

An Examination of The Seasonal Birth Pattern in Manitoba:  
1920 to The Present

by

Timothy James Werschler

A thesis  
presented to the University of Manitoba  
in fulfillment of the  
thesis requirement for the degree of  
Master of Arts  
in  
Geography

Winnipeg, Manitoba

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TIMOTHY JAMES WERSCHLER

A thesis submitted to the Faculty of Graduate Studies of  
the University of Manitoba in partial fulfillment of the requirements  
of the degree of

MASTER OF ARTS

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## ABSTRACT

The objective of this thesis is to examine the seasonal birth pattern in Manitoba during the period 1920 to the present. First, a descriptive examination of the seasonal birth pattern from 1920 to 1985 is conducted. Second, the modern seasonal birth pattern is investigated by conducting questionnaire research on the reproductive behaviors and birth-month preferences of currently reproducing women in the city of Winnipeg.

The findings indicate that the seasonal birth pattern in Manitoba has undergone considerable change during the period 1920-1985. These changes are linked to broad socio-economic and demographic changes within the province during this period. The questionnaire survey data suggest that the modern seasonal birth pattern is influenced to some extent by a group of seasonal birth planners within the currently reproducing population. To conclude, some directions for further research are suggested.

## ACKNOWLEDGMENTS

The author wishes to acknowledge the contribution of several individuals and agencies to this research effort. First, recognition is given to those agencies through which the questionnaire survey was administered (Appendix E). Without the cooperation of these offices, this research project would not have been possible.

An acknowledgment is also given to the members of the thesis committee. Professor Shiva Halli and Professor William Norton offered helpful comments during the writing of the manuscript. A special acknowledgment is reserved for Professor Geoffrey Smith, who served as thesis advisor.

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## Chapter I

### INTRODUCTION

#### 1.1 THESIS OBJECTIVES

The objective of this thesis is to examine seasonal birth patterns in Manitoba, Canada. Seasonal birth patterns are defined as the seasonal variation of births within a population. The specific research objectives of this thesis are twofold:

1. to examine the seasonal birth pattern in Manitoba during the period 1920-1985.
2. to analyze the modern seasonal birth pattern by conducting questionnaire research on the reproductive behaviors and birth-month preferences of currently reproducing women in the city of Winnipeg.

#### 1.2 ORGANIZATION OF THE THESIS

The remainder of Chapter 1 deals with two other introductory topics. First, the background to the study is discussed. Second, the contributions of the thesis to the existing corpus of relevant research are identified. Chapter 2 surveys the related literature in this field.

Chapter 3 examines the seasonal birth pattern in Manitoba during the period 1920-1985. The chapter focuses primarily on the changes which have occurred in the pattern over time.

Chapters 4 and 5 examine the modern seasonal birth pattern in Winnipeg. Chapter 4 considers the data sources and sample design. In chapter 5, the questionnaire survey data are presented. These data are used to interpret the seasonal birth pattern within the city of Winnipeg.

Chapter 6 provides an overview of the main findings of the study, and makes some recommendations for further research.

### 1.3 BACKGROUND TO THE STUDY

Seasonal birth patterns have been observed in almost all human populations. As background information, the research on seasonal birth patterns in Canada will be briefly discussed. A full review of the relevant literature will be conducted in the following chapter.

There have been five studies on seasonal birth patterns in Canada. Three of these examined the birth patterns of Canadian Inuit (Condon, 1982; Condon and Scaglione, 1982; and Ehrenkrantz, 1983). Generally, the findings among the Inuit reveal that most births occur in the first half of the year. The peak birth months are March/April. The fewest births occur in October/November. The birth pattern of this

population seems to be influenced by physiological and sociological responses to extreme seasonal variation of environmental conditions (Condon, 1982 :167; Ehrenkrantz, 1984 :23). The conception peak is associated with the warmest month of the year, and with the longest days.

Cowgill (1966) examined the seasonal birth pattern in Canada during the period 1920-1962. During this period, there is a birth peak in March and a trough in November. Within Canada, the birth patterns in Manitoba, Saskatchewan, Alberta, and Quebec exhibit the greatest provincial "seasonality." Cowgill also notes that the amplitude of the birth pattern decreases after 1920. The amplitude of the seasonal birth pattern is defined as the magnitude of the variation of the birth pattern from the lowest birth month to the highest birth month.

Halli (1989) conducted an analysis of the contraceptive practices and the seasonal birth pattern of over 5000 Canadian women. The data were extracted from the 1984 Canadian Fertility Survey Halli observed that the peak birth months (August/September) lagged behind the most preferred birth months (April/May). Halli suggests that some couples attempt to target the arrival of their children toward spring, however, the delay between contraceptive cessation and successful pregnancy results in a birth peak during August/September.

These studies indicate that there are both spatial and temporal variations in the seasonal birth pattern in Canada. The researcher must be conscious of these variations, for it follows that the determinants of the birth pattern vary across space and time.

#### 1.4 CONTRIBUTIONS OF THE THESIS

This thesis makes two contributions to the body of knowledge on seasonal birth patterns. First, this work attempts to verify and extend Cowgill's research on the seasonal birth pattern in Manitoba. This thesis will present 65 years of seasonal birth data in Manitoba, Canada. Such a record may be useful in discussing the longer-term changes in the seasonal birth pattern as they are effected by broad socio-economic and demographic changes within the province.

Second, this work contributes to the literature by conducting a detailed analysis of the modern seasonal birth pattern within an urban, contraceptive using population. This is achieved by way of questionnaire research on the reproductive behaviors and birth-month preferences of currently reproducing women in the city of Winnipeg, Manitoba.

## Chapter II

### LITERATURE REVIEW

#### 2.1 CHAPTER ORGANIZATION

Seasonal birth patterns have long been of interest to geographers (Huntington, 1938). This is because seasonal birth patterns are seen to reflect the influence of economic, climatic, and social factors on human fertility. Contributions to the literature in this field have also been made by physiologists, demographers, sociologists, and economists. As a result of the diverse research into seasonal birth patterns, there are numerous hypotheses which purport to explain the phenomenon. Initial research in this field focussed on the role of climate in the determination of seasonal birth patterns. Later research examined the influence of work cycles and socio-economic status on the seasonal birth pattern. Recent work investigates the influence of birth-month preferences on seasonal birth patterns. In this chapter, each of these research directions are discussed in turn, and their application to the current research is outlined.

## 2.2 THE EFFECT OF CLIMATE ON SEASONAL BIRTH PATTERNS

Many of the studies on seasonal birth patterns investigate the role of climate in the determination of conception rates (Takahashi, 1965; Stoekal and Chaudhurry, 1972; Mathers and Harris, 1983). These studies indicate that climatic extremes act to decrease the coital frequency and/or fecundity of the individual.

Siever (1985) is a frequently cited paper which examined U.S. birth data by state. The data were compiled into 10 year periods from 1947 to 1976. The paper tests whether climate is related to the birth season. For the post-war period, the low birth season was April/May, and the birth peak was September. April/May births are associated with July/August conceptions. It was found that the magnitude of the April/May trough is most pronounced in the warmest states. Seiver argued that in the lower latitudes of the U.S., the summer months become so warm as to produce a reduction in coital frequency and/or the fecundity of the population.

Condon (1982) studied seasonal birth patterns in the Canadian Arctic. Condon's hypothesis was that the dramatic semi-annual changes in the climate of this region would affect the birth cycle. Indeed, both planned and unplanned births occurred predominantly in the first half of the year. He found that the use of contraception acted to further reinforce the seasonal pattern.

The above studies suggest that in societies which experience extreme climatic variation, the seasonal birth pattern can be influenced by climate. These findings however, have limited application to the study of the seasonal birth patterns of urban societies. In urban environments, the effects of climatic variation have been moderated through technology. A further difficulty in interpreting the effects of climate on the seasonal birth pattern is that climate also influences several other social and economic activities. As a result, it is difficult to determine whether the seasonal birth pattern is influenced directly or indirectly by climate.

### 2.3 WORK CYCLES AND SEASONAL BIRTH PATTERNS

There are two hypotheses regarding the association between work cycles and seasonal birth patterns. First, coital frequency and/or fecundity may decrease due to increased labour activity. Thompson and Robins (1973) studied the seasonal variation in conceptions in rural Uganda, and found that the conception rate increased whenever the agricultural work-load decreased.

Second, births may be timed so as not to interfere with peak work periods. Levy's (1986) analysis of seasonal fertility cycles in rural Egypt revealed that many couples timed the births of their children in order that they would not interfere with the labour-intensive months of the agricultural cycle.

These studies conclude that the seasonal birth pattern can also be influenced by the work cycle. In most cases, births are timed away from the labour-intensive seasons.

#### 2.4 SOCIO-ECONOMIC STATUS AND SEASONAL BIRTH PATTERNS

Several studies on the relationship between socio-economic status and the seasonal birth pattern have been conducted in the United States (Pasamanick, 1960; Zelnick, 1969; Chaudhury, 1972; Warren and Tyler, 1979). These studies observe that the amplitude of the seasonal birth pattern is greater for low status groups. The birth pattern of the low status groups was found to be subject to greater variation, possibly due to less secure sources of income, inadequate housing, and variations in the nutritional quality of the diet. In the United Kingdom, however, James (1971) indicates that the amplitude of the seasonal birth pattern is greater in the high status groups. He speculates that this could be due to the fact that the upper status groups enjoy longer and more mobile holidays. Births in the high status groups are timed so as not to interfere with the holiday schedule. The seasonal birth pattern for the U.K. is a reliable February to May peak with a secondary peak in August. The trough is November/December.

In Lam and Miron (1987), the historical seasonal birth patterns of England, Luxembourg, Japan, and Sweden are examined. The authors found that the amplitude of the

seasonal birth pattern generally decreased over time. The decrease in the amplitude of the seasonal birth pattern is attributed to the advanced socio-economic development of these countries.

Cowgill (1966) is credited with the earliest analysis of the seasonal birth pattern in Canada. The results indicate that during the period 1920-1962, there is a March birth peak, and a lull in November. She found that the amplitude of the birth pattern is most pronounced in Quebec, Manitoba, Saskatchewan, and Alberta. The provinces with the lowest amplitude are British Columbia and Ontario. All the provinces with high seasonality (amplitude) were agriculturally based economies during that time. Cowgill argued that with increasing industrialization and urbanization, there would be a more stable food supply, and the environment would be moderated through better housing, clothing, etc. With moderation of environmental conditions, there is a concomitant moderation of the seasonal birth pattern.

In general, these studies indicate that increases in socio-economic status reduce the amplitude of the seasonal birth pattern. The amplitude of the seasonal birth pattern in modern societies is normally less than in pre-industrial societies. Nonetheless, there can be very distinct seasonal birth patterns in modern societies.

## 2.5 THE INFLUENCE OF BIRTH PLANNING ON SEASONAL BIRTH PATTERNS

In modern industrial societies, it is possible that contraceptive practices and unconstrained preferences for month of birth significantly influence the seasonal birth pattern. This possibility has only recently been investigated.

Shimura (1981) noted that the introduction and subsequent widespread use of oral contraceptives in the U.S. did not appear to change the nature of the U.S. birth pattern. The seasonal birth patterns of contracepting and non-contracepting couples were similar, but the pattern for contraceptors was of a greater amplitude. The greater seasonality of births among contracepting couples is an indication that effective contraceptive methods allow births to be more accurately timed.

Recent works by Rodgers (1984), and Rodgers and Udry (1985), indicate that birth-month preferences may significantly influence the seasonal birth pattern. Rodgers (1984) revealed a strong preference for April/May births in a sample of Wisconsin women. Data collected on the birth pattern of contracepting individuals revealed that there was a consistent August/September birth peak. The birth peak lagged behind the most preferred birth season by 3 to 4 months. Rodgers and Udry argue that there is a delay of approximately 3 months between contraceptive cessation and

conception. Rodgers and Udry attribute the secondary peak in February/March primarily to non-contraceptors. This suggests a biological basis for the secondary birth peak in February/March. These studies indicate that in modern societies, birth-month preferences may influence the seasonal birth pattern to some degree.

## 2.6 CHAPTER SUMMARY

The literature review has demonstrated that much research has been undertaken in an effort to increase understanding about seasonal birth patterns. The seasonal birth pattern is influenced by factors such as climate, work cycles, and socio-economic status. The effects of climate on the birth pattern are most pronounced in non-industrialized economies, and in areas where there is extreme seasonal variation in climate. Work cycles have most influence on birth patterns in rural-agrarian settings. Recent research indicates that with the introduction and subsequent widespread use of highly effective contraceptive methods, seasonal birth patterns may be increasingly influenced by birth-month preferences and other sociological factors. These findings are applicable to urban-industrial economies.

## Chapter III

### THE SEASONAL BIRTH PATTERN IN MANITOBA

#### 3.1 CHAPTER ORGANIZATION

This chapter examines the seasonal birth pattern in Manitoba during the period 1920-1985. First, the data source is discussed. Second, a descriptive examination of the seasonal birth pattern is conducted. Third, a summary of the main findings is offered.

#### 3.2 THE DATA

The data were obtained from Vital Statistics data for Manitoba. The Vital Statistics data record births by month and year, from 1920 to 1985 (Appendix A).

Two adjustments are made to the birth data in order to facilitate an examination of the seasonal birth pattern. First, the data are adjusted for variations in the length of month according to the following formula:

$$B_{ai} = (B_{ri} / n_i) * 30.4375$$

where:

$B_{ai}$  = adjusted number of births for month  $i$   
 $B_{ri}$  = unadjusted number of births for month  $i$   
 $n_i$  = number of days in month  $i$

In the case of February, a leap year correction is also made.

Second, the adjusted birth data are converted to ratio scores, which allow different series of birth data to be contrasted (Appendix B). Ratio score data are computed by:

$$R_i = (O_i / E_i) * 100$$

where:

$R_i$  = ratio score for month  $i$   
 $O_i$  = observed number of births in month  $i$   
 $E_i$  = expected number of births in month  $i$

The expected number of births is derived by dividing the total number of births in year  $i$  by 12 (the number of months in a year). Ratio values are expressed as the percentage deviation from the mean monthly number of births in a given year. This method of data conversion is conventional in the literature (Cowgill, 1966; Holland, 1989).

### 3.3 EXAMINATION OF THE SEASONAL BIRTH PATTERN

In order to examine the changes which have occurred in the seasonal birth pattern, the ratio score data are compiled into four periods: 1920-1939, 1940-1959, 1960-1974, 1975-1985. Figure 3.1 illustrates the seasonal birth pattern in Manitoba for each period.

The 1920-1939 period is characterized by a prominent February-April birth peak. The above average birth months were February to September. The lowest birth months were November/December. In the literature, an early spring birth peak is often attributed to the effects of the agricultural cycle (Nurge, 1970; Mosher, 1979; Knodel, 1981; Levy, 1986).

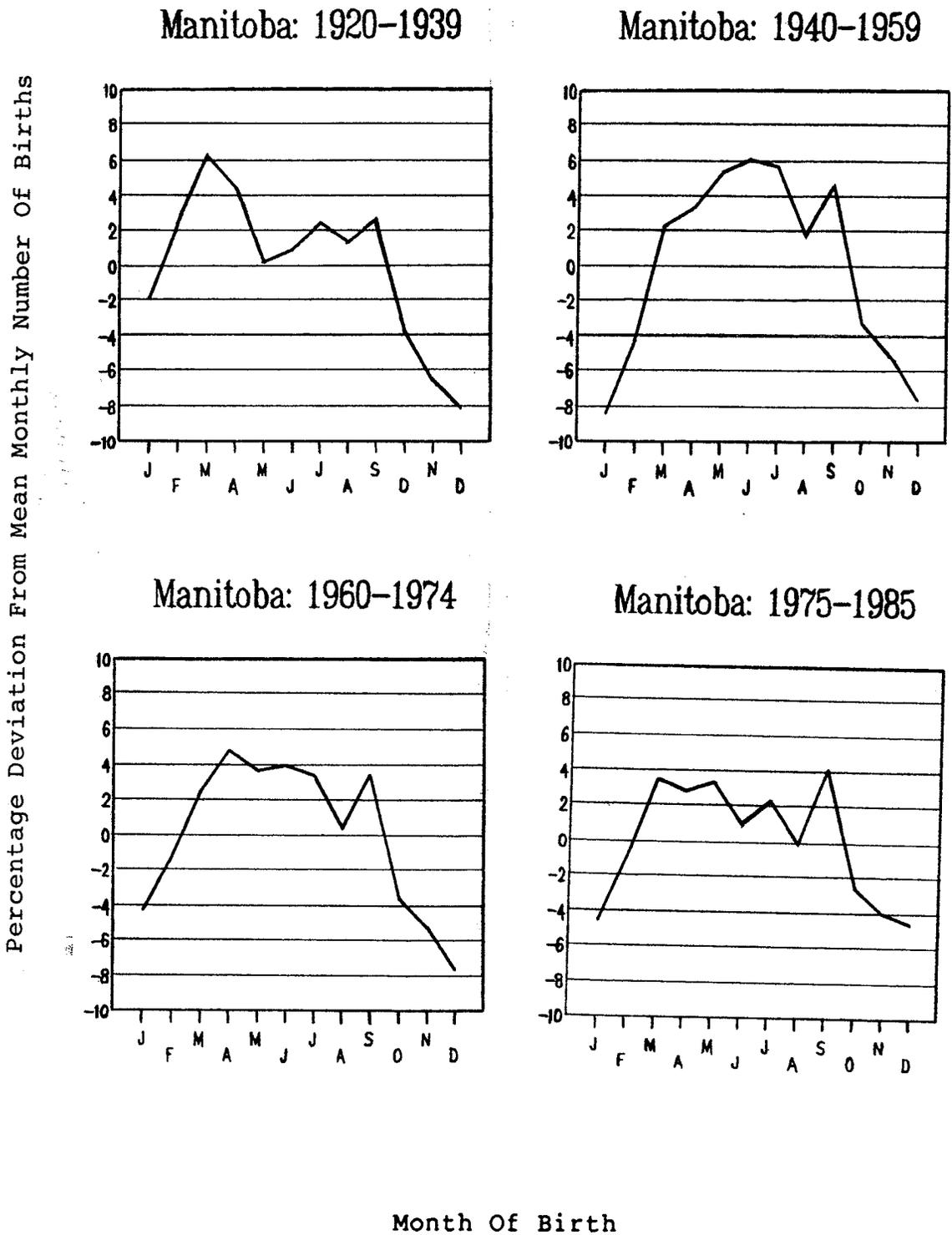


Figure 3.1: Seasonal Birth Pattern in Manitoba: 1920-1985

There are two reasons why early spring births would be preferred. First, a February-April birth means that a woman would not be in the advanced stages of pregnancy during the harvest (September). This would allow her to participate fully in the harvest activities. Second, an early spring birth would allow the woman ample post-natal recuperation time in order to participate in the spring sowing of the crops and gardens.

Table 3.1 illustrates the percentage urban/rural population distribution in Manitoba during the period 1921-1986. During the 1920-1939 period, Manitoba's population was approximately 57% rural. Manitoba's overall seasonal birth pattern was thus significantly influenced by that of the rural population. In addition to this, the seasonal birth pattern in many smaller urban centers may also have been influenced by the agricultural cycle. The economies in the smaller towns were, in many instances, directly linked to the agricultural cycle because they served as supply and transport centers for the surrounding

TABLE 3.1

Urban/Rural Population Distribution in Manitoba: 1920-1986

Year:	1921	1931	1941	1951	1961	1971	1981	1986
% Urban:	42.9	45.1	41.1	56.6	63.9	67.1	71.2	72.1
% Rural:	57.1	54.9	58.9	43.4	36.1	32.9	28.8	27.9

source: Statistics Canada

agricultural communities.

In the 1940-1959 period, a considerably different seasonal birth pattern is evident (Figure 3.1). The first observation that can be made about the 1940-1959 period is that the primary birth peak shifted from spring to summer. It is possible that changes in the rural/urban distribution of Manitoba's population influenced the change in the seasonal birth pattern. The economic diversification of the province during the post-war period influenced the rapid urbanization of the population during the period 1940-1959 (Table 3.1). During this period, Manitoba's overall seasonal birth pattern became heavily influenced by that of the urban population. The work/holiday cycle and birth month preferences of urban residents may have influenced a summer birth peak.

The mechanization of agricultural operations during the post-war period may also have influenced a shift in the birth peak within the rural population. Reductions in female labor demand as a result of increased mechanization, may have reduced the importance of a late-winter birth (Lam and Miron, 1987). Births could be targeted to other months without interrupting the agricultural work cycle.

The second feature of the 1940-1959 period is a secondary birth peak in September. The secondary birth peak in September has often been attributed to the "Christmas

holiday effect." Lam and Miron (1987) attempt to explain the seasonal birth pattern of Sweden by suggesting that the September birth peak is influenced by increased coital activity during the previous December. Whatever the cause, the birth peak in September becomes a feature of Manitoba's seasonal birth pattern for this and the two subsequent time periods.

The 1960-1974 and 1975-1985 periods are characterized by a weakening spring peak and winter trough. In the 1975-1985 period, September becomes the peak birth month. At first glance, the 1960-1985 period may be interpreted as a period of transition in which the spring birth peak is replaced by the September birth peak. In actuality, the magnitude of the spring peak and winter trough decrease substantially, while the magnitude of the September peak remains relatively constant. In order to interpret the changes in the birth pattern during this period, the changes in the amplitude of the seasonal birth pattern must be considered.

### 3.3.1 Amplitude of the Seasonal Birth Pattern

The amplitude of the seasonal birth pattern is the magnitude of the variation from the lowest birth month, to the highest birth month. Table 3.2 indicates the amplitude of the seasonal birth pattern according to the time periods used above.

TABLE 3.2

## Amplitude of the Seasonal Birth Pattern: 1920-1985

Year Block	Ratio Score of Peak Month (%)	Ratio Score of Lowest Month (%)	Amplitude of Birth Pattern (%)
1920-1939	6.2	-8.2	14.4
1940-1959	6.1	-8.5	14.6
1960-1974	4.8	-7.6	12.4
1975-1985	4.2	-4.6	8.8

The first feature that can be observed in Table 3.2 is that the amplitude of the seasonal birth pattern has decreased over time. This finding is supported by Cowgill (1966) and Lam and Miron (1987), who state that the amplitude of the seasonal birth pattern decreases with the socio-economic development of a society. This decrease may also be due to the increased use of highly effective contraceptives after 1960 (Shimura, 1981). With near universal use of highly effective contraceptives, seasonal variations in coital frequency no longer influence great variations in births. As a result, the amplitude of the birth pattern decreases.

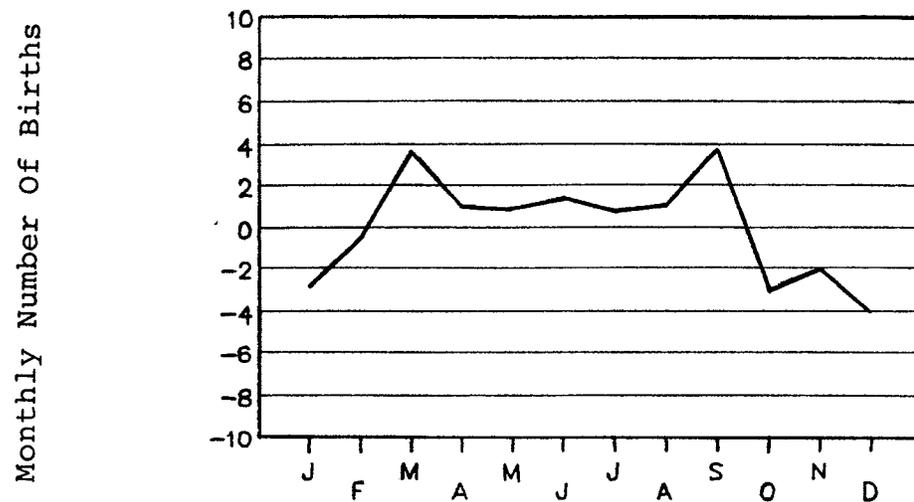
A second observation is that the magnitude of the mean minimum birth ratio is greater than that of the mean maximum birth ratio, in each period. These data undoubtedly reflect the fact that it is simply easier not to conceive, than to accurately time the arrival of a child.

### 3.4 DISAGGREGATION OF THE MODERN SEASONAL BIRTH PATTERN

Figure 3.2 illustrates the modern seasonal birth pattern of Winnipeg, and that of Manitoba (Winnipeg excluded). The seasonal birth pattern of Manitoba (Winnipeg excluded) is characterized by birth peaks in March and September, and by a trough in December/January. Some couples may target the births of their children toward the spring so that the birth does not interfere with the agricultural work cycle. The September birth peak may be influenced by the Christmas holiday effect. Increased coital activity during the Christmas season may result in an increase in births during the following September.

The seasonal birth pattern within Winnipeg is characterized by a birth peak in April/May, and a trough from November-January. It is possible that the birth peak in spring is influenced to some extent by the seasonal birth planners within the population of Winnipeg. The Christmas holiday effect may influence the secondary birth peak in September. The modern seasonal birth pattern in Winnipeg will be further interpreted in Chapters 4 and 5, through an analysis of the questionnaire survey data.

## Manitoba (Winnipeg Excluded)



## Winnipeg

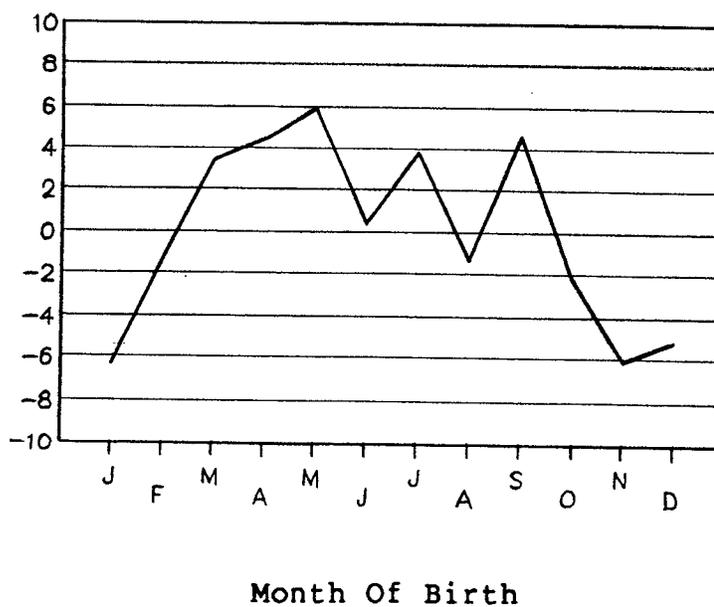


Figure 3.2: Disaggregation of The Seasonal Birth Pattern:  
1975-85

### 3.5 CHAPTER SUMMARY

Substantial changes have occurred in the birth pattern during the period under consideration. The most significant change in the birth pattern is the distinct shift from a spring birth peak in the 1920-1939 period, to a summer peak in the 1940-1959 period. This shift may have been associated with the rapid urbanization of the province during this period, and with the post-war industrialization of Manitoba's economy.

The second substantial change has been the marked decrease in the amplitude of the seasonal birth pattern after 1960. This decrease may be the result of continued socio-economic development within the province, and the introduction of effective contraceptive methods. Disaggregation of the data has revealed that there are variations in the seasonal birth pattern within the province. These variations may be attributable to economic and social differences between the urban and rural populations in the province.

## Chapter IV

### DATA SOURCES AND SAMPLE DESIGN

#### 4.1 CHAPTER ORGANIZATION

Chapters 4 and 5 examine the modern seasonal birth pattern in Winnipeg, Manitoba. The following chapter describes the formulation and implementation of the questionnaire survey. First, the sample population and study area are identified. Second, the questionnaire design is discussed. Third, the sampling procedure is described. Fourth, the response rates of the questionnaire survey are outlined and assessed. Finally, a brief summary of the chapter is offered.

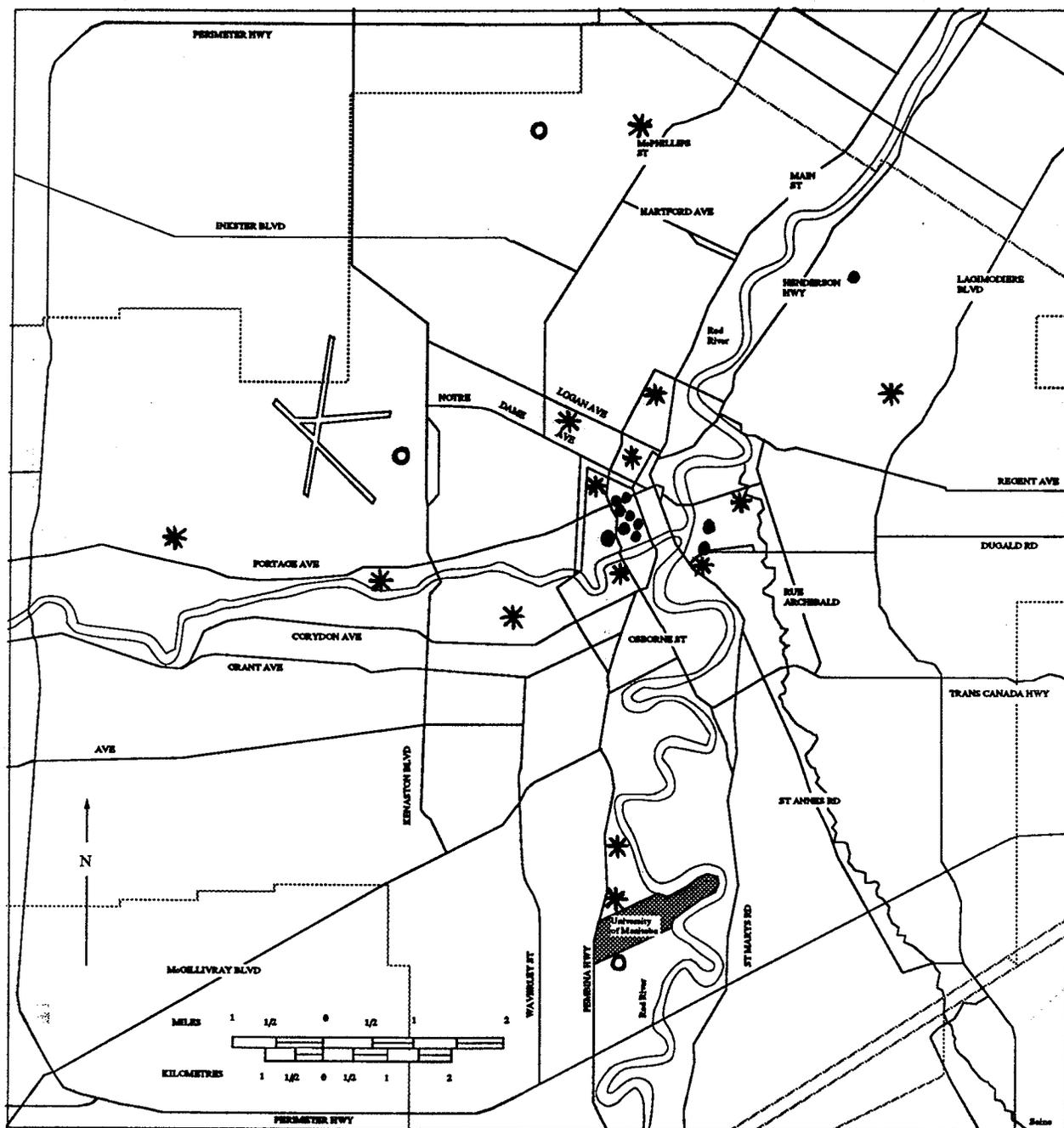
#### 4.2 SAMPLE POPULATION AND STUDY AREA

The sample population is comprised of pregnant women in the city of Winnipeg. The questionnaire was administered exclusively to pregnant women for two reasons. First, pregnant women tend to frequent certain places during the course of their gestation (i.e. doctors offices and pre-natal classes). This would allow for the expeditious administration of the questionnaire. Second, the modern seasonal birth pattern is influenced solely by the currently reproducing women within the general population. The sample respondents are extracted from the population of currently reproducing women within the study area.

The study area for the questionnaire research is the city of Winnipeg. The results of the questionnaire survey are, therefore, applicable only to an interpretation of the seasonal birth pattern within Winnipeg. The urban context of this study is not inappropriate since industrialized countries are characterized by high levels of urbanization. Manitoba is no exception to this trend. In 1986, 72.1% of Manitoba's population was classified as urban. In fact, 55.9% of the provincial population live in Winnipeg alone.

An effort was made to administer the questionnaire from many points within Winnipeg. These include hospitals in each quadrant of the city, the offices of Obstetricians and Gynecologists, and pre-natal classes in community centers across the city (Appendix E). Figure 4.1 illustrates the location of the sampling points within Winnipeg. The concentration of doctors offices in the central area of the city is influenced by the existence of large medical centers in this area. This spatial concentration is not expected to significantly bias the sample because these offices are frequented by pregnant women from all areas of the city. The pre-natal classes are evenly distributed throughout the study area.

Table 4.1 provides a summary of the interviews completed through the sampling locations. The table discloses that 92.1% of the questionnaires were administered through doctors' offices and pre-natal classes. It was expected



Sampling Points

- Doctor's Office
- \* Pre-Natal Class
- Other Point

Figure 4.1: Location of Sampling Points in Winnipeg

that a wide spectrum of respondents would be contacted through the doctors offices. This is because virtually all pregnant women, regardless of age or socio-economic status, utilize the services of obstetricians or general

TABLE 4.1

Summary of Interviews Completed at The Sampling Locations

Agency	Number of Sampling Points	% of Total Number of Sampling Points	Number of Respondents Contacted	Percentage of Entire Sample
Doctor's Office	11	39.2	226	47.4
Pre-Natal Class	14	50.0	213	44.7
Welcome Wagon	1	3.6	23	4.8
Fitness Class	2	7.1	15	3.1
Total	28	100.0	477	100.0

practitioners during the course of their gestation. The respondents contacted through pre-natal classes may be slightly younger on average because pre-natal classes are generally attended by women who are pregnant for the first or second time.

#### 4.3 THE QUESTIONNAIRE DESIGN

The questionnaire contained 30 questions designed to elicit information on the reproductive behaviors and birth-month preferences of the respondent (Appendix F). The questionnaire could normally be completed in less than 15 minutes. A cover letter attached to the questionnaire commented on the nature of the research, and gave full instructions regarding the completion of the form.

The questionnaire consisted of two parts. The first part was comprised of questions which elicited socio-economic, cultural, and religious information about the respondent. These questions required one word responses, or check marks placed in appropriate boxes. The second part elicited information on the reproductive behaviors and birth-month preferences of the respondent. These questions were presented in both structured and open-end formats. Open-end responses were used to obtain information on topics anticipated to be important to this research, but for which structured response formats could not be used. The responses to each question were coded so as to make statistical analysis of the data possible where appropriate.

#### 4.4 THE QUESTIONNAIRE SURVEY

##### 4.4.1 Pre-test of The Questionnaire

The pre-test sample consisted of 8 pregnant women, most of whom were younger than 20 years. It is argued that if these respondents could properly complete the questionnaire, then this would provide increased confidence that the questionnaire would be completed without difficulty by the main sample group.

There were three questions which caused some confusion in the pre-test of the questionnaire. These were questions 11, 13, and 20 (Appendix G). In each case, the meaning of the question was unclear to one or more of the pre-test respondents. Once the ambiguities in these questions were corrected, the main field survey was conducted.

##### 4.4.2 The Main Survey

The data were obtained in a questionnaire survey conducted in Winnipeg during the period June 1 to August 15, 1989. Where the respondents were contacted in a pre-natal class setting, the procedure for the administration of the questionnaire was as follows. At the beginning of a pre-natal class, the objectives of the research were briefly described, and questionnaire forms were distributed to each class member. The prospective respondents were invited to complete the questionnaire during the upcoming week, and instructed to return the completed form to the next class.

The following week, and normally at the beginning of the class, all of the forms were collected (completed or otherwise). Arrangements were made to collect completed questionnaires from those respondents who had forgotten to bring the form to class. This was the full extent of the contact that was made with each pre-natal group.

Where the questionnaire was administered through a doctor's office, the doctor or a designated nurse would describe the objectives of the study, invite the respondent to complete the form at her leisure, and request that the respondent bring the completed form to her next appointment. The frequency of a respondent's visits to the doctor were a function of the phase of gestation. The visits were no less than once per month and no more than once per week. Therefore, the respondent would have ample time to complete the form between visits.

In two instances, the questionnaires were administered through pre-natal fitness classes. During the classroom portion of one exercise class, the instructor would describe the study and distribute the forms. The respondents were instructed to complete the forms during the upcoming week and return them to their next class.

The Winnipeg chapter of the Welcome Wagon permitted the administration of the questionnaire at one of their "baby showers." At this occasion, the cover letter was the only

source of information about the questionnaire. There was no personal contact between the respondents and the researcher. The respondents in this group were instructed to return the completed questionnaires by mail.

#### 4.5 RESPONSE RATES

The response rates from the pre-natal and pre-natal fitness classes were 73% on average. It is difficult to determine the response rates of the doctors' offices. The staff at these offices were not instructed to keep records of how many potential respondents were invited to complete the form. However, the response rates of the doctors' offices are assumed to approximate those of the pre-natal classes, since requests made by medical professionals are likely to be complied with. The response rate at the Welcome Wagon baby shower was only 15%, almost certainly because there was no personal contact with the respondents. Additionally, the respondents had to pay postage to return the completed questionnaire to the University.

The questionnaire research yielded 477 completed questionnaires. The relatively high response rates are partly attributed to the level of popular interest in the research topic. It is felt that the sample size is sufficient to provide meaningful information for the analysis of the modern seasonal birth pattern in Winnipeg.

#### 4.6 CHAPTER SUMMARY

In this chapter, the formulation and implementation of the questionnaire survey were discussed. The study area and sample population were chosen so that the seasonal birth pattern within an urban context could be investigated. The questionnaire used in this research elicited information on several factors thought to influence the reproductive behaviors and birth-month preferences of the respondent. The relatively large sample size permits a more detailed examination of the modern seasonal birth pattern in Winnipeg.

## Chapter V

### ANALYSIS OF THE SURVEY RESULTS

#### 5.1 CHAPTER ORGANIZATION

In this chapter the questionnaire survey data are presented. These data are used to interpret the seasonal birth pattern within the city of Winnipeg. First, the composition of the sample is discussed. Second, the preferences for month of birth are examined. Third, the respondents views on the importance of a seasonally planned birth are considered. Fourth, the seasonal birth planners within the sample population are identified and discussed. The chapter closes with a summary of the main findings of the questionnaire research.

#### 5.2 COMPOSITION OF THE SAMPLE

Table 5.1 summarizes the demographic and socio-economic characteristics of the sample respondents. The demographic characteristics are: (a) the respondent's age, and (b) the number of times the respondent was pregnant. The table discloses that 63% of the respondents are between 20-29 years of age. This can be expected since birth rates are highest for women in this age group (Nam and Philiber, 1984:115).

TABLE 5.1  
Composition of Entire Sample

Characteristic	N	%
<b>Age distribution:</b>		
0-20 years	12	3
20-29 years	295	63
30-39 years	160	34
40- + years	5	1
<b>Number of Pregnancies:</b>		
1	260	55
2	130	28
3	47	10
4+	30	7
<b>Educational attainment:</b>		
grades 7- 9	12	3
grades 10-12	159	34
some college/university	125	27
college/university degree	172	37
<b>Family Income in 1988:</b>		
\$0-10,000	13	3
\$10,000-29,000	85	19
\$30,000-49,000	221	50
\$50,000- +	127	28
<b>Employed Household Members:</b>		
0	13	3
1	146	31
2	316	66

N = number of respondents

% = percentage of entire sample

Most of the respondents were pregnant for the first time. This characteristic of the sample is partly due to the sampling method employed in the research. A large proportion of the respondents (44.7%) were contacted through pre-natal classes. The women who attend these classes are normally pregnant for the first time.

The socio-economic characteristics of the respondents in Table 5.1 are: (a) educational attainment, (b) family income, and (c) number of employed household members. These data indicate that the sample is well represented by the middle and upper-middle socio-economic groups.

The representativeness of the sample in relation to the population of reproducing women within Winnipeg is not measured empirically in this study. This is because cross-tabulated data employing the socio-economic characteristics in Table 5.1 could not be obtained for the city of Winnipeg. Despite a lack of empirical evidence, it is felt that the composition of the sample is generally representative of the reproducing women within Winnipeg. This is because the sample size is relatively large ( $n=477$ ). A relatively large sample size should ensure that a wide spectrum of respondents from the general population are represented in the sample. However, due to the sampling procedure employed in this research there may be a slight over-representation of younger women, and of women in the middle and upper-middle socio-economic groups. This potential source of bias must be considered in the interpretation of the questionnaire results.

### 5.3 PREFERENCES FOR MONTH OF BIRTH

Table 5.2 indicates the unconstrained preferences for month of birth, expressed by the entire sample. The respondents were asked which was the most preferred month for birth, and

TABLE 5.2

Birth-Month Preferences of The Respondents

Month	Most-Preferred Month		Least-Preferred Month	
	N	%	N	%
January	14	3.6	87	21.3
February	10	2.6	20	4.9
March	34	8.7	4	1.0
April	99	25.3	1	0.2
May	122	31.1	2	0.5
June	48	12.2	7	1.7
July	13	3.3	46	11.3
August	13	3.3	44	10.8
September	17	4.3	34	8.3
October	12	3.1	7	1.7
November	8	2.0	23	5.6
December	2	0.5	133	32.6
Total	392	100.0	408	100.0

N = number of subjects who responded

% = percentage of subjects who responded

which was the least preferred month for birth. From these responses, frequency distributions of the most preferred and least preferred months were compiled. Table 5.2 indicates that there is a consensus preference for an April/May birth, with 56.4% of the respondents choosing either April or May as the most preferred birth month. The least preferred

birth months are December/January, with 53.9% of the respondents choosing these months. A further 22.1% of the sample chose July/August as the least preferred birth months. These findings are consistent with those of Rodgers (1984).

In order to test the association between preferences for month of birth and the seasonal birth pattern in Winnipeg (1979-1988), Spearman Rank Order tests were conducted. Specifically, tests were conducted to determine:

1. the correlation between the "monthly number of births" and the "frequency distribution of the most preferred month" (from table 5.2).
2. the correlation between the "monthly number of births" and the "frequency distribution of the least preferred month" (from table 5.2).
3. the correlation between the "monthly number of births" and the "net preference for the most preferred month."

The net preference is defined as the difference between the percentage of respondents who chose any month as the most preferred, and the percentage of respondents who chose the same month as least preferred. This method provides the most accurate representation of the preferences for month of birth as expressed by the respondents.

The results of these tests are as follows. The correlation between the monthly number of births and the frequency distribution of the most preferred month was significant at the 0.01 level. The correlation between the monthly number of births and the frequency distribution of the least preferred month was not significant at the 0.05 level. The correlation between the monthly number of births and the net preferences for the most preferred month was significant at the 0.05 level. These results indicate that there is a moderate association between the birth pattern and preferences for month of birth. In each test, the peak and trough of the birth pattern correspond with the most preferred and least preferred months for birth. There were, however, substantial differences between the birth pattern and the preferences for month of birth. Most notably, July-September are not considered to be preferred months for birth, yet there are secondary birth peaks in July and September. This results in a "zigzag" distribution of births from May to September in Winnipeg (see figure 3.2 p.20). Halli (1989) considers that

the timing of ovulation, spontaneous abortion, and the relationship between coital activity and exact time of conception are highly unpredictable. Thus, the "zigzag" pattern of pregnancy distribution may reflect a lag between when parents begin trying to have a child and when the successful pregnancy really occurs.

In Winnipeg, the secondary birth peaks in July and September may be influenced by such delays in pregnancy.

Tables 5.3 and 5.4 list the reasons for choosing the most preferred and least preferred months for birth. The responses were elicited by asking the respondent to indicate why they chose a certain month as most preferred or least preferred. The total number of responses in Table 5.4 is larger than the sample size because some respondents gave more than one response.

Table 5.3 indicates the influence of weather-related

TABLE 5.3

Reasons For Choosing the Most Preferred Birth-Month

Response	N	%	Response Type
1.Nice Weather	201	44.7	W
2.Baby Can be Outside	73	16.2	W
3.Pregnancy During Winter	46	10.3	W
4.Favorite Season	32	7.1	W
5.Summer Off Work	31	6.9	W
6.Child's Birthday During School Year	17	3.8	S
7.Not Too Busy	13	2.9	S
8.Baby Can Cope With Summer Heat	7	1.6	W
9.Other (22 responses)	29	6.5	O
Total	449	100.0	

N = number of times a response was given

% = percentage of total number of responses

W = weather related; S = social related; O = other

concerns in the choice of the most preferred month. In fact, 86.8% of the responses are classified as weather-related concerns. Spring or early-summer are the most preferred seasons because the climate is considered to be

moderate (responses 1-2). Further, 6.7% of the responses were related to social factors. For instance, some respondents were concerned about the age of the child upon entry into school. For purposes of generalization, reasons which comprised less than 1% of the total number of

TABLE 5.4

## Reasons For Choosing The Least Preferred Birth-Month

Response	N	%	Response Type
1.Weather Too Cold	173	34.9	W
2.Weather Too Hot	134	27.0	W
3.Christmas Season Too Busy	110	22.2	S
4.Weather	24	4.8	W
5.Relative Age of Class-Mates	17	3.4	S
6.Child's Birthday in December	12	2.4	S
7.Bad Roads (Winter)	10	2.0	W
8.Expensive Time of Year (Winter)	6	1.2	S
9.Other (5 responses)	7	1.5	O
Total	493	100.0	

N = number of times a response was given

% = percentage of total number of responses

W = weather related; S = social related; O = other

responses were grouped into the "Other" category.

Table 5.4 lists the reasons for choosing the least preferred birth-month. Again, weather-related concerns are pre-eminent, with 68.7% of the responses in this category. The most common weather-related responses were: (a) the weather is too cold, and (b) the weather is too hot. Climatic extremes in winter and summer seem to influence the

preference of the least preferred month for birth. Second, 29.2% of the responses were influenced by social-related concerns. Social related concerns are more prominent in relation to the least-preferred month. The most prominent social-related concern is that the Christmas season is considered to be a socially demanding time. Many respondents indicated that they did not want to spend Christmas in the hospital because they would not be able to participate in the holiday festivities.

In general, spring births are the most preferred because the baby can be outdoors for longer periods. December/January and July-September births are considered to be the least preferred because of extreme weather conditions, and because the Christmas season is a socially demanding time.

#### 5.4 IMPORTANCE OF A SEASONALLY PLANNED BIRTH

The questionnaire allowed the respondents to indicate their views on the importance of a seasonally timed birth. The responses are measured on a three point rating scale (Table 5.5). The results indicate that the majority of the sample do not consider the season of birth as an important consideration when planning to have a baby. The preferences for month of birth discussed in section 5.3 may have little influence on the seasonal birth pattern in Winnipeg if most respondents do not consider the season of birth as an

TABLE 5.5  
Importance of a Seasonally Timed Birth

Response	Number of Respondents	Percentage of Entire Sample
very important	15	3.1
important	165	35.0
not important	292	61.9
Total	472	100.0

important factor when planning to have a child. Alternatively, the seasonal birth pattern may be influenced by an identifiable group of seasonal birth planners within the population.

#### 5.5 RESPONDENTS WHO SEASONALLY PLANNED A BIRTH

Table 5.6 summarizes the proportion of seasonal birth planners in the sample. The results demonstrate the existence of an identifiable minority of seasonal birth planners, with 27.4% of the respondents identifying themselves thus. An examination of the birth planners within the sample may provide information linking the reproductive behaviors of the birth planners to the relatively small but predictable seasonal variation of births in Winnipeg.

The demographic and socio-economic characteristics of planners and non-planners are contrasted in Table 5.7.

TABLE 5.6  
Proportion of Seasonal Birth Planners in Sample

	Number of Respondents	Percentage of Entire Sample
Planners	119	27.4
Non-Planners	316	72.6
Total	435	100.0

There are two major differences between the planners and non-planners. First, the seasonal birth planners tend to be more highly educated than the non-planners. Specifically, 48.7% of the planners indicated that they had a college or university degree. By comparison, only 32.6% of non-planners had attained this level of education. Well educated individuals tend to hold professional jobs which may require that births be timed to correspond with the low work season. Well educated individuals may also be more inclined to plan the births of their children because they are likely to have a fuller understanding of the human reproductive system and of contraceptive use. This knowledge enables them to become effective birth planners, should they so choose.

A second difference is that seasonal birth planners tend already to have had one child. Table 5.7 indicates that 37% of planners were pregnant for the second time. This compares with 24.3% of non-planners. Experiences during the

TABLE 5.7  
 Characteristics of Planners And Non-Planners

Characteristic	Non-Planners		Planners	
	N	%	N	%
<b>Age Distribution:</b>				
0-20 years	11	3.1	1	0.8
20-29 years	229	64.9	66	55.4
30-39 years	109	30.9	51	42.9
40- + years	4	1.1	1	0.8
<b>Number of Pregnancies:</b>				
1	208	58.8	52	43.6
2	86	24.3	44	37.0
3	34	9.6	13	10.9
4+	26	7.3	10	8.4
<b>Educational Attainment:</b>				
grades 7- 9	12	3.4	1	0.8
grades 10-12	123	35.1	36	30.3
some college/university	101	28.9	24	20.2
college/university degree	114	32.6	58	48.7
<b>Family Income:</b>				
\$0-10,000	12	3.6	1	0.9
\$10,000-29,000	68	20.5	17	14.8
\$30,000-49,000	163	49.2	58	50.3
\$50,000- +	88	26.6	39	33.9
<b>Employed Household Members:</b>				
0	9	2.5	4	3.4
1	114	32.0	32	26.9
2	233	65.4	83	69.7

N = number of respondents in subgroup  
 % = percentage of respondents in subgroup

first pregnancy may motivate a respondent to consider planning the birth time of subsequent children. For example, if the respondent was in the advanced stages of pregnancy during the late summer, she may experience that the warm weather added to the discomfort of her pregnancy.

Because of this experience, she may attempt to time the births of subsequent children toward the spring. Overall, the propensity to seasonally plan a birth may be associated with the educational attainment of the respondent, and the number of times the respondent has been pregnant.

Table 5.8 lists the reasons for timing the arrival of a

TABLE 5.8

Reasons For Timing a Birth Cited by Planners

Response	N	%	Response Type
1. Correspond to Low Work Season	20	18.2	C
2. Want Baby Born in Summer	16	14.5	W
3. Want Baby Born in Spring	12	10.9	W
4. Avoid Pregnancy in Summer	11	10.0	W
5. Weather	10	9.1	W
6. Timing of Maternity Leave	8	7.3	C
7. Career	6	5.5	C
8. Avoid Christmas	5	4.5	S
9. Birth Near Beginning of School Year	5	4.5	S
10. Wanted to Space Children	4	3.6	S
11. Child's Birthday to Stand Apart	2	1.8	S
12. Other (11 responses)	11	10.1	O
Total	110	100.0	

N = number of times a response was given  
 % = percentage of total number of responses  
 W = weather related; C = career related;  
 S = social related; O = other

child, as cited by the planners. These results indicate the influence of weather-related and career-related concerns in timing the arrival of a child. First, 44.5% of the seasonal birth planners indicated that they seasonally planned the

arrival of a child according to weather-related concerns. Most of these planners timed the arrival of their child toward spring or summer in order that the baby could be outdoors and that the respondent would not be pregnant during the warmest months. Second, 31% of the seasonal planners indicated that career-related concerns influenced the seasonal birth timing of their child. Timing births to correspond with the low work season was the most commonly cited reason for seasonally planning a birth. Births may be timed to coincide with the summer holidays so that more time could be devoted to the infant. Third, 14.4% of the planners indicated that social factors influenced their decision to seasonally time the arrival of their child. Within this group, 6.3% of the birth planners were concerned that the arrival time would be of some benefit to the child. For example, some planners timed the arrival of their children toward spring so that the children would not be among the youngest in their class at school.

#### 5.6 CHAPTER SUMMARY

In this chapter, the results of the questionnaire research are presented. Despite a consensus preference for an April/May birth, the majority of the sample respondents did not consider the season of birth to be an important factor when planning to have a baby. Further investigation revealed that only 27.4% of the sample respondents were seasonal birth planners. The birth planners tend to be more

highly educated than the non-planners, and they also tend to already have had at least one child.

An examination of the reasons for planning a birth as cited by the planners, indicates that most births were planned according to weather-related and career-related concerns. Most of the children born to the planners were targeted toward the spring or early-summer. Taken together, the results presented in this chapter suggest that the seasonal birth pattern in Winnipeg is influenced to some extent by the seasonal birth planners within the currently reproducing population.

## Chapter VI

### SUMMARY AND IMPLICATIONS

The objective of this research was to examine the seasonal birth pattern in Manitoba during the period 1920 to the present. The analysis of the seasonal birth pattern was conducted in two stages. First, a descriptive examination of the seasonal birth pattern was conducted. This examination focused primarily on the changes which have occurred in the pattern during the period 1920-1985. Second, the modern seasonal birth pattern was further examined by conducting questionnaire research on the reproductive behaviors and birth-month preferences of currently reproducing women in the city of Winnipeg.

#### 6.1 THE FINDINGS

##### 6.1.1 The Seasonal Birth Pattern in Manitoba: 1920-1985

The seasonal birth pattern in Manitoba has undergone considerable change during the period 1920-1985. First, the birth peak shifted from February-April in the 1920-1939 period, to May-July in the 1940-1959 period. This shift may have been the result of socio-economic and demographic changes within the province during this period. During the period from 1940-1960, there was rapid urbanization within the province. Thus, the overall birth pattern became

heavily influenced by the reproductive behaviors of the urban population. It is possible that summer was the most preferred season for birth because the baby could be taken outdoors. A summer birth coincides with the most preferred season for vacations. Births could be timed to coincide with the vacation period so that more time could be devoted to the child.

After 1960, the spring birth peak and winter trough become much less pronounced. The decrease in the amplitude of the birth pattern may have been influenced by continued socio-economic development within the province, and by the introduction, and subsequent widespread use of highly efficacious contraceptive methods. The use of contraceptives serves to reduce the influence of seasonal variations in coital activity on the seasonal birth pattern. As a result, the amplitude of the seasonal birth pattern decreases.

This examination has also shown that there are variations in the modern seasonal birth pattern within Manitoba. The birth pattern of Manitoba (Winnipeg excluded) is characterized by peaks in March and September, and by a trough in December/January. Some couples may target the arrival of their children toward early spring so that the births do not interfere with the agricultural work cycle. The September birth peak may be influenced by the Christmas holiday effect. It is possible that increased coital

activity during the Christmas season may result in a peak in births during the following September.

The current seasonal birth pattern in Winnipeg is characterized by an April/May peak, and by a trough in December/January. The purpose of the questionnaire research is to further interpret the modern seasonal birth pattern within Winnipeg.

#### 6.1.2 Results of The Questionnaire Survey

The questionnaire research yielded 477 completed questionnaires with which to interpret the modern seasonal birth pattern in Winnipeg. The questionnaires were administered primarily through pre-natal classes and doctors offices in Winnipeg, between June 1 and August 15, 1989.

The sample composition is assumed to be generally representative of reproducing women within the city of Winnipeg. Although the representativeness of the sample is not measured empirically in this study, there is no evidence to suggest that the composition of the sample is substantially skewed. However, due to the sampling method employed in the research, there may be a slight over-representation of younger women (20-29 years), and of the middle and upper-middle socio-economic groups.

An analysis of the birth-month preferences of the respondents revealed a consensus preference for an April/May

birth. The least preferred months for birth are December/January. Spring births were the most-preferred because the weather would be suitable for the infant to be outdoors, and because the respondent would not be pregnant during the warmest months. December/January are the least preferred months because the Christmas season is a socially demanding time, and because the weather is considered to be too cold.

Despite a consensus preference for month of birth, the majority of the respondents (62%) indicated that the season of birth was not an important factor to consider when planning for the birth of a child. Further investigation revealed that only 27.4% of the respondents identified themselves as seasonal birth planners.

A comparison of the socio-economic and demographic characteristics of planners and non-planners indicates that the propensity to seasonally plan a birth may be linked to the educational attainment of the respondent, and to the number of times the respondent was pregnant. Well educated respondents may have a greater propensity to plan the birth of their children for two reasons. First, they are more likely to be well informed on the effective use of contraceptives. Second, well educated women are normally employed outside the home. These women may time the arrival of their children to coincide with the less work-intensive periods of the year. The propensity to seasonally plan a

birth is also greater in respondents who already have had one pregnancy. Experiences during the first pregnancy may motivate a respondent to plan the birth times of subsequent children.

Overall, the analysis of the questionnaire results suggests that the small but predictable seasonal birth pattern in Winnipeg is influenced to some degree by the seasonal birth planners within the reproducing population. This statement can be supported in two ways. First, the amplitude of the seasonal birth pattern in Winnipeg is relatively small. Births in the peak month are only 6% above average. If the entire reproducing population were seasonal birth planners, then the amplitude of the birth pattern would be much greater. The relatively small seasonal variation in births suggests that the birth pattern is influenced by a fairly modest subgroup within the reproducing population.

Second, the majority of the sample did not consider the month of birth as an important factor when planning for the birth of a child. These respondents used contraceptives to control child spacing and family size, but not to target the arrival of their children toward specific months of the year. In contrast, the seasonal birth planners thought that the season of birth was of some importance. Most of the birth planners targeted the births of their children toward spring or early-summer. The months from March to May were

preferred because the weather is considered to be moderate and because the summer is a less work-intensive season.

## 6.2 IMPLICATIONS OF THE FINDINGS

The modern seasonal birth pattern in Winnipeg is influenced by the extensive use of highly effective contraceptive methods. The majority of the respondents used contraceptives to control family size and child-spacing. The seasonal birth planners within the sample used contraceptives to control fertility, but also to target the births of their children toward specific months of the year. There is one significant implication of these results which may not be immediately apparent. The seasonal birth pattern may become more pronounced if the proportion of seasonal birth planners within the population increases.

In Winnipeg, an increase in the amplitude of the seasonal birth pattern can be expected to exert a strain on public health services. Two strategies can be employed in order to offset this strain. First, additional medical staff could be obtained from non-essential medical services (e.g. elective surgery) during the peak birth months. A second and perhaps more appropriate strategy is for policy planners to devise incentives for targeting births toward other seasons. For example, maternity leaves could be extended, or "baby bonuses" could be paid to those who choose to have their baby during the low birth season. Seasonal birth

planners could then employ contraceptive techniques to take advantage of the incentives being offered. As a result, the amplitude of the seasonal birth pattern would be reduced.

### 6.3 DIRECTIONS FOR FUTURE RESEARCH

The primary contribution of this work is to interpret the seasonal birth pattern of an urban Canadian population through questionnaire research. Although some broad implications of the research are suggested, the study is essentially exploratory. In raising additional questions about the seasonal birth pattern in Canada, several directions for further research can be noted. First, there should be continued study into the regional variations of the seasonal birth pattern. This effort may provide additional information on the influence of different work patterns and social structures on the modern seasonal birth pattern.

Second, further research should be conducted on the seasonal birth patterns of planners and non-planners. In this research, it is assumed that birth frequencies among non-planners are randomly distributed throughout the year. It is possible however, that non-planners also exhibit a seasonal variation in births. In order to investigate this possibility, much larger sample sizes, and more detailed information on reproductive intentions must be obtained.

Finally, an analysis of the effects of the seasonal birth pattern on health care services would constitute a practical application of the research in this field. For example, the influence of the seasonal birth pattern on supportive medical services within Winnipeg could be assessed. The author is aware of only one discussion on the influence of the seasonal birth pattern on medical services (Kenny and Ritter, 1981). To conclude, it is hoped that this research has contributed to a deeper understanding of human fertility, and has indicated several avenues of further research on seasonal birth patterns.

## Appendix A

### MANITOBA BIRTHS BY MONTH OF OCCURRENCE: 1920-1985

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1920	1652	1682	1733	1596	1576	1430	1572	1518	1488	1443	1308	1324
1921	1482	1382	1686	1656	1560	1551	1505	1576	1574	1537	1420	1549
1922	1574	1445	1604	1504	1553	1457	1568	1537	1466	1355	1319	1297
1923	1331	1384	1492	1466	1421	1292	1432	1428	1390	1379	1218	1236
1924	1277	1278	1375	1355	1308	1259	1281	1321	1263	1255	1217	1265
1925	1252	1150	1295	1278	1317	1287	1234	1314	1221	1176	1179	1164
1926	1190	1197	1316	1275	1250	1179	1249	1229	1266	1134	1191	1185
1927	1134	1122	1262	1241	1182	1188	1177	1215	1175	1197	1131	1123
1928	1210	1116	1324	1357	1189	1109	1152	1235	1239	1212	1153	1208
1929	1262	1097	1223	1140	1230	1202	1213	1285	1135	1177	1113	1159
1930	1220	1159	1261	1263	1246	1194	1267	1269	1248	1162	1072	1050
1931	1228	1052	1308	1221	1191	1213	1297	1218	1226	1189	1228	1105
1932	1168	1156	1270	1181	1193	1126	1166	1218	1230	1171	1080	1165
1933	1154	1102	1253	1172	1158	1097	1172	1110	1077	1046	946	1017
1934	1110	1036	1187	1050	1130	1044	1204	1187	1127	1112	1030	1093
1935	1085	997	1179	1176	1145	1111	1201	1142	1110	1174	1031	984
1936	1035	1027	1174	1148	1067	1125	1187	1094	1047	1048	920	983
1937	1010	981	1213	969	1040	1163	1198	1134	1181	1053	924	1022
1938	1098	1035	1149	1123	1112	1192	1250	1151	1163	1083	1045	1077
1939	1092	1010	1275	1159	1207	1153	1210	1154	1179	1137	1060	947
1940	1085	1053	1224	1193	1243	1258	1344	1381	1335	1215	1217	1223
1941	1180	1106	1251	1366	1347	1262	1295	1298	1245	1152	1133	1177
1942	1222	1138	1329	1249	1375	1338	1453	1352	1366	1323	1228	1297
1943	1356	1296	1439	1361	1497	1408	1452	1461	1411	1334	1216	1181
1944	1254	1257	1427	1345	1447	1419	1440	1288	1367	1253	1248	1266
1945	1296	1171	1392	1383	1477	1386	1449	1349	1380	1343	1297	1330
1946	1286	1263	1524	1562	1648	1620	1735	1705	1649	1645	1575	1582
1947	1662	1512	1828	1827	1884	1865	1893	1711	1655	1611	1462	1499
1948	1528	1451	1642	1581	1670	1668	1655	1629	1614	1504	1473	1455
1949	1441	1436	1729	1560	1790	1716	1709	1709	1680	1605	1461	1456
1950	1467	1470	1709	1649	1703	1728	1745	1635	1636	1544	1512	1463
1951	1558	1353	1695	1718	1889	1747	1763	1710	1754	1664	1567	1524
1952	1562	1550	1816	1824	1832	1787	1875	1835	1775	1760	1618	1543
1953	1563	1515	1824	1816	1920	1836	1929	1953	1805	1738	1642	1701
1954	1743	1721	1962	1904	1874	1915	2006	1796	1924	1876	1717	1810
1955	1813	1648	1951	1879	2008	1930	1998	1898	1908	1803	1792	1772
1956	1767	1691	1920	1779	1929	1955	1963	1982	1845	1812	1618	1684
1957	1736	1657	1885	1933	1993	1982	2092	1826	1866	1847	1757	1788
1958	1699	1683	1938	1805	1949	1862	1825	1751	1891	1822	1747	1725
1959	1872	1716	2150	2107	2112	2092	2115	2103	2158	1985	1861	1860

## Manitoba Births by Month of Occurrence

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1960	1767	1708	2010	2075	2146	1922	2080	2082	2006	1859	1765	1817
1961	1836	1721	1991	1985	2048	1985	2109	1985	1954	1917	1839	1918
1962	1808	1664	1986	2003	2040	1984	2013	1994	2004	1864	1794	1764
1963	1879	1768	2023	1929	1976	2025	2004	1949	1976	1866	1688	1668
1964	1779	1729	1875	1795	1885	1958	1985	1772	1951	1689	1638	1698
1965	1682	1534	1806	1744	1805	1735	1751	1722	1669	1589	1483	1456
1966	1535	1467	1577	1548	1625	1555	1555	1532	1579	1467	1312	1255
1967	1367	1331	1545	1466	1490	1470	1513	1496	1443	1374	1351	1334
1968	1381	1295	1490	1481	1562	1483	1541	1524	1491	1428	1341	1407
1969	1507	1299	1462	1577	1609	1488	1598	1506	1419	1463	1413	1468
1970	1512	1366	1578	1510	1563	1577	1570	1473	1564	1557	1506	1472
1971	1507	1448	1625	1550	1578	1523	1594	1454	1501	1485	1392	1374
1972	1387	1469	1512	1539	1476	1444	1441	1535	1428	1392	1376	1399
1973	1357	1233	1451	1512	1492	1374	1475	1437	1405	1428	1359	1441
1974	1414	1285	1485	1442	1439	1470	1457	1449	1479	1523	1456	1412
1975	1401	1257	1459	1434	1517	1486	1528	1450	1477	1418	1308	1410
1976	1415	1347	1479	1448	1392	1314	1401	1400	1465	1394	1338	1340
1977	1384	1259	1457	1376	1423	1416	1486	1462	1430	1385	1278	1360
1978	1324	1246	1517	1356	1492	1372	1298	1351	1422	1375	1305	1339
1979	1347	1233	1407	1383	1526	1346	1404	1348	1338	1284	1305	1321
1980	1260	1251	1357	1360	1417	1322	1376	1333	1436	1365	1186	1326
1981	1289	1203	1416	1340	1455	1333	1411	1353	1274	1329	1339	1331
1982	1306	1317	1393	1327	1328	1322	1385	1360	1433	1308	1329	1315
1983	1277	1217	1508	1455	1484	1390	1404	1442	1448	1341	1272	1364
1984	1339	1312	1456	1400	1406	1374	1517	1436	1436	1402	1301	1272
1985	1373	1293	1514	1467	1498	1392	1569	1478	1392	1422	1365	1334

Appendix B

RATIO SCORES OF MANITOBA BIRTHS: 1920-1985

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1920	6	16	12	6	2	-5	1	-2	-1	-7	-13	-15
1921	-6	-3	7	9	-1	2	-4	0	4	-2	-7	-1
1922	5	7	7	3	3	0	4	2	1	-10	-9	-14
1923	-5	9	7	8	2	-5	2	2	3	-1	-10	-12
1924	-2	4	5	7	-0	-1	-2	1	-0	-4	-4	-3
1925	-1	1	3	5	4	5	-2	4	-0	-7	-4	-8
1926	-5	6	6	6	0	-2	0	-1	5	-9	-1	-5
1927	-6	3	5	7	-2	2	-2	1	1	-0	-3	-7
1928	-2	-3	8	14	-3	-7	-6	1	4	-1	-3	-2
1929	4	0	1	-3	2	3	0	6	-3	-3	-5	-4
1930	-0	5	3	7	2	1	3	4	5	-5	-10	-14
1931	-0	-5	6	3	-3	2	6	-1	3	-3	3	-10
1932	-2	3	6	2	-0	-3	-3	2	6	-2	-7	-3
1933	2	8	11	7	2	0	4	-2	-2	-7	-14	-10
1934	-2	1	5	-4	-0	-5	7	5	3	-2	-6	-3
1935	-4	-3	4	7	1	1	6	1	1	4	-6	-13
1936	-5	1	8	9	-2	7	9	0	-1	-4	-13	-10
1937	-8	-1	11	-9	-5	10	9	4	11	-4	-13	-7
1938	-4	0	0	1	-3	8	9	1	5	-5	-6	-6
1939	-5	-3	11	4	5	3	5	0	6	-1	-5	-18
1940	-13	-10	-2	-1	-1	4	7	10	10	-3	1	-2
1941	-6	-3	-1	12	7	4	3	3	2	-8	-7	-6
1942	-8	-5	-0	-3	3	4	9	2	6	-1	-5	-3
1943	-3	3	3	1	7	4	4	5	5	-4	-10	-15
1944	-8	-1	5	2	7	8	6	-5	4	-8	-5	-7
1945	-6	-6	1	4	7	4	5	-2	3	-3	-3	-4
1946	-19	-12	-4	1	3	5	9	7	7	3	2	-1
1947	-4	-3	5	9	9	11	9	-1	-1	-7	-13	-14
1948	-4	-3	3	2	4	8	4	2	4	-6	-5	-9
1949	-12	-3	6	-2	9	8	4	4	6	-2	-8	-11
1950	-10	-1	4	4	4	9	7	-0	3	-6	-5	-11
1951	-8	-12	0	5	12	7	4	1	7	-2	-4	-10
1952	-11	-6	3	7	4	5	7	4	4	0	-5	-12
1953	-13	-7	1	4	6	5	7	8	3	-4	-6	-6
1954	-8	1	4	4	-1	5	6	-5	5	-1	-6	-4
1955	-5	-4	3	2	6	5	5	-0	4	-5	-3	-7
1956	-5	-3	3	-1	4	9	6	7	3	-2	-10	-9
1957	-9	-3	-1	5	5	8	10	-4	2	-3	-4	-6
1958	-8	1	5	1	6	4	-1	-5	6	-1	-2	-6
1959	-9	-7	5	6	3	5	3	3	9	-3	-6	-9

## Ratio Scores of Manitoba Births

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1960	-10	-7	2	9	9	1	6	6	5	-6	-7	-8
1961	-7	-4	1	4	4	4	7	0	2	-3	-4	-3
1962	-7	-5	2	6	5	5	3	2	6	-4	-5	-9
1963	-3	1	5	3	2	8	4	1	6	-3	-10	-14
1964	-3	0	2	1	2	10	8	-4	9	-8	-8	-8
1965	-1	0	6	6	6	6	3	1	2	-6	-10	-14
1966	0	6	3	5	6	5	2	0	7	-4	-11	-18
1967	-6	1	6	4	2	4	4	3	2	-6	-4	-9
1968	-6	-6	1	4	6	4	4	3	4	-3	-6	-5
1969	-0	-5	-3	8	6	2	6	-0	-3	-3	-3	-3
1970	-2	-2	2	1	1	5	1	-5	4	0	0	-5
1971	-2	5	6	5	3	3	4	-5	1	-3	-6	-10
1972	-6	7	3	8	0	1	-2	4	0	-6	-4	-5
1973	-6	-5	1	8	4	-1	2	-0	1	-1	-3	0
1974	-4	-3	1	1	-2	3	-1	-1	4	4	2	-4
1975	-4	-4	0	2	4	5	5	-0	5	-3	-7	-3
1976	-0	2	4	6	-2	-4	-1	-1	7	-2	-2	-5
1977	-3	-2	3	0	0	3	5	3	4	-2	-7	-4
1978	-5	-1	9	1	7	2	-7	-3	6	-1	-3	-4
1979	-2	-1	2	4	11	1	2	-2	0	-7	-2	-4
1980	-7	-1	0	4	5	1	2	-2	10	1	-10	-2
1981	-6	-2	4	1	7	1	3	-1	-4	-3	1	-2
1982	-5	6	2	0	-3	-0	1	-1	8	-5	0	-4
1983	-9	-4	7	7	5	2	-0	2	6	-5	-7	-3
1984	-5	-1	3	3	-0	1	8	2	5	-1	-5	-10
1985	-5	-1	4	4	3	-1	8	2	-1	-2	-3	-8

Appendix C

WINNIPEG BIRTHS BY MONTH OF OCCURRENCE:  
1975-1988

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1975	621	557	656	607	735	624	691	574	675	616	534	603
1976	715	670	773	716	726	655	720	690	747	699	654	674
1977	670	617	752	721	726	722	766	694	705	722	618	675
1978	655	617	781	703	766	662	627	679	694	697	643	661
1979	662	602	718	677	730	682	702	687	682	648	631	673
1980	625	638	648	668	704	676	703	675	721	679	571	646
1981	646	604	719	708	738	674	721	677	607	694	685	652
1982	621	656	678	680	701	639	730	686	715	641	638	685
1983	632	626	739	785	795	674	711	722	762	698	643	688
1984	679	664	709	722	736	700	808	739	757	703	662	654
1985	671	666	778	788	780	755	799	760	718	716	709	672
1986	697	719	758	771	798	733	782	760	758	732	688	697
1987	728	668	800	773	822	795	775	782	701	705	698	667
1988	681	707	744	783	806	798	788	791	734	797	690	741

## Appendix D

### RATIO SCORES OF WINNIPEG BIRTHS: 1975-1988

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1975	-2	-3	3	-1	16	1	9	-10	10	-3	-13	-5
1976	0	0	8	4	2	-5	1	-3	8	-2	-5	-6
1977	-6	-4	6	5	2	5	8	-3	2	1	-10	-5
1978	-6	-2	12	5	10	-2	-10	-2	3	0	-4	-5
1979	-4	-3	4	2	6	3	2	-0	3	-6	-5	-2
1980	-7	1	-4	2	4	4	4	0	11	1	-12	-4
1981	-6	-3	4	6	7	1	5	-2	-9	1	3	-5
1982	-9	6	-1	2	2	-4	6	0	8	-7	-4	-0
1983	-12	-4	3	13	10	-3	-1	0	9	-3	-8	-4
1984	-6	-2	-2	3	2	0	12	2	8	-3	-5	-10
1985	-10	-1	4	9	4	4	7	2	-1	-4	-2	-10
1986	-8	5	0	5	6	0	3	1	4	-3	-6	-8
1987	-4	-2	6	6	9	9	2	3	-4	-7	-5	-12
1988	-11	-2	-3	5	5	7	3	3	-1	4	-7	-3

Appendix E

LIST OF DATA COLLECTION POINTS

Doctors' Offices

Abbot Clinic, 274 Osborne.  
Antilla/Yamamoto, 1114 Medical Arts Bldg.  
Bertsch, Rothesay Medical, N. Kildonan.  
Bourgeois-Law, 400 Tache.  
Collister, 1102 Medical Arts Bldg.  
Dubyna, Winnipeg Clinic.  
Fainman, 514-388 Portage Ave.  
Set, 702 Medical Arts Bldg.  
Shah, 407-388 Portage Ave.  
Sinha, 120 Marion.  
Sylwestrowicz, 1108 Medical Arts Bldg.

Pre-Natal Classes

Birthing Awareness, Nancy Gajdosik (instr.),  
685 William Ave.  
Heart And Hands Complete Natural Childbirth,  
Donna Peters, St. Andrews River Heights  
United Church, 255 Oak St.  
Lamaze Prepared Childbirth, Cathy Cordy,  
St. James YMCA, 150 Ferry.  
Prepared Childbirth Classes, Moshe and  
Sharon Selchen, Seven Oaks and  
Concordia General Hospitals.  
Prenatal Classes For Singles, Jeanette Quaglia,  
Young Parents Community Center, 100-475 Sargent Ave.  
Vaginal Birth After Cesarean Support Group,

Claire Dorge, Southwood Mall Women's Center,  
1910 Pembina Hwy.

Life Care Center, Linda Oellet, 475 Provenche Blvd.

City of Winnipeg Childbirth Classes: 385 River Ave,  
Sandy Prince and Alex Henteleff; 601 Aikens, Pam  
Swensen and Rita Friesen; 102-490 Hargrave,  
Marlene Hoffman.

Grace General Hospital Childbirth Classes,  
Evon Blais, 300 Booth.

Victoria General Hospital Childbirth Classes,  
Shelley Burkett, Ft. Richmond.

Youville Clinic, Donna Foreman, 33 Marion.

#### Pre-Natal Fitness Classes

Seven Oaks Pool, Joanne Muir, 444 Adsum, OKld.

Target Fitness Center, Bonnie Gray, rm 124  
Frank Kennedy Bldg. Univ. of Manitoba.

#### Other Points

Welcome Wagon Baby Shower, Dea Code,  
International Inn, 1808 Wellington Ave.

Appendix F  
THE QUESTIONNAIRE

Winnipeg Birth Seasonality Survey

DO NOT USE THIS SPACE  
Complete\_\_\_ Incomplete\_\_\_

BEGIN HERE

1. Are you pregnant at this time? Yes\_\_\_ No\_\_\_
  
2. If you are pregnant, in what month do you expect your baby to be born?  
\_\_\_\_\_
  
3. How many times have you been pregnant? \_\_\_\_\_
  
4. Into which of the following age groups do you fit?  
under 20 years\_\_\_      30-39 years\_\_\_  
20-29 years\_\_\_      40 + years\_\_\_
  
5. In what month were you born? \_\_\_\_\_
  
6. Do you have air-conditioning where you live?  
Yes\_\_\_ No\_\_\_

7. What country were you born in?

\_\_\_\_\_

8. Which language do you normally speak at home?

\_\_\_\_\_

9. What religion do you belong to, if any?

\_\_\_\_\_

10. What do you think is the best month of the year to have a baby?

\_\_\_\_\_

11. Why do you think it is the best month?

\_\_\_\_\_

12. What do you think would be the worst month of the year to have a baby?

\_\_\_\_\_

13. Why do you think it is the worst month?

\_\_\_\_\_

14. Please list the month and year of birth of all your natural children, from oldest to youngest.

	month	year		month	year
first child:	_____	_____	sixth child:	_____	_____
second child:	_____	_____	seventh child:	_____	_____
third child:	_____	_____	eighth child:	_____	_____
fourth child:	_____	_____	ninth child:	_____	_____
fifth child:	_____	_____	tenth child:	_____	_____

15. Have you ever used contraceptives of any kind?

Yes\_\_\_ No\_\_\_

16. Did you ever become pregnant even though you used contraceptives?

Yes\_\_\_ No\_\_\_

17. Do you think that the amount of money the family makes is important in planning when to have a baby? (Please check the appropriate space)

very important\_\_\_ important\_\_\_ not important\_\_\_

18. Do you think that the season of the year that a child will be born in is an important factor when planning to have a baby?

very important\_\_\_ important\_\_\_ not important\_\_\_

19. Can you list any other things that you think are important in planning for the arrival of a baby?

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20. For any pregnancy, did you try to time the child's arrival TOWARD a certain month or season?

Yes\_\_\_ No\_\_\_

21. If "yes", for what reasons did you do this?

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22. Let us assume that you wanted to give birth to a baby during a certain season. Let us also assume that you did not get pregnant in time for the birth to occur during this season. Would you now use contraception to avoid having the baby born during any other season?

Definitely Probably Probably Not Definitely Not

23. Are you employed outside the home? Yes\_\_\_ No\_\_\_

24. If you are employed outside the home, do you have a full-time or a part-time job?

Full-time\_\_\_ Part-time\_\_\_

25. Is your husband or boyfriend employed outside the home?

Yes\_\_\_ No\_\_\_

26. If your husband or boyfriend is employed outside the home, does he have a full-time or a part-time job?

Full-time\_\_\_ Part-time\_\_\_

27. In what season do you normally take a vacation?

Spring\_\_\_ Summer\_\_\_ Fall\_\_\_ Winter\_\_\_ No Vacation\_\_\_

28. Please indicate your total family income in 1988?

less than \$10,000\_\_\_ \$30,000 to \$49,999\_\_\_  
\$10,000 to \$29,999\_\_\_ over \$50,000\_\_\_

29. Please indicate the level of schooling you have completed.

no school\_\_\_ grade 10 to 12\_\_\_  
grade 1 to 6\_\_\_ some college or university\_\_\_  
grade 7 to 9\_\_\_ a college or university degree\_\_\_

30. Did you find any of these questions to be offensive?

Yes\_\_\_ No\_\_\_

If "Yes", which one(s)? \_\_\_\_\_

PLEASE REMEMBER TO RETURN THIS QUESTIONNAIRE

Thank-you very much for your time.

Appendix G

MODIFICATIONS TO THE QUESTIONNAIRE

Original Questions

- 11b. Why did you choose this month?
- 13b. Why did you choose this month?
- 21. For any child, did you try to time the child's arrival  
TOWARD a certain month or season?

Modified Questions

- 11b. Why do you think it is the best month?
- 13b. Why do you think it is the worst month?
- 21. For any pregnancy, did you try to time the child's  
arrival TOWARD a certain month or season?

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