Hughes and McKilligan are correct in attributing fertility decline to the infusion of leadership in the provision of family planning services, then Twillingate, the northern half of the West Coast, Grand Bank and most urban centres must have had stronger leadership than other areas. Catholic areas must have had less.

The paucity of research on fertility in Newfoundland renders this conclusion tentative. Confirmation of this hypothesis would entail undertaking a spatio-temporal study of the availability of a number of controlling techniques. Furthermore, the hypothesis that spatial patterns of

fertility reflect differences in the degree of knowledge and access to birth control does not deny the existence of other variables. On the contrary, it does explain a number of otherwise unexplained patterns. The low fertility of a number of rural areas can be better understood in the context of local leadership in family planning services. This leadership may conceivably come from regional hospitals, clinics or individual doctors and instructors. The Planned Parenthood clinic in St. John's is a prime example. It also explains the formidable barrier of Catholism to the rapid decline of fertility in 1966 and 1971, since resistance by local leadership and medical personnel may make access more difficult resulting in a slower decline. This implies that it is the precondition of acceptance which is lacking in Catholic areas. The fast pace of decline between 1971 and 1976 suggests that the resistance to family planning may have come from community leaders and medical personnel and not necessarily from the individual.

The limitations of the data and the almost virtual absence of related research in Newfoudland, renders most conclusions speculative. More research is certainly needed for causal mechanisms of decline to be established. This preliminary study does, however, fill some of the enormous gaps in the knowledge of recent trends of fertility in

Newfoundland. More importantly, it introduces a series of new and pointed questions about reproductive and nuptial patterns on the island which serve to direct future research. In this regard, despite the many questions left unanswered, it constitutes a significant contribution to the study of fertility in general and to the better understanding of Newfoundland, specifically during fifteen of the demographically most significant years of this century.

APPENDIX A

Computation of Measures

$$\underline{TMFR} = n \cdot \sum_{z=2}^{7} \frac{D_z}{MF_z}$$

Where:
- n = the number of years in each age group (n = 5 here)
- z = a series of age groups (here 7 stands for the 7 five year age groups, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44 and 45-49)
- D = live birth deliveries to mothers in age group z
- MF_z = married females in age group z

$$\underline{TFR} = n \cdot \sum_{z=1}^{7} \frac{D_z}{F_z}$$

Where:
- F_z = females in group z

$$\underline{Pm} = \frac{MF_1}{F_1} \cdot 100$$

$$\underline{F}_{35} = \sum_{z=4}^{3} \frac{D_z}{MF_z}$$

$$\underline{PR}_{35} = \frac{F_{35}}{TMFR} \cdot 100$$

$$5\underline{f}_{15} = n \cdot \frac{D_1}{F_1}$$

APPENDIX B

Return of Birth

...of Health
...s Division

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR

RETURN OF BIRTH

Place of Birth { Town or Village .....
District of.....

1. **FULL NAME OF CHILD** .....
(given names) (surname in BLOCK letters)

3. Sex of Child ..... | 4. Single, Twin ..... | 5. Date of Birth ..... 19.....
(month) (day) (year)

6. By Whom Baptized
Rev.....

7. Date of Baptism ..... 19.....

8. NAME OF FATHER
.....
(given name) (surname)

9. NAME OF MOTHER
.....
(given name) (maiden surname)

10. Residence ..... | 11. Occupation of Father .....

12. The above particulars are true according to the best of my knowledge and belief

The ..... Parish of .....

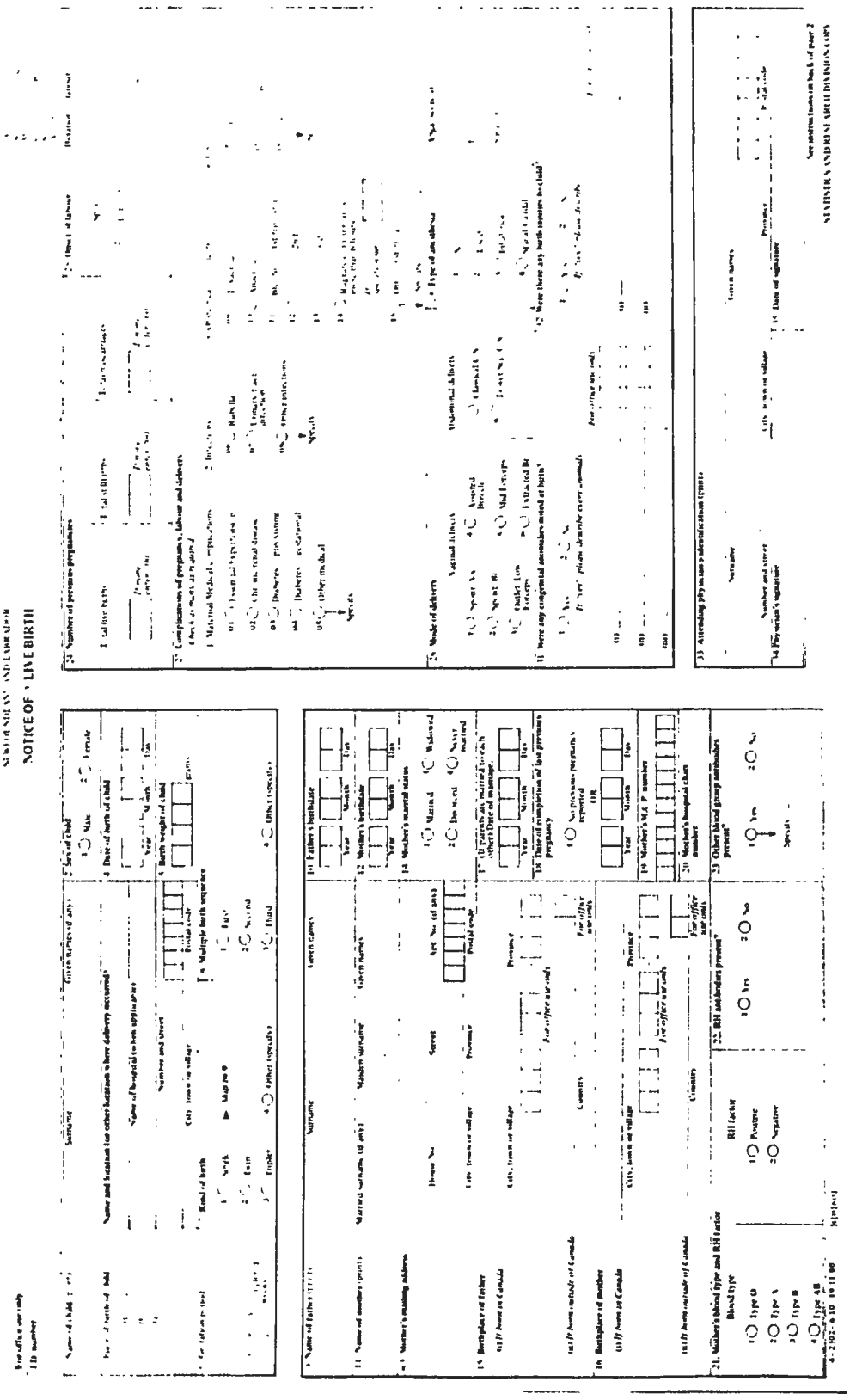
Dated this.....day of..... 19..... .....
Signature of Registering Officer.

REMARKS:

DATE OF REGISTRATION

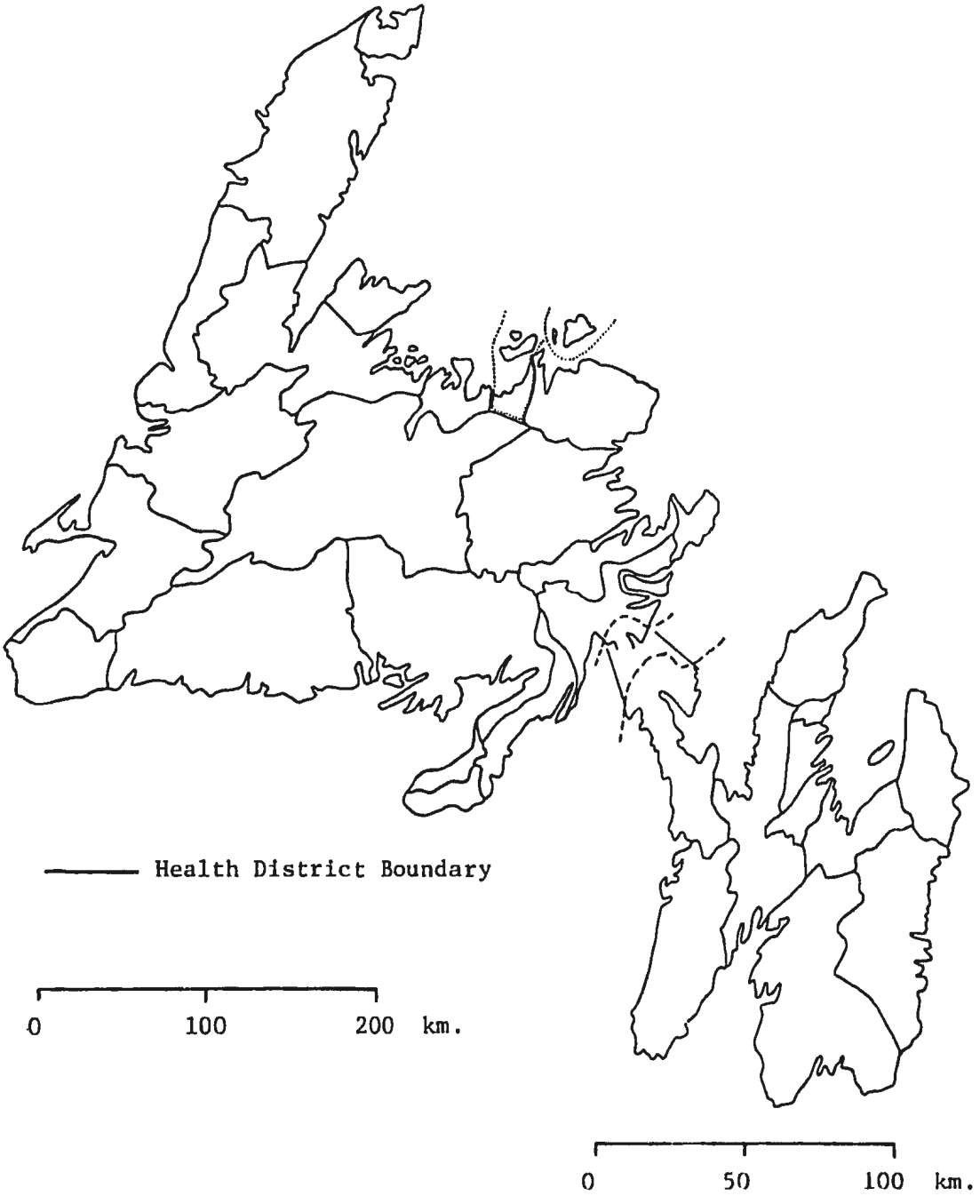
APPENDIX C

Notice of Live Birth Form



APPENDIX D

Hospital Districts



Source: Statistics Division, Department of Health,
Newfoundland and Labrador

APPENDIX E

Definition of 39 Study Units by the SGCs that Constitute them, 1971

10 = 01512512 to 01512542, 01512545, 01512551
12 = 01501501 to 01501505, 01490490, 01490494
13 = 01477477 to 01477481
20 = 01124124 to 01124140, 01557558, 01101101 to 01101120
21 = 01155155 to 01234254, 01293298
22 = 01234234 to 01234254, 01293298
30 = 01452452 to 01452472
31 = 01374385 to 01441446
32 = 01357357 to 01374377
33 = 01321321 to 01339347
34 = 01259259 to 01293293, 01304304, 02044038 to 02048048
40 = 07014014 to 07024027
41 = 07001001 to 07009011, 07028028 to 07031031
42 = 07038038 to 07038048, 07045045 to 07051053, 07051066
43 = 08001001 to 08001006, 07056056 to 07056061, 07051054
50 = 08008008 to 08008011
51 = 08020020 to 08020024
52 = 08026026 to 08031031
53 = 08036036 to 08042044
54 = 08046046 to 08046049, 06014022, 06001003
55 = 08052052 to 08065069
56 = 05003003 05507008, 08067067 to 08074096
60 = 09031029 to 09031034, 09001001 to 090010028
61 = 09021021 to 09021025, 09041015 to 09047048
62 = 09009009 to 09009037, 05019019 to 05019023
70 = 05001001 to 05001006, 05007007, 05007014, 05010010 to 05010027
71 = 05016016 to 05016018
72 = 04006006 to 04011013, 04016016, 04016017, 04022022 to 04022037
73 = 04016018 to 04016020, 04016021, 04016042
74 = 03031031 to 03031034, 04001001
80 = 03021021 to 03024028, 03038038 to 03042042
81 = 03014014 to 03014020, 03001001 to 03009012
82 = 02026026 to 02029030, 02016016, 02031031 to 02031040
83 = 02016018 to 02016019
84 = 02006006 to 02009015, 02001001 to 02001004
85 = 02022022 to 02022025
90 = 06014016, 06014018
91 = 06008009
92 = 06008008, 06008011, 06008012, 06001001, 06014014, 06014019 to 06014026, 06029028 to 06029031

APPENDIX F

Definition of 39 Study Units by the SGCs that Constitute them, 1976

10 = 01512512 to 01512542, 01512545, 01512551
12 = 01501501 to 01501509, 04190490, 01490494
13 = 01477477 to 01477485
20 = 01124124 to 01124149, 01558558, 01101101 to 01101120
21 = 01155155 to 01203207, 01214214 to 01214228
22 = 01234234 to 01234254, 01293298
30 = 01452452 to 01452472
31 = 01374385 to 01421446
32 = 01357357 to 01374381
33 = 01321321 to 01339352
34 = 01259259 to 01293293, 01304304 to 01304316, 020044038 to 02048048
40 = 07014014 to 07024027
41 = 07001001 to 07002012, 0702828 to 07031036
42 = 07038037 to 07038048, 07045045 to 07051053, 07051055 to 07051067
43 = 08001001 to 08001006, 07056056 to 07056061, 07051054
50 = 08008008 to 08008011
51 = 08020020 to 08020025
52 = 08026026 to 08031033
53 = 08036036 to 08042045
54 = 08046046 to 08046049, 06014021, 06014022, 06001003
55 = 08052052 to 08065069
56 = 05003002, 05007008, 08067067 to 08074096
60 = 09031029 to 09031039, 0900101 to 09001028
61 = 09021021 to 09021025, 09041015 to 09047048
62 = 09009009 to 09009037, 05019019 to 015019035
70 = 05001001 to 05001006, 05007007, 05007009, 05007014, 05010010 to 05010028
71 = 05016016 to 05016033
72 = 04006006 to 04011013, 04016016, 04016017, 04022022 to 04022037
73 = 04016018 to 04016042
74 = 03031031 to 03031034, 04001001
80 = 03021021 to 03024028, 03038038 to 03042045
81 = 03014014 to 03014020,03001001 to 03009012
82 = 02026026 to 02029039, 02016016, 02016017, 02016021, 02031031 to 02031040
83 = 02016016 to 02016021
84 = 02006006 to 02009015, 02001001 to 02001004
85 = 02022022 to 02022025
90 = 06014016, 06014018
91 = 06008009
92 = 06008008, 06008011 to 06008013, 06001001, 06014014, 06014015, 06014019 to 06014026, 06029028 to 06029031

APPENDIX G

Definition of 39 Study Units by the SGCs that Constitute them, 1981

10 = 01515513 to 01515542, 01515545, 01515551
12 = 01515502 to 01515509, 01490490, 01490494
13 = 01515478 to 01515486
20 = 01124124 to 01124149, 01515558, 01515128, 01101101 to 01101120
21 = 01155155 to 01203207, 01214214 to 01214228
22 = 01234234 to 01234254, 01293298
30 = 01452452 to 01472472
31 = 01374385 to 01421446
32 = 01357357 to 01339352
33 = 01321321 to 01339352
34 = 01259259 to 01293293, 01304304 to 01304316, 02044038 to 02048048
40 = 07014014 to 07024027
41 = 07001001 to 07011011, 07028028 to 07031036
42 = 07038037 to 07038048, 07045045 to 07051053, 07051055 to 07051067
43 = 08001001 to 08006006, 07056056 to 07056061, 07051054
50 = 08008008 to 08008011
51 = 08020020 to 08020025
52 = 08026026 to 08031033
53 = 08036036 to 08044044
54 = 08046046 to 08046049, 06014021, 06014022, 06001003, 06014015
55 = 08052052 to 08065069
56 = 05003003, 05007008, 08067067 to 08074096
60 = 09031029 to 09031039, 09001001 to 09001028
61 = 09021021 to 09021026, 09041015 to 09047058
62 = 09009009 to 09009037, 05019019 to 05019035
70 = 05001001 to 05001006, 05004004, 05007007, 05007009 to 05007014, 05010010 to 05010028
71 = 05016016 to 05016033
72 = 04006006 to 04011013, 04016016, 04016017, 04022022 to 04022037
73 = 04016018 to 04016042
74 = 03031031 to 03031034,0400100
80 = 03021021 to 03024028, 03038038 to 03042045
81 = 03014014 to 03014020, 03001001 to 03009012
82 = 02026026 to 02030030, 02016016, 02017017, 02021021, 02031031 to 02031040
83 = 02016019, 0201808
84 = 02006006 to 02012015, 02001001 to 02001004
85 = 02022022 to 02024024
90 = 06014016, 06014018
91 = 06008009
92 = 06008008, 06008011, 06008012, 06001001, 06014014, 06014019 to 06014026, 06029028 to 06029031

APPENDIX H

Number of Females by Five Year Age Group, 1966

AREA	AGE 15-19	20-24	25-29	30-34	35-39	40-44	45-49	All Ages
10	6056	4998	3315	2909	3014	2750	2701	25743
13	823	533	429	365	357	347	346	3200
20	314	137	104	104	118	113	152	1901
22	581	357	249	223	243	221	229	2103
33	334	191	142	147	166	179	228	1387
40	545	284	229	237	281	266	307	2149
51	40	119	103	89	71	106	97	625
52	702	425	322	293	242	292	296	2572
55	666	400	304	272	265	225	210	2342
56	511	382	281	227	204	174	158	1937
74	697	433	323	263	285	231	222	2454
80	239	152	103	93	80	91	85	843
81	825	47[illegible]	365	296	305	303	279	2848
83	377	236	153	113	157	131	131	2062

APPENDIX H (cont'd)

Number of Females by Five Year Age Group, 1971

AREA	AGE 15-19	20-24	25-29	30-34	35-39	40-44	45-49	All Ages
10	6870	6210	4575	3425	3095	3010	2745	29930
12	815	485	320	275	285	270	245	2695
13	490	425	385	250	230	210	205	2195
20	480	310	180	160	160	175	155	1620
21	405	210	150	115	110	130	110	1230
22	570	330	240	160	175	195	190	1860
30	375	240	155	130	140	140	120	1300
31	765	550	440	380	300	295	340	3070
32	740	480	355	300	265	255	270	2665
33	425	240	210	165	180	185	215	1620
34	700	490	370	250	250	250	260	2570
40	575	345	305	210	230	290	275	2230
41	685	505	415	415	335	295	310	2960
42	640	360	305	270	265	245	260	2345
43	340	170	145	130	155	160	140	1240
50	235	155	155	90	95	105	95	930
51	255	160	115	100	80	85	115	910
52	420	300	265	220	175	155	185	1720
53	470	295	250	215	205	175	150	1760
54	495	295	285	225	170	190	210	1870
55	530	440	320	240	230	210	195	2165
56	610	465	375	280	270	215	195	2410
60	600	385	325	235	195	195	210	2145
61	550	410	280	205	175	165	160	1945
62	515	315	270	185	180	155	150	1770
70	595	405	405	275	255	240	225	2400
71	1830	1275	890	770	785	740	580	6870
72	825	505	410	320	255	230	260	2805
73	835	530	370	330	300	250	255	2870
74	610	455	375	285	235	230	205	2395
80	285	260	165	125	95	90	100	1120
81	545	375	305	255	220	205	220	2125
82	310	220	160	130	115	105	135	1175
83	315	275	200	145	105	135	125	1300
84	535	355	220	210	160	185	195	1860
85	340	285	170	130	115	100	115	1255
90	880	660	500	425	390	335	295	3485
91	450	415	335	290	215	245	195	2145
92	705	475	370	295	290	225	220	2580

APPENDIX H (cont'd)

Number of Females by Five Year Age Group, 1976

AGE

AREA	15-19	20-24	25-29	30-34	35-39	40-44	45-49	All Ages
10	6585	6620	5340	4230	3215	2815	2820	31625
12	750	580	545	370	280	295	250	3070
13	590	555	595	455	290	245	225	2955
20	490	340	325	205	140	150	175	1825
21	390	220	180	150	115	130	130	1315
22	575	375	350	250	170	165	190	2075
30	385	280	215	160	120	130	125	1415
31	745	620	620	485	380	310	305	3465
32	690	545	485	400	275	275	255	2925
33	390	255	225	200	165	180	180	1595
34	750	565	580	410	255	240	245	3045
40	490	415	340	290	205	230	280	2250
41	800	595	640	495	400	335	315	3580
42	710	515	440	355	260	265	245	2790
43	280	220	190	140	135	135	155	1255
50	240	220	190	155	100	90	95	1090
51	235	115	130	130	100	105	65	880
52	385	340	305	245	215	165	160	1815
53	520	360	375	240	225	215	175	2110
54	530	390	345	285	225	190	170	2135
55	590	465	420	305	245	230	205	2460
56	690	495	475	330	260	225	200	2675
60	580	485	375	325	220	185	195	2365
61	570	485	430	300	220	185	205	2395
62	480	405	345	300	185	170	160	2045
70	700	565	545	495	280	250	260	3095
71	1680	1375	1040	780	745	750	685	7055
72	765	500	380	300	260	215	210	2630
73	1045	785	680	500	400	365	275	4050
74	660	565	405	375	290	235	245	2775
80	255	245	245	160	130	95	95	1225
81	595	390	400	300	240	210	225	2360
82	325	255	245	160	155	125	110	1375
83	305	285	285	205	135	115	125	1455
84	520	395	375	215	210	160	165	2040
85	380	360	315	205	125	125	95	1605
90	935	720	610	510	415	370	325	3885
91	550	560	470	360	285	215	240	2680
92	680	540	470	330	285	285	230	2820

APPENDIX H (Cont'd)

Number of Females by Five Year Age Group, 1981

AREA	AGE 15-19	20-24	25-29	30-34	35-39	40-44	45-49	All Ages
10	7060	7380	6290	5520	4380	3290	2865	36785
12	700	535	590	520	380	285	270	3280
13	620	580	660	670	480	315	260	3585
20	485	400	380	330	190	135	160	2080
21	410	240	220	195	140	105	125	1435
22	540	315	300	325	230	160	170	2040
30	410	270	275	235	165	125	140	1620
31	850	600	685	700	535	390	310	4070
32	665	545	545	510	400	290	275	3230
33	360	295	290	240	225	175	175	1760
34	775	525	565	565	425	245	240	3340
40	510	420	415	365	295	220	235	2460
41	865	575	605	610	475	400	350	3880
42	700	445	445	435	345	260	280	2910
43	295	210	265	210	150	135	135	1400
50	270	190	245	165	155	100	85	1210
51	245	180	150	150	130	90	75	1020
52	445	365	360	330	275	205	175	2155
53	530	385	345	375	260	220	195	2310
54	540	310	375	330	270	205	170	2200
55	555	455	430	430	320	245	210	2645
56	710	525	490	445	355	275	220	3020
60	600	500	435	375	300	205	175	2590
61	620	525	510	435	325	220	185	2820
62	540	355	390	340	280	215	160	2280
70	740	610	650	585	505	280	265	3635
71	1440	1315	1085	1015	745	685	715	7000
72	675	485	450	365	285	240	210	2710
73	965	660	625	595	430	345	310	3930
74	715	480	520	410	365	285	235	3010
80	300	250	265	245	145	125	90	1420
81	645	445	405	385	280	245	205	2610
82	355	300	245	220	150	155	110	1535
83	350	260	255	295	195	135	105	1595
84	560	370	330	340	205	200	150	2155
85	380	365	350	315	200	130	115	1855
90	815	660	580	585	500	410	360	3910
91	555	585	520	495	355	315	215	3040
92	620	435	455	430	315	280	245	2780

APPENDIX I

Number of Married Females by Five Year Age Group, 1966

AREA	AGE							
	15-19	20-24	25-29	30-34	35-39	40-44	45-49	All Ages
10	289	2103	2657	2536	2614	2320	2234	14753
13	61	330	381	317	334	306	302	2031
20	9	51	86	90	106	97	132	571
22	41	220	218	194	229	195	192	2962
33	23	119	129	140	159	164	204	938
40	49	173	210	209	264	243	278	1426
51	12	70	90	82	68	96	94	512
52	79	286	296	279	231	264	279	1714
55	124	299	256	256	247	217	201	1600
56	91	282	255	221	190	166	145	1944
74	86	318	301	248	268	221	196	1337
80	45	108	99	92	76	83	77	625
81	86	319	337	285	291	276	251	1845
83	39	165	136	97	140	119	121	817

APPENDIX I (Continued)

Number of Married Females by Five Year Age Group, 1971

AREA	AGE 15-19	20-24	25-29	30-34	35-39	40-44	45-49	All Ages
10	430	2975	3715	2920	2615	2510	2230	17395
12	75	265	265	230	260	235	210	1540
13	40	285	340	225	200	175	170	1435
20	30	170	125	140	135	155	135	890
21	10	110	115	105	110	140	105	695
22	30	180	230	150	155	185	150	1080
30	15	100	110	100	110	105	100	640
31	80	385	390	355	270	265	305	2050
32	80	285	315	270	240	225	225	1640
33	45	155	180	155	175	175	190	1075
34	70	325	345	250	245	225	245	1705
40	60	220	255	205	210	260	245	1455
41	70	360	375	380	305	290	290	2070
42	70	255	285	240	250	220	240	1560
43	45	110	125	130	145	145	130	830
50	45	120	145	95	85	100	80	670
51	15	105	105	95	80	75	105	580
52	55	225	230	215	155	145	180	1205
53	35	210	230	200	175	165	150	1165
54	50	185	250	215	160	160	185	1205
55	90	355	285	230	205	190	180	1535
56	80	360	345	260	245	200	165	1655
60	60	250	280	195	205	190	200	1380
61	35	240	265	195	170	170	140	1215
62	65	220	250	165	155	145	140	1140
70	55	265	365	250	220	210	190	1555
71	115	705	740	660	705	665	495	4085
72	70	305	335	260	235	215	230	1650
73	65	280	280	270	250	210	200	1555
74	75	295	345	270	230	210	200	1625
80	50	205	155	110	105	100	95	820
81	50	285	275	210	215	190	185	1410
82	30	195	130	120	100	85	120	780
83	45	210	180	135	90	115	115	890
84	50	220	195	190	155	150	155	1115
85	40	215	135	110	90	90	100	780
90	55	320	405	370	340	295	255	2040
91	35	250	290	280	200	225	180	1460
92	75	325	345	285	275	225	205	1735

APPENDIX I (Cont'd)

Number of Married Females by Five Year Age Group, 1976

AREA	AGE 20-24	25-29	30-34	35-39	40-44	45-49	All Ages
10	3325	4400	3800	2840	2505	2445	19745
12	345	465	330	245	260	210	1905
13	335	530	420	280	215	185	2030
20	195	275	165	125	120	140	1040
21	130	155	135	95	110	115	750
22	205	295	250	160	155	170	1255
30	145	195	125	110	115	95	815
31	435	565	465	360	270	265	2450
32	345	425	365	270	240	215	1950
33	170	215	195	160	165	165	1105
34	410	540	390	250	245	235	2175
40	260	290	265	190	215	255	1570
41	450	600	460	390	310	290	2595
42	370	430	320	245	260	240	1955
43	185	155	115	120	130	155	905
50	175	180	150	90	85	100	835
51	85	120	130	90	90	45	575
52	220	280	250	200	170	145	1315
53	260	345	240	200	190	165	1450
54	250	310	275	210	175	155	1435
55	340	400	290	215	190	185	1705
56	340	430	335	260	220	190	1855
60	295	305	280	195	190	180	1495
61	305	390	270	205	175	165	1565
62	295	315	280	170	150	150	1405
70	400	525	460	255	235	240	2205
71	715	865	705	670	675	590	4345
72	300	340	275	225	190	180	1580
73	410	570	435	365	315	245	2400
74	405	365	350	280	225	215	1930
80	185	230	160	130	100	90	935
81	275	355	275	240	185	175	1580
82	180	210	135	115	110	90	880
83	215	265	195	135	105	110	1070
84	255	325	210	215	155	150	1350
85	240	285	185	125	115	85	1085
90	400	520	450	380	330	290	2435
91	285	400	330	265	205	220	1745
92	360	425	295	270	255	195	1875

APPENDIX I (Cont'd)

Number of Married Females by Five Year Age Group, 1981

AREA	AGE 15-19	20-24	25-29	30-34	35-39	40-44	45-49	All Ages
10	240	2785	4690	4650	3790	2815	2385	21355
12	30	235	495	460	335	245	240	2040
13	20	300	570	610	440	280	225	2445
20	5	140	315	295	170	130	105	1160
21	5	125	200	180	125	105	110	850
22	0	130	240	300	230	140	155	1195
30	15	110	215	215	150	95	110	910
31	60	370	605	635	470	350	290	2780
32	55	315	480	445	370	250	250	2165
33	20	170	240	230	205	155	165	1185
34	65	325	540	510	400	140	245	2325
40	65	275	330	320	275	190	215	1670
41	65	345	535	595	435	380	310	2665
42	45	260	385	425	330	235	255	1935
43	45	135	235	195	130	115	120	975
50	20	130	220	160	145	95	85	855
51	35	120	120	145	120	90	65	695
52	35	235	330	300	240	185	155	1480
53	35	235	305	345	245	205	180	1550
54	30	180	320	295	250	185	165	1425
55	25	280	385	395	310	220	195	1810
56	75	340	415	410	315	250	210	2015
60	30	250	355	350	295	195	160	1635
61	35	280	415	375	290	210	160	1765
62	25	205	330	320	260	195	140	1475
70	20	355	570	545	470	270	230	2460
71	40	530	865	885	665	610	620	4215
72	35	265	380	325	255	200	175	1635
73	15	305	490	500	370	295	280	2255
74	40	285	450	385	345	280	210	1995
80	40	175	240	245	140	120	95	1055
81	35	245	365	350	260	215	200	1670
82	35	185	235	220	145	130	100	1050
83	40	180	235	275	185	130	90	1135
84	35	205	310	315	190	190	135	1380
85	20	210	310	295	170	120	90	1215
90	25	290	475	500	440	370	315	2415
91	20	300	390	465	335	280	195	1985
92	30	235	410	395	290	260	235	1855

APPENDIX J

Average number of Deliveries by Five Year Age Group, 1966

AREA	AGE OF MOTHER						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
10	277.5	912.0	667.0	425.5	258.5	73.5	7.0
13	63.5	136.5	88.0	53.0	36.5	18.5	2.0
20	10.0	31.0	28.0	24.0	18.0	8.5	1.0
22	46.0	82.5	51.5	49.0	39.5	16.5	2.5
33	18.0	45.5	32.5	24.0	9.5	5.5	1.0
40	55.5	74.0	42.5	31.5	19.5	5.0	0.0
51	17.0	37.0	34.0	36.0	10.5	6.5	0.5
52	56.8	120.0	64.5	34.5	25.5	13.0	2.0
55	105.5	136.0	71.0	43.4	25.5	175.0	2.5
56	62.0	99.0	72.0	40.0	22.0	15.0	2.0
74	51.3	119.0	65.5	44.0	27.0	11.5	3.5
80	28.0	34.5	16.5	16.5	7.5	4.5	0.0
81	43.5	95.5	70.0	41.0	32.0	13.5	1.0
83	39.5	52.0	35.5	15.5	13.0	4.0	1.0

APPENDIX J (cont'd)

Average Number of Deliveries by Five Year Age Group, 1971

AGE OF MOTHER

AREA	15-19	20-24	25-29	30-34	35-39	40-44	45-49
10	354.0	895.5	815.5	349.0	157.5	45.5	2.0
12	45.5	97.0	62.5	37.0	22.0	10.5	0.5
13	38.5	92.0	70.0	32.5	11.0	6.0	0.5
20	19.0	61.5	34.5	25.5	15.0	10.5	0.0
21	16.0	46.5	33.5	17.0	15.0	7.0	1.0
22	21.0	78.5	55.0	23.5	17.5	9.0	2.0
30	17.0	50.0	30.5	16.5	14.0	4.5	1.0
31	50.5	112.0	78.5	36.5	18.0	8.5	1.0
32	52.0	100.0	77.5	29.0	19.0	4.5	1.5
33	25.0	47.0	33.0	18.0	14.5	4.5	0.0
34	59.0	119.0	78.0	36.0	24.5	11.5	1.0
40	43.5	77.5	52.5	29.5	13.5	7.5	1.0
41	62.5	118.0	77.5	41.0	21.5	8.0	1.5
42	63.5	101.5	59.0	33.0	13.5	7.0	0.5
43	35.0	37.0	25.5	16.0	8.0	2.5	0.5
50	44.5	46.5	30.5	16.0	6.0	4.5	0.5
51	19.5	40.0	31.5	17.0	10.5	5.0	0.5
52	50.5	68.0	44.5	18.5	10.5	3.5	0.0
53	38.0	69.5	50.5	27.0	15.0	5.0	0.0
54	47.5	69.5	68.0	33.0	16.5	9.5	0.5
55	74.5	115.5	65.5	33.0	20.5	6.0	1.5
56	62.5	122.5	75.5	42.5	22.5	3.5	1.5
60	69.5	106.5	62.0	20.0	10.0	4.5	0.0
61	56.0	74.5	39.0	20.0	8.5	3.0	0.0
62	67.5	77.5	38.0	24.0	11.5	6.5	1.5
70	51.0	76.5	75.0	35.5	14.5	6.5	0.0
71	102.0	201.5	138.0	60.5	35.5	17.0	0.5
72	76.0	112.5	51.5	36.5	23.0	10.5	1.0
73	80.0	138.0	82.5	43.0	27.0	10.5	1.5
74	65.0	103.5	64.5	40.0	20.5	7.0	1.0
80	29.5	70.0	34.0	11.0	9.5	3.5	0.5
81	39.5	98.5	55.5	30.5	22.0	9.5	2.0
82	40.5	62.5	40.5	21.5	15.5	4.5	0.0
83	40.5	53.0	26.5	11.0	4.5	3.5	0.0
84	51.0	83.5	45.0	27.0	14.5	4.5	0.5
85	43.5	80.5	42.0	17.0	16.0	3.5	0.5
90	69.5	121.0	83.5	51.5	25.0	7.0	0.0
91	22.5	71.0	50.0	33.0	8.5	3.0	0.0
92	60.5	96.5	58.0	33.0	15.0	7.0	0.5

APPENDIX J (cont'd)

Average Number of Deliveries by Five Year Age Group, 1976

	AGE OF MOTHER						
AREA	15-19	20-24	25-29	30-34	35-39	40-44	45-49
10	300.0	752.5	779.5	317.0	92.5	20.0	1.5
12	44.0	84.5	42.5	28.5	11.0	3.0	0.0
13	37.5	81.5	89.5	40.0	6.0	1.5	0.0
20	16.5	67.0	83.0	24.0	8.0	2.0	0.0
21	18.5	37.5	64.0	15.5	4.0	0.5	0.0
22	28.0	72.5	32.0	23.5	4.0	3.5	0.0
30	22.5	40.0	66.5	15.5	11.0	2.5	0.0
31	46.5	119.5	41.5	37.0	10.0	4.5	0.0
32	44.5	82.0	85.5	30.0	8.5	3.0	0.0
33	22.0	41.5	70.5	13.5	1.5	2.0	0.0
34	57.5	110.5	28.5	20.5	8.5	2.0	1.0
40	48.0	60.5	76.0	16.5	5.0	2.0	0.5
41	61.0	112.0	41.0	29.0	11.0	3.0	0.5
42	68.0	92.0	70.0	18.5	8.5	3.5	0.0
43	29.5	47.5	56.0	8.0	7.0	2.0	0.0
50	36.5	49.0	22.5	11.5	5.5	0.0	0.0
51	20.0	24.0	26.0	10.0	4.0	1.5	0.0
52	37.0	60.0	16.0	12.5	6.0	1.5	0.5
53	37.5	49.5	38.0	12.0	7.0	4.0	0.0
54	36.5	61.5	45.0	20.5	9.0	3.5	0.5
55	61.5	77.5	37.5	18.5	10.0	2.0	0.0
56	67.0	83.5	53.0	24.0	8.5	2.0	0.0
60	64.0	74.0	56.0	16.0	7.5	1.5	0.5
61	59.5	90.5	46.0	16.5	6.5	1.0	0.0
62	46.0	77.5	38.0	20.0	6.0	2.5	0.5
70	51.5	112.0	52.0	28.5	10.5	3.0	1.0
71	71.5	157.0	80.5	53.0	14.5	3.5	0.5
72	68.0	77.5	148.0	19.5	10.5	4.0	1.5
73	59.5	103.5	52.0	33.5	14.0	3.0	0.0
74	59.5	88.5	84.0	23.0	10.0	0.5	1.5
80	21.0	41.5	54.0	12.0	2.0	0.5	0.0
81	54.0	72.5	32.0	25.0	10.0	7.5	1.5
82	38.0	44.0	59.0	13.0	6.0	2.5	0.0
83	25.0	41.0	30.5	7.5	4.0	0.5	0.5
84	40.5	62.0	27.5	25.0	9.5	2.5	0.0
85	41.0	54.5	53.0	14.5	7.0	2.0	0.0
90	47.5	113.5	49.0	34.0	10.5	5.0	0.0
91	21.0	51.5	82.0	19.0	3.0	1.5	0.0
92	32.0	82.5	65.0	18.5	1.0	2.0	1.0

APPENDIX J (cont'd)

Average Number of Deliveries by Five Year Age Group, 1981

	AGE OF MOTHER						
AREA	15-19	20-24	25-29	30-34	35-39	40-44	45-49
10	222.5	603.5	821.0	376.0	92.5	22.5	2.5
12	30.0	85.5	87.0	41.5	14.0	3.0	0.0
13	24.5	81.5	96.5	44.0	8.0	1.0	0.5
20	16.0	47.5	59.0	24.5	10.5	2.0	0.0
21	14.5	38.5	34.0	15.0	4.5	1.5	0.0
22	22.5	52.5	44.5	25.0	4.0	0.5	0.0
30	14.0	35.5	45.0	21.0	6.0	1.0	0.0
31	32.0	88.5	89.0	41.5	9.0	0.5	0.0
32	28.0	66.5	67.0	27.5	6.5	0.0	0.0
33	18.5	44.0	37.5	10.0	3.5	0.0	0.0
34	39.5	80.5	76.0	28.0	11.0	0.5	0.0
40	42.0	54.5	43.0	21.0	6.0	2.5	0.0
41	57.5	86.0	55.0	25.5	10.5	0.5	0.0
42	41.5	53.5	42.0	16.0	4.5	1.0	0.0
43	34.0	30.0	17.5	9.5	4.5	1.5	0.0
50	18.0	32.5	19.0	6.5	3.5	2.0	0.5
51	23.5	34.0	20.5	10.0	3.0	0.5	0.0
52	32.0	47.0	40.0	19.0	5.0	1.0	0.0
53	32.5	50.5	40.0	13.5	4.5	1.5	0.0
54	31.5	53.0	43.5	17.5	6.5	0.0	0.0
55	39.0	58.0	43.5	25.0	8.0	3.0	0.0
56	58.0	91.0	49.0	17.0	8.0	2.5	0.0
60	64.0	66.0	47.5	18.0	4.0	2.0	0.0
61	48.0	71.5	49.5	14.5	5.0	1.5	0.0
62	40.5	51.5	31.0	13.0	4.0	1.0	0.0
70	39.5	87.5	85.0	25.0	10.5	3.0	0.0
71	46.0	132.5	130.0	47.0	13.0	1.5	0.5
72	48.5	74.0	55.5	21.0	5.0	1.5	0.0
73	41.5	94.0	89.0	32.0	13.0	1.5	0.0
74	41.5	55.0	49.0	21.5	5.0	0.5	0.5
80	25.0	34.5	24.5	8.0	0.5	0.5	0.0
81	46.5	69.0	45.0	27.0	5.0	2.0	1.0
82	29.5	52.5	26.5	13.5	3.5	1.5	0.5
83	16.5	37.5	23.5	12.5	2.5	0.0	0.0
84	31.0	58.5	42.5	19.0	5.5	1.5	0.5
85	22.0	54.0	39.5	21.0	4.5	0.5	0.0
90	28.0	80.0	70.5	35.0	5.0	1.5	0.0
91	16.5	62.5	73.0	25.5	10.5	0.5	0.5
92	25.5	48.0	45.5	11.5	4.5	1.0	0.0

APPENDIX K

1966	AREA	$ASMFR_2$	$ASMFR_3$	$ASMFR_4$	$ASMFR_5$	$ASMFR_6$	ASMFR	AMFR
	10	.43	.25	.17	.10	.03	.00	4.9
	13	.41	.23	.17	.11	.06	.01	4.9
	20	.61	.33	.27	.17	.09	.01	7.3
	22	.38	.24	.25	.17	.09	.01	5.7
	33	.38	.25	.17	.06	.03	.01	4.5
	40	.43	.20	.15	.07	.02	.00	4.4
	51	.53	.24	.30	.15	.07	.01	6.5
	52	.42	.22	.12	.11	.05	.01	4.6
	55	.46	.25	.17	.10	.08	.01	5.4
	56	.35	.28	.18	.12	.09	.01	5.2
	74	.37	.22	.18	.10	.05	.02	4.7
	80	.32	.17	.18	.10	.05	.00	4.1
	81	.30	.21	.14	.11	.05	.00	4.1
	83	.32	.26	.16	.09	.03	.01	4.3
1971								
	10	.30	.22	.12	.06	.02	.00	3.6
	12	.37	.24	.16	.09	.05	.00	4.5
	13	.32	.21	.14	.06	.03	.00	3.8
	20	.36	.28	.18	.11	.07	.00	5.0
	21	.42	.29	.16	.14	.05	.01	5.4
	22	.44	.24	.16	.11	.05	.01	5.0
	30	.50	.28	.17	.13	.04	.01	5.6
	31	.29	.20	.10	.07	.03	.00	3.5
	32	.35	.25	.11	.08	.02	.01	4.1
	33	.30	.18	.12	.08	.03	.00	3.6
	34	.37	.23	.14	.06	.05	.00	4.3
	40	.35	.21	.14	.06	.03	.00	4.0
	41	.33	.21	.11	.07	.03	.01	3.7
	42	.40	.21	.14	.05	.03	.00	4.2
	43	.34	.20	.12	.06	.02	.00	3.7
	50	.39	.21	.17	.07	.05	.01	4.4
	51	.38	.30	.18	.13	.07	.01	5.3
	52	.30	.19	.09	.07	.02	.00	3.4
	53	.33	.22	.14	.09	.03	.00	4.0
	54	.38	.27	.15	.10	.06	.00	4.8
	55	.33	.23	.14	.10	.03	.01	4.2
	56	.34	.22	.16	.09	.02	.01	4.2
	60	.43	.22	.10	.05	.02	.00	4.1
	61	.31	.15	.10	.05	.02	.00	3.1
	62	.35	.15	.15	.07	.05	.01	3.9
	70	.29	.21	.14	.07	.03	.00	3.7
	71	.29	.19	.09	.05	.03	.00	3.2
	72	.37	.15	.14	.10	.05	.00	4.1
	73	.49	.30	.16	.11	.05	.01	5.6
	74	.35	.19	.15	.09	.03	.01	4.1
	80	.34	.22	.10	.09	.04	.01	4.0
	81	.35	.20	.15	.10	.05	.01	4.3
	82	.32	.31	.18	.16	.05	.00	5.1
	83	.25	.15	.08	.05	.03	.00	2.8
	84	.38	.23	.14	.09	.03	.00	4.4
	85	.37	.31	.15	.18	.04	.01	5.3
	90	.38	.21	.14	.07	.02	.00	4.1
	91	.28	.17	.12	.04	.01	.00	3.2
	92	.30	.17	.12	.05	.03	.00	3.3

APPENDIX K (cont'd)

1976	AREA	$ASMFR_2$	$ASMFR_3$	$ASMFR_4$	$ASMFR_5$	$ASMFR_6$	$ASMFR_7$	TMFR
	10	.23	.18	.08	.03	.01	.00	2.6
	12	.25	.19	.09	.05	.01	.00	2.9
	13	.24	.16	.10	.02	.01	.00	2.6
	20	.34	.23	.15	.06	.02	.00	4.0
	21	.29	.21	.12	.04	.00	.00	3.3
	22	.35	.23	.09	.03	.02	.00	3.6
	30	.28	.21	.12	.10	.02	.00	3.7
	31	.28	.15	.08	.03	.02	.00	2.8
	32	.24	.17	.08	.03	.01	.00	2.7
	33	.24	.13	.07	.01	.01	.00	2.3
	34	.27	.14	.05	.03	.01	.00	2.6
	40	.23	.14	.06	.03	.01	.00	2.4
	41	.25	.12	.06	.03	.01	.00	2.3
	42	.25	.13	.06	.04	.01	.00	2.4
	43	.26	.15	.07	.06	.02	.00	2.7
	50	.28	.14	.08	.06	.00	.00	2.8
	51	.28	.13	.08	.04	.02	.00	2.8
	52	.27	.14	.05	.03	.01	.00	2.5
	53	.19	.13	.05	.04	.02	.00	2.1
	54	.25	.12	.07	.04	.02	.00	2.5
	55	.23	.13	.06	.05	.01	.00	2.4
	56	.25	.13	.07	.03	.01	.00	2.5
	60	.25	.15	.06	.04	.01	.00	2.5
	61	.30	.10	.06	.03	.01	.00	2.5
	62	.26	.17	.07	.04	.02	.00	2.8
	70	.28	.15	.06	.04	.01	.00	2.8
	71	.22	.17	.08	.02	.01	.00	2.5
	72	.26	.15	.07	.05	.02	.01	2.8
	73	.25	.15	.08	.04	.01	.00	2.6
	74	.22	.15	.07	.04	.00	.01	2.4
	80	.22	.14	.08	.02	.01	.00	2.3
	81	.26	.17	.09	.04	.04	.01	3.1
	82	.24	.15	.10	.05	.02	.00	2.8
	83	.19	.10	.04	.03	.01	.00	1.9
	84	.24	.16	.12	.04	.02	.00	2.9
	85	.23	.17	.08	.06	.02	.00	2.8
	90	.28	.16	.08	.03	.02	.00	2.8
	91	.18	.16	.06	.01	.01	.00	2.1
	92	.23	.14	.06	.00	.01	.01	2.2

1981	AREA	$ASMFR_2$	$ASMFR_3$	$ASMFR_4$	$ASMFR_5$	$ASMFR_6$	$ASMFR_7$	TMFR
	10	.22	.17	.08	.02	.01	.00	2.6
	12	.37	.18	.09	.04	.01	.00	3.4
	13	.27	.17	.07	.02	.00	.00	2.7
	20	.34	.19	.08	.06	.02	.00	3.4
	21	.31	.17	.08	.04	.01	.00	3.1
	22	.40	.19	.08	.02	.00	.00	3.5
	30	.32	.21	.10	.04	.01	.00	3.4
	31	.24	.15	.07	.02	.00	.00	2.4
	32	.21	.14	.06	.02	.00	.00	2.2
	33	.26	.16	.04	.02	.00	.00	2.4
	34	.25	.14	.06	.03	.00	.00	2.4
	40	.20	.13	.07	.02	.01	.00	2.2
	41	.25	.10	.04	.02	.00	.00	2.1
	42	.21	.11	.04	.01	.00	.00	1.9
	43	.22	.07	.05	.04	.01	.00	2.0
	50	.25	.09	.04	.02	.02	.01	2.1
	51	.28	.17	.07	.03	.01	.00	2.8
	52	.20	.12	.06	.02	.01	.00	2.8
	53	.22	.13	.04	.02	.01	.00	2.1
	54	.29	.14	.06	.03	.00	.00	2.6
	55	.21	.11	.06	.03	.01	.00	2.1
	56	.27	.12	.04	.03	.01	.00	2.3
	60	.26	.13	.05	.01	.01	.00	2.4
	61	.26	.12	.04	.02	.01	.00	2.2
	62	.25	.09	.04	.02	.01	.00	2.0
	70	.25	.15	.05	.02	.01	.00	2.4
	71	.25	.15	.05	.02	.00	.00	2.4
	72	.28	.15	.07	.02	.01	.00	2.6
	73	.31	.18	.06	.04	.01	.00	3.0
	74	.19	.11	.06	.02	.00	.00	1.9
	80	.20	.10	.03	.00	.00	.00	1.7
	81	.28	.12	.08	.02	.01	.01	2.6
	82	.28	.11	.06	.02	.01	.01	2.5
	83	.21	.10	.05	.01	.00	.00	1.8
	84	.29	.14	.06	.03	.01	.00	2.6
	85	.26	.13	.07	.03	.00	.00	2.4
	90	.28	.15	.07	.01	.00	.00	2.6
	91	.21	.19	.06	.03	.00	.00	2.4
	92	.20	.11	.03	.02	.00	.00	1.8

APPENDIX L

1966	AREA	$ASFR_1$	$ASFR_2$	$ASFR_3$	$ASFR_4$	$ASFR_5$	$ASFR_6$	$ASFR_7$	TFR
	10	.05	.19	.20	.15	.09	.03	.00	3.5
	13	.06	.26	.21	.15	.10	.05	.01	4.1
	20	.04	.23	.27	.23	.15	.08	.01	5.0
	22	.06	.23	.21	.22	.16	.08	.01	4.8
	33	.05	.24	.23	.16	.06	.03	.00	3.9
	40	.07	.26	.19	.13	.07	.02	.00	3.7
	51	.07	.31	.21	.28	.15	.06	.01	5.4
	52	.10	.28	.20	.12	.11	.05	.01	4.3
	55	.16	.34	.23	.16	.10	.08	.01	5.4
	56	.12	.26	.26	.18	.11	.09	.01	5.1
	74	.09	.28	.20	.17	.10	.05	.02	4.5
	80	.12	.23	.16	.18	.09	.05	.00	4.1
	81	.06	.20	.19	.14	.11	.05	.00	3.7
	83	.11	.22	.23	.14	.08	.03	.01	4.1
1971									
	10	.05	.14	.18	.10	.05	.02	.00	2.7
	12	.06	.20	.20	.14	.08	.04	.00	3.5
	13	.08	.22	.18	.13	.05	.03	.00	3.4
	20	.04	.20	.19	.16	.09	.06	.00	3.7
	21	.04	.22	.22	.15	.14	.05	.01	4.2
	22	.04	.24	.23	.15	.10	.05	.01	4.0
	30	.05	.21	.20	.13	.10	.03	.01	3.6
	31	.07	.20	.18	.10	.06	.03	.00	3.2
	32	.07	.21	.22	.10	.07	.02	.01	3.4
	33	.06	.20	.16	.11	.08	.02	.00	3.1
	34	.09	.24	.21	.14	.06	.05	.00	4.0
	40	.08	.23	.17	.14	.06	.03	.00	3.5
	41	.09	.23	.19	.10	.06	.03	.01	3.5
	42	.10	.28	.19	.12	.05	.03	.00	3.9
	43	.11	.22	.18	.12	.05	.02	.00	3.5
	50	.19	.30	.20	.18	.06	.04	.01	4.9
	51	.08	.25	.27	.17	.13	.06	.00	4.8
	52	.12	.23	.17	.08	.06	.02	.00	3.4
	53	.08	.24	.20	.13	.07	.03	.00	3.7
	54	.10	.24	.24	.15	.10	.05	.00	4.3
	55	.14	.26	.21	.14	.09	.03	.01	4.4
	56	.11	.26	.20	.15	.03	.02	.01	4.1
	60	.12	.28	.19	.09	.05	.02	.00	3.7
	61	.10	.18	.14	.10	.05	.02	.00	2.9
	62	.13	.25	.14	.13	.06	.04	.01	3.8
	70	.09	.19	.19	.13	.06	.03	.00	3.4
	71	.06	.16	.16	.08	.05	.02	.00	2.6
	72	.09	.22	.13	.11	.09	.05	.00	3.5
	73	.10	.26	.22	.13	.09	.04	.01	4.2
	74	.11	.23	.17	.14	.09	.03	.01	3.9
	80	.11	.27	.21	.09	.10	.04	.01	4.1
	81	.08	.26	.18	.12	.10	.05	.01	4.0
	82	.13	.28	.25	.17	.14	.04	.00	5.1
	83	.13	.19	.13	.08	.04	.03	.00	3.0
	84	.10	.24	.20	.13	.09	.02	.00	3.9
	85	.13	.28	.25	.13	.14	.04	.00	4.8
	90	.08	.18	.17	.12	.06	.02	.00	3.2
	91	.05	.17	.15	.11	.04	.01	.00	2.7
	92	.09	.20	.16	.11	.05	.03	.00	3.2

1976	AREA	$ASFR_1$	$ASFR_2$	$ASFR_3$	$ASFR_4$	$ASFR_5$	$ASFR_6$	$ASFR_7$	TFR
	10	.05	.11	.14	.07	.03	.01	.00	2.0
	12	.06	.15	.16	.08	.04	.01	.00	2.5
	13	.07	.15	.14	.09	.02	.01	.00	2.3
	20	.04	.20	.20	.12	.06	.01	.00	3.1
	21	.05	.17	.18	.10	.04	.00	.00	2.7
	22	.05	.19	.19	.09	.02	.02	.00	2.9
	30	.06	.14	.19	.10	.09	.02	.00	3.0
	31	.06	.19	.14	.08	.03	.02	.00	2.6
	32	.07	.15	.15	.08	.03	.01	.00	2.4
	33	.06	.16	.13	.07	.01	.01	.00	2.2
	34	.08	.20	.13	.05	.03	.01	.00	2.5
	40	.10	.15	.12	.06	.02	.01	.00	2.3
	41	.08	.19	.11	.06	.03	.01	.00	2.4
	42	.10	.18	.13	.05	.03	.01	.00	2.5
	43	.11	.22	.12	.06	.05	.02	.00	2.8
	50	.15	.22	.14	.07	.06	.00	.00	3.2
	51	.09	.21	.12	.08	.04	.01	.00	2.7
	52	.10	.18	.13	.05	.03	.01	.00	2.4
	53	.07	.14	.12	.05	.03	.02	.00	2.2
	54	.07	.16	.11	.07	.04	.02	.00	2.3
	55	.11	.17	.13	.06	.04	.01	.00	2.5
	56	.10	.17	.12	.07	.03	.01	.00	2.5
	60	.11	.15	.12	.15	.03	.01	.00	2.4
	61	.11	.19	.09	.06	.03	.01	.00	2.4
	62	.10	.19	.15	.07	.03	.02	.00	2.8
	70	.08	.20	.15	.06	.04	.01	.00	2.7
	71	.05	.11	.14	.07	.02	.01	.00	2.0
	72	.09	.16	.14	.07	.04	.02	.01	2.6
	73	.06	.13	.12	.07	.04	.01	.00	2.1
	74	.09	.16	.13	.06	.04	.00	.01	2.4
	80	.08	.17	.13	.08	.02	.01	.00	2.4
	81	.09	.19	.15	.08	.04	.04	.01	3.0
	82	.12	.17	.12	.08	.04	.02	.00	2.8
	83	.08	.14	.10	.04	.03	.00	.00	2.0
	84	.08	.16	.14	.12	.05	.02	.00	2.8
	85	.11	.15	.16	.07	.06	.02	.00	2.8
	90	.05	.16	.13	.07	.03	.01	.00	2.2
	91	.04	.09	.14	.05	.01	.01	.00	1.7
	92	.05	.15	.12	.06	.00	.01	.00	2.0

APPENDIX L (cont'd)

1981	AREA	$ASFR_1$	$ASFR_2$	$ASFR_3$	$ASFR_4$	$ASFR_5$	$ASFR_6$	$ASFR_7$	TFR
	10	.03	.08	.13	.07	.02	.01	.00	1.7
	12	.05	.16	.15	.08	.04	.01	.00	2.4
	13	.04	.14	.15	.07	.02	.00	.00	2.1
	20	.04	.12	.16	.07	.06	.02	.00	2.3
	21	.04	.16	.15	.08	.03	.01	.00	2.4
	22	.04	.17	.15	.08	.02	.00	.00	2.3
	30	.04	.13	.16	.09	.04	.01	.00	2.3
	31	.04	.15	.13	.06	.02	.00	.00	2.0
	32	.04	.12	.12	.05	.02	.00	.00	1.8
	33	.05	.15	.13	.04	.02	.00	.00	1.9
	34	.05	.15	.14	.05	.03	.00	.00	2.1
	40	.08	.13	.10	.06	.02	.01	.00	2.0
	41	.07	.15	.09	.04	.02	.00	.00	1.9
	42	.06	.12	.09	.04	.01	.00	.00	1.6
	43	.12	.14	.07	.05	.03	.01	.00	2.1
	50	.07	.17	.08	.04	.02	.02	.01	2.0
	51	.10	.19	.14	.07	.02	.01	.00	2.6
	52	.07	.13	.11	.06	.02	.01	.00	2.0
	53	.06	.13	.12	.04	.02	.01	.00	1.8
	54	.06	.17	.12	.05	.02	.00	.00	2.1
	55	.07	.13	.10	.06	.03	.01	.00	2.0
	56	.08	.17	.10	.04	.02	.01	.00	2.1
	60	.11	.13	.11	.05	.01	.01	.00	2.1
	61	.08	.14	.10	.03	.02	.01	.00	1.8
	62	.08	.15	.08	.04	.01	.01	.00	1.8
	70	.06	.14	.13	.04	.02	.01	.00	2.0
	71	.03	.10	.12	.05	.02	.00	.00	1.6
	72	.07	.15	.12	.06	.02	.01	.00	2.2
	73	.05	.14	.14	.05	.03	.00	.00	2.1
	74	.06	.12	.09	.05	.01	.00	.00	1.7
	80	.09	.14	.09	.03	.00	.00	.00	1.8
	81	.07	.16	.11	.07	.02	.01	.01	2.2
	82	.09	.18	.11	.06	.02	.01	.00	2.3
	83	.05	.14	.09	.04	.01	.00	.00	1.7
	84	.06	.16	.13	.06	.03	.01	.00	2.2
	85	.06	.15	.11	.07	.02	.00	.00	2.1
	90	.04	.12	.12	.06	.01	.00	.00	1.8
	91	.03	.11	.14	.05	.03	.00	.00	1.8
	92	.04	.11	.10	.03	.01	.00	.00	1.5

APPENDIX M

Proportions Married (Pm), 1966, 1971, 1976, 1981

AREA	1966	1971	1976	1981
10	42	48	48	37
12		55	60	34
13	62	67	60	52
20	37	55	57	35
21		52	59	52
22	62	55	55	41
30		42	52	41
31		70	70	62
32		60	63	58
33	38	65	67	58
34		66	73	62
40	61	64	63	66
41		71	76	60
42		71	72	58
43		65	84	64
50		77	80	68
51	59	66	74	67
52	67	75	65	64
53		71	72	61
54		63	64	58
55	75	81	73	62
56	74	77	69	65
60		65	61	50
61		59	63	53
62		70	73	58
70		65	71	59
71		56	52	40
72		60	60	55
73		53	52	46
74	73	65	72	59
80	71	79	76	70
81	67	76	71	55
82		89	71	62
83	70	76	75	69
84		62	65	55
85		75	67	58
90		49	56	44
91		60	51	51
92		68	67	54

APPENDIX N

F_{35}: 1966, 1971, 1976, 1981

AREA	1966	1971	1976	1981
10	135	80	40	30
12		130	55	55
13	175	90	30	25
20	265	180	80	80
21		195	45	50
22	270	175	50	20
30		180	120	50
31		100	45	20
32		105	45	20
33	100	110	20	20
34		115	45	30
40	95	95	35	35
41		105	40	25
42		90	50	20
43		75	75	48
50		120	60	50
51	225	205	60	30
52	165	90	40	30
53		115	65	25
54		165	65	25
55	195	140	55	40
56	220	120	40	35
60		75	50	25
61		70	40	25
62		130	55	20
70		95	55	35
71		75	30	25
72		150	75	25
73		165	45	40
74	170	125	45	20
80	155	130	20	10
81	165	165	85	35
82		210	75	40
83	135	80	40	15
84		125	60	40
85		220	75	30
90		95	45	15
91		55	20	35
92		85	15	20

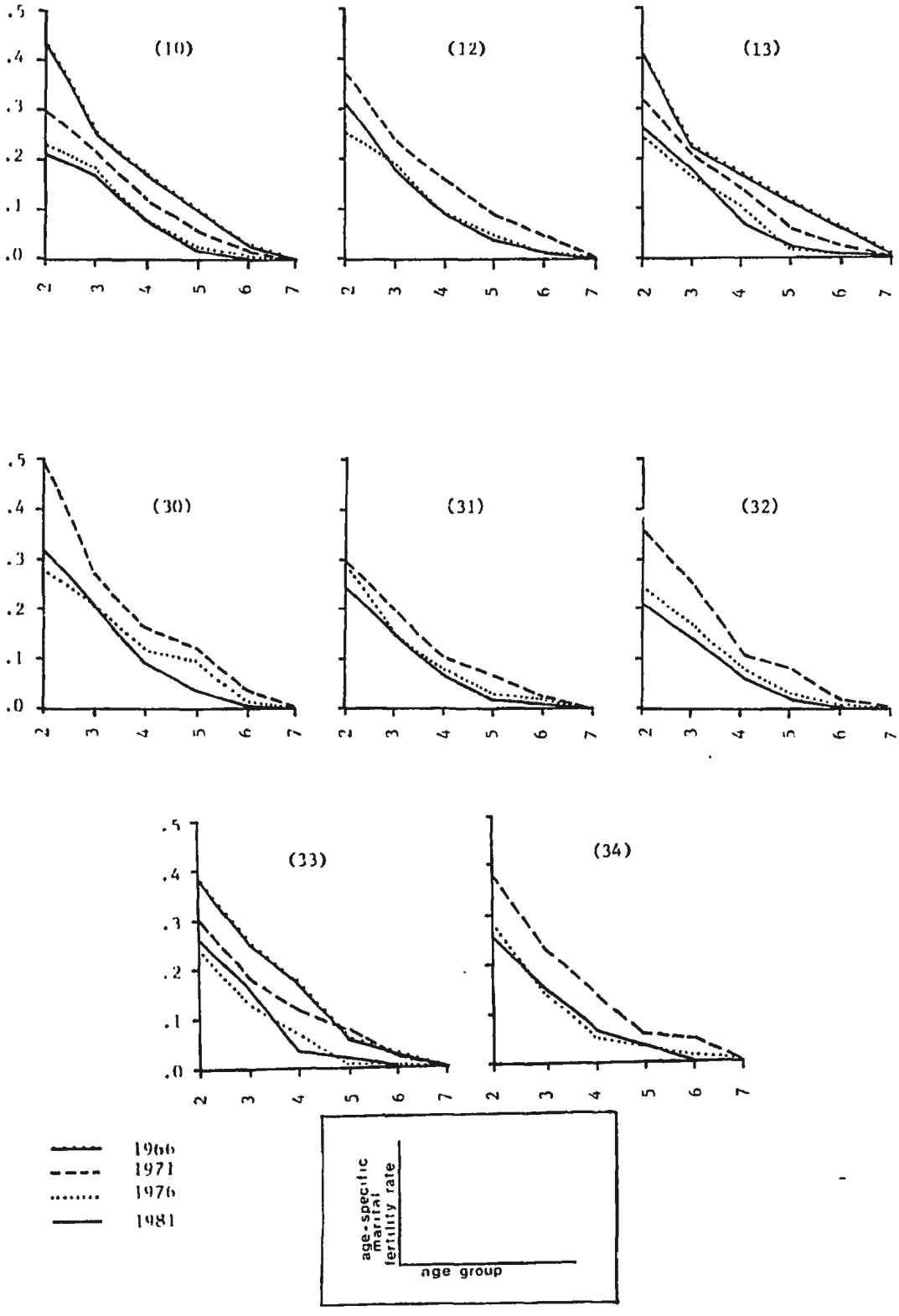
APPENDIX C

PR_{35}: 1966, 1971, 1976, 1981

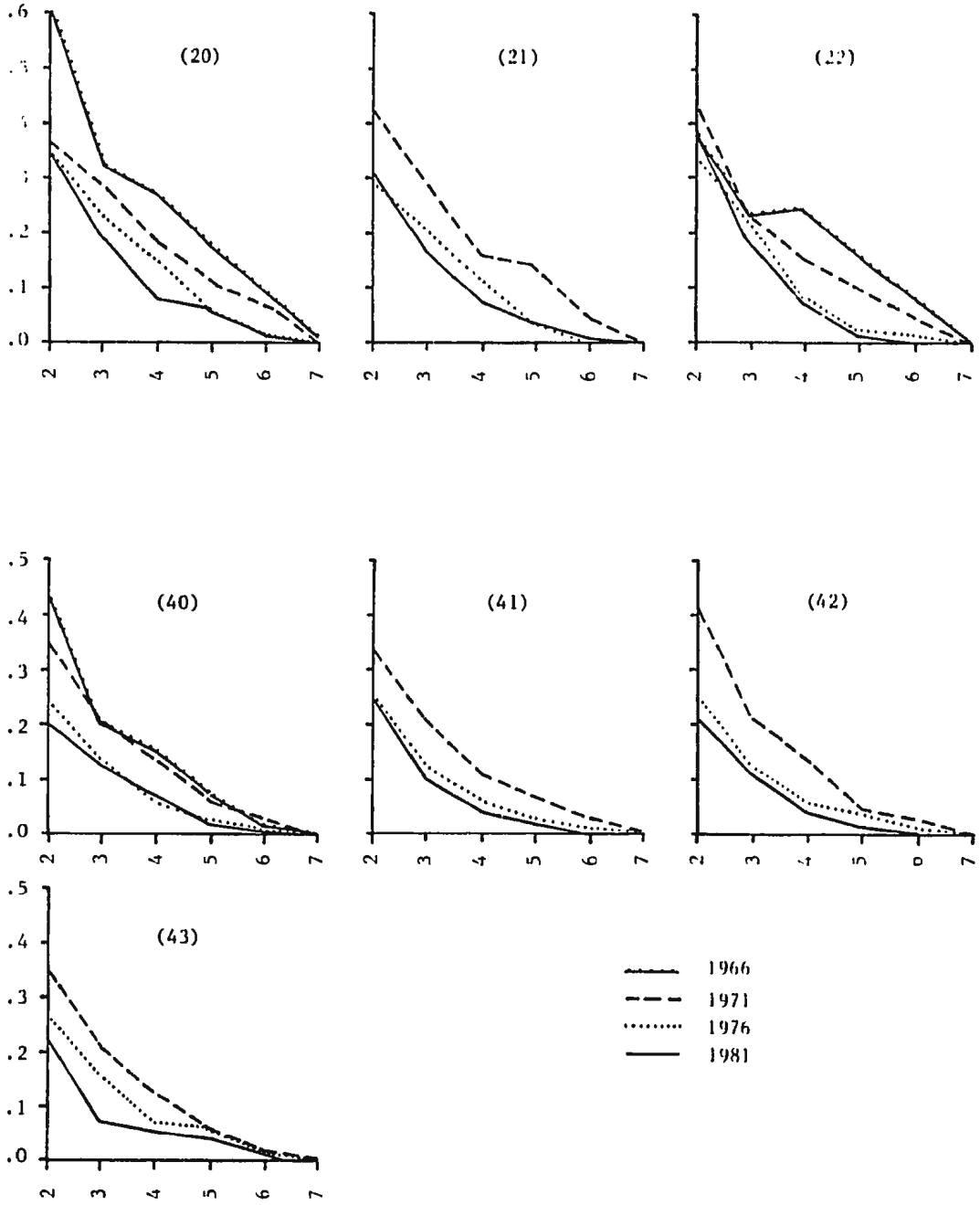
AREA	1966	1971	1976	1981
10	13	11	8	7
12		15	10	8
13	18	12	5	11
20	18	18	10	11
21	24	18	7	8
22		17	7	3
30		16	17	7
31		15	8	4
32		13	8	4
33	11	15	5	4
34		13	9	6
40	11	12	8	8
41		14	8	6
42		11	10	5
43		10	13	12
50		14	11	12
51	17	19	11	5
52	18	14	8	6
53		14	13	6
54		17	13	5
55	18	17	12	9
56	21	14	8	8
60		9	10	5
61		11	8	6
62		17	10	5
70		13	10	7
71		12	6	5
72		19	14	5
73		15	9	7
74	18	16	9	5
80	19	16	4	2
81	20	19	15	6
82		20	13	8
83	16	14	10	4
84		14	10	8
85		21	13	6
90		12	8	3
91		9	4	7
92		13	4	5

APPENDIX P

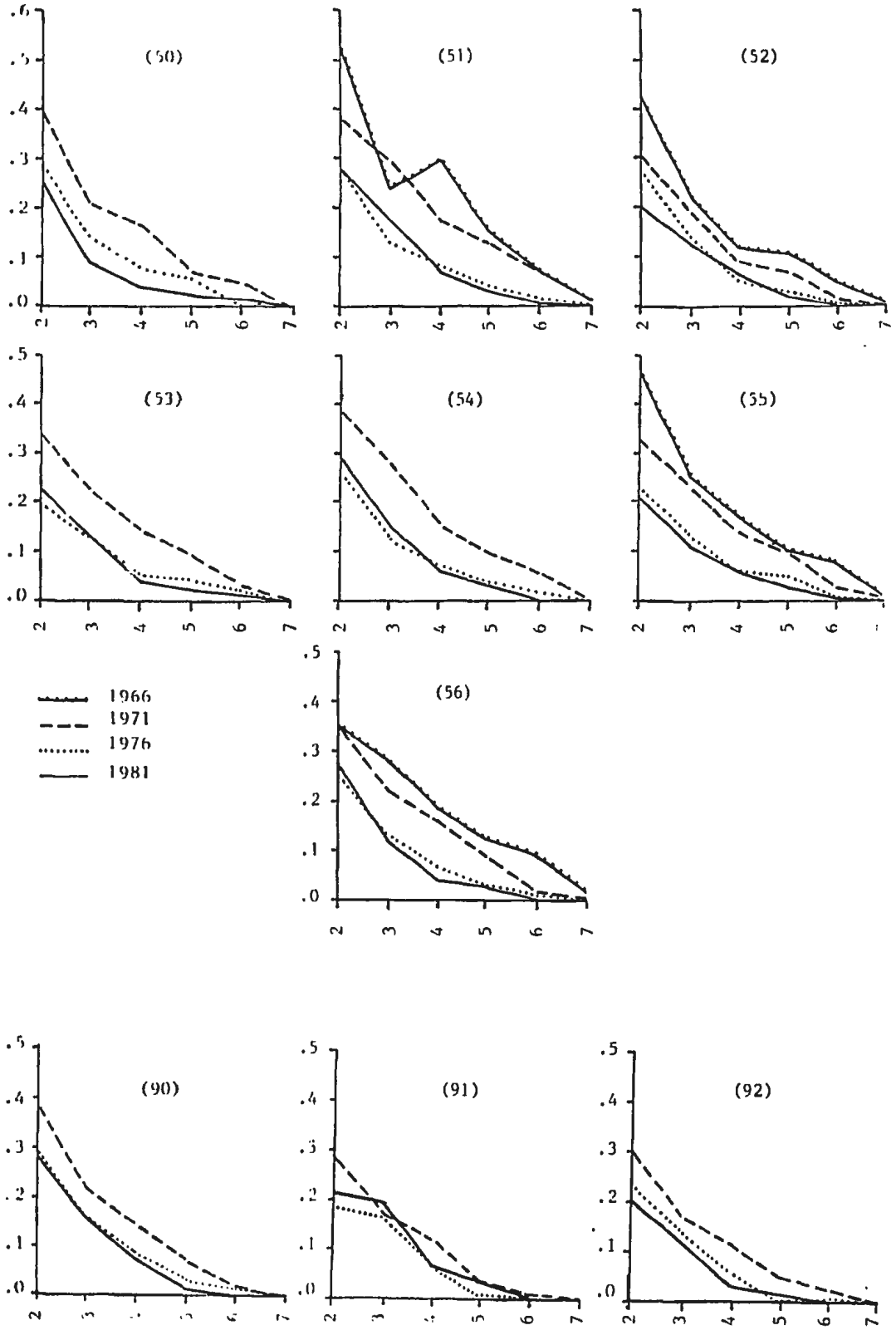
Age-Specific Marital Fertility Curves by Area and Year

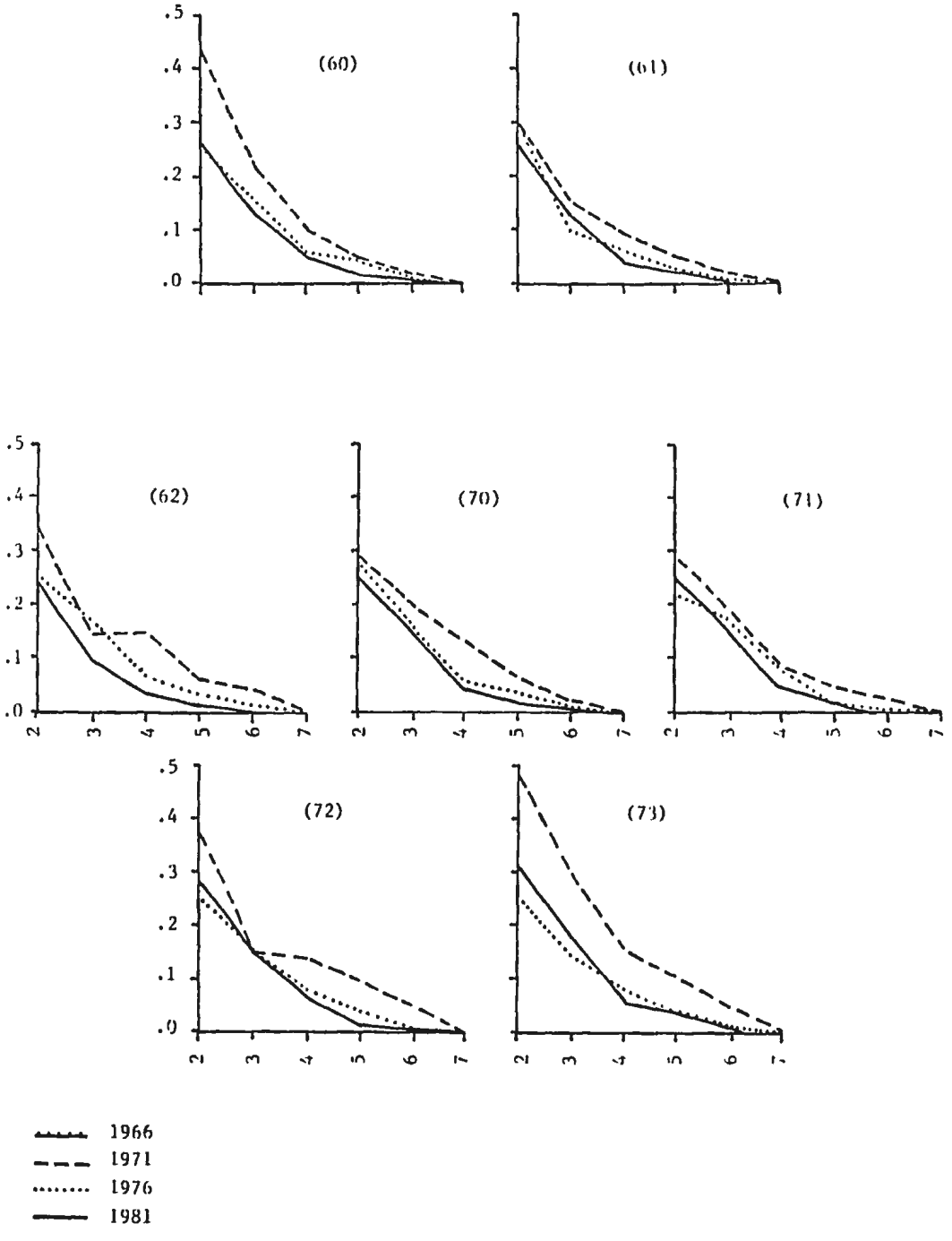


APPENDIX P (cont'd)



APPENDIX P (cont'd)

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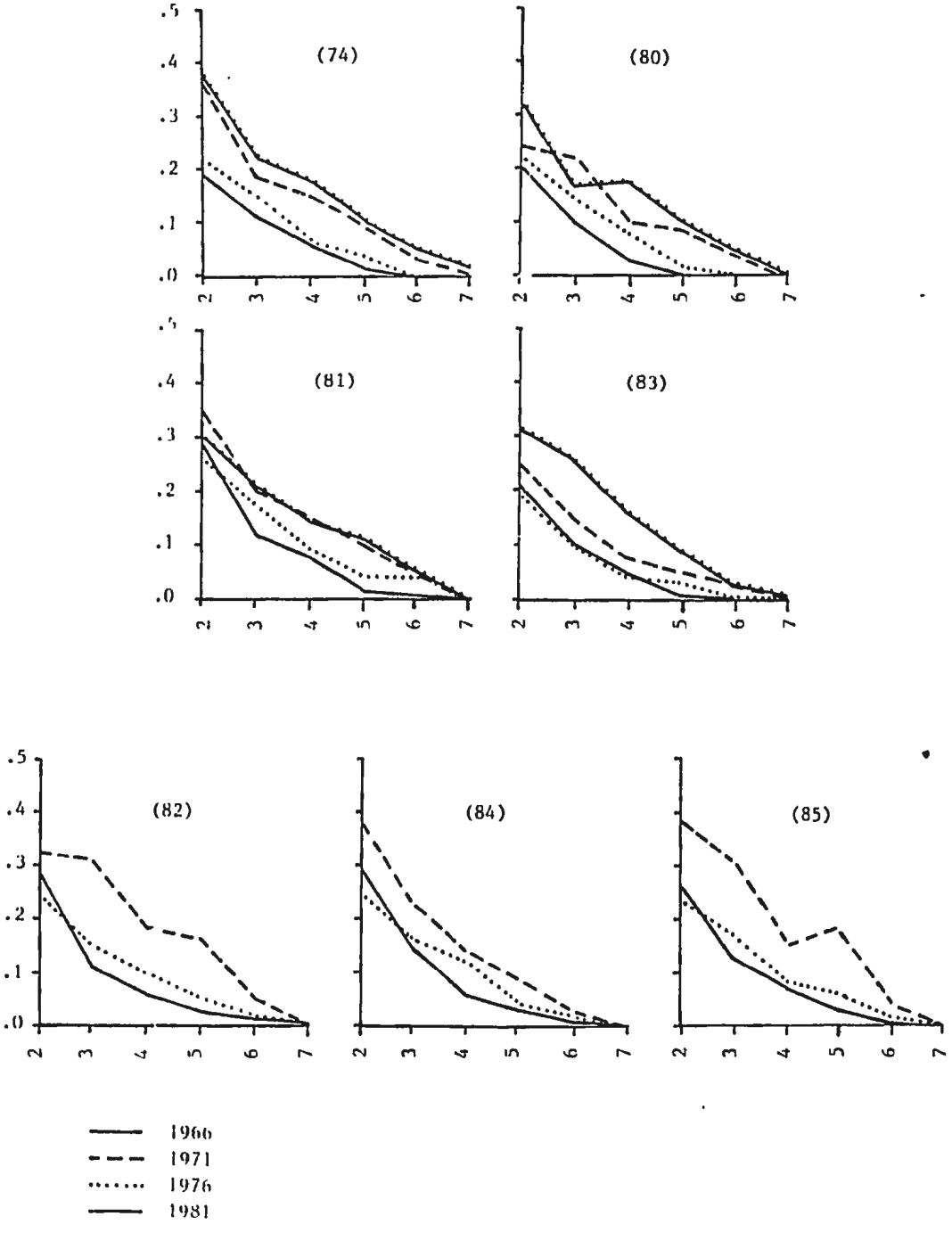
1966
1971
1976
1981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(82)
(84)
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1966
1971
1976
1981

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