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Fertility Projections for Canada, Provinces and Territories, 1993-2016

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SYMBOLS

.. figures not available.

... figures not appropriate or not applicable.

- nil or zero.

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SUMMARY

This paper describes the methodology for fertility projections used in the 1993-based population projections by age and sex for Canada, provinces and territories, 1993-2016. A new version of the parametric model known as the Pearsonian Type III curve was applied for projecting fertility age pattern. The Pearsonian Type III model is considered as an improvement over the Type I used in the past projections. This is because the Type III curve better portrays both the distribution of the age-specific fertility rates and the estimates of births. Since the 1993-based population projections are the first official projections to incorporate the net census undercoverage in the population base, it has been necessary to recalculate fertility rates based on the adjusted population estimates. This recalculation resulted in lowering the historical series of age-specific and total fertility rates, 1971-1993. The three sets of fertility assumptions and projections were developed with these adjusted annual fertility rates.

It is hoped that this paper will provide valuable information about the technical and analytical aspects of the current fertility projection model. Discussions on the current and future levels and age pattern of fertility in Canada, provinces and territories are also presented in the paper.

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A version of this paper was presented earlier and discussed at the meeting of the Federal Provincial Committee on Demography held in December 1992 and the Advisory Committee on Demographic Statistics and Studies held in November 1992. It was also reviewed by Prof. A. Mitra of Emory University. Professor N. Ryder made a special contribution to the development of fertility assumptions presented. The present version was reviewed by M. V. George, R. Lachapelle and J. Dumas. Y. Lavoie of the Université du Québec à Montréal reviewed the French manuscript. Editorial assistance was provided by L. Wise; computer programming by V. Kawka; technical help by L. Dell'Oso, P. Johnston and D. St-Germain.

COMING SOON

"The Population in Collective Dwellings: Canada, 1971-1991" in ***Demographic Document No. 2***, Catalogue no. 91F0015MPE.

TABLE OF CONTENTS

INTRODUCTION

At the national level, fertility is still the most important demographic factor influencing population growth and the age structure[1], although it has declined to a level that is no longer sufficient to ensure the renewal of generations[2]. As in the past, trends in population growth and the age structure will depend heavily on the future course of fertility. What direction is fertility likely to take? This topic has engendered considerable discussion and speculation among demographers. Forecasting the future course of fertility has always been a challenging endeavour for the demographers involved in population projections.

The fertility projections in the 1993-based[3] population projections employ a new version of the parametric model, known as the Pearson Type III curve. This model requires four parameters to project the age-specific fertility rates: the total fertility rate (TFR), the mean age of fertility, the variance, and the third moment of the fertility distribution or skewness. A discussion on this new method is given in Chapter 1.

The 1993-based population projections are the first official projections to incorporate the net census undercoverage in the population base, which necessitated the recalculation of fertility rates based on the adjusted population estimates. Chapter 2 presents the historical series of the four fertility parameters based on the adjusted population estimates. This chapter also examines the recent trends and patterns of fertility, with an emphasis on the national and provincial variations in total fertility rates and the age pattern of fertility.

Chapters 3 and 4 present the assumptions and their underlying rationales for the parameters utilized in the fertility projections. Finally, the conclusion offers some remarks on the unpredictability of fertility projections.

[1] This is only true at the national level; at the provincial level it is often internal migration which constitutes the most important growth factor.

[2] Under the current level of mortality, the replacement level of fertility was estimated to be around 2.1 children per woman.

[3] Based on population estimates as of July 1st, 1993.


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Chapter 1

METHODOLOGY: A FOUR PARAMETERS MODEL

The derivation of the annual number of births is obtained by applying projected age-specific fertility rates to the projected female population of corresponding child-bearing ages. For the past twenty years, Statistics Canada used Pearson's Type I curve to graduate age-specific fertility rates based on three fertility measures, namely, the total fertility rate, the mean age of fertility, and the modal age of fertility (Romaniuk, 1975). Instead of having to project the age-specific fertility rates by single years of age, this parametric model requires the projection of only these three relatively simple fertility measures.

The reduction in the number of fertility parameters offers appreciable operational and analytical advantages. The use of three simple and demographically significant parameters offers more analytical advantages than the conventional method. Since the age-specific fertility rate has little meaning in itself, it is difficult to relate it to those factors which determine a woman's actual reproductive behaviour. Therefore projections which are made in terms of age-specific fertility rates are mostly based on vague assumptions about future trends in fertility. In contrast, assumptions about future fertility formulated in terms of fertility parameters such as the total fertility rate and the mean and modal ages of fertility, are amenable to in-depth analysis and meaningful demographic interpretation.

In the past, Pearson's Type I curve was the most suitable choice to graduate age-specific fertility rates as the mean age of fertility had consistently been higher than the modal age. However, in recent years, with the generalised postponement of child-bearing the differences between the mean and modal ages of fertility have been narrowing and the shape of the distribution of child-bearing is becoming more symmetrical.

Due to the recent changes in the age pattern of child-bearing, Verma and Loh (1992) evaluated the utility of using the Pearsonian Type I curve as a means of graduating the age-specific fertility rates based on birth data from 1980 to 1989 for Canada, provinces and territories. The results of the analyses suggested that besides the Pearson Type I model, alternative curves of fertility need to be tested. Verma and Ford (1992) conducted a more thorough evaluation on the performance of Pearson Types I, II, III and normal curves in representing the age-specific fertility rates based on historical birth data from 1971 to 1989. These four models were chosen from the Pearson's thirteen different frequency curves on the basis of the moments of their age-specific fertility distribution. The evaluation procedures and results discussed in the aforementioned study will be summarized in the following subsections.

1.1 Pearson's System of Frequency Curves

Frequency distributions can be described by a system of curves. In demography, several types of population data, such as age-specific fertility rates, exhibit skewed bell-shaped patterns of distribution which can be approximated reasonably well by some frequency curves.

Pearson curves often use the prior knowledge or the assumption of different summary statistics of the distribution (mean, variance, index of asymmetry and kurtosis) in estimating the fertility distribution of rates. In predicting these parameters of the distribution, one is shaping the curve according to their projections of future

fertility. To the extent that the assumptions correctly anticipate the future, the projection foretells what will be the shape of the fertility distribution.

1.2 The Method of Moments

The fitting of Pearsonian distributions by the method of moments may be considered from two rather different standpoints. When the first four moments are known, the distribution can be approximated by a mathematical expression. However, when the observed data are from a random sample drawn from a population, the method of moments yields only estimates of the population moments and these do not in general, lead to efficient estimates of the population parameters. A more effective approach is to select a particular type of curve, by κ, β_1 and β_2 criteria and then estimate the parameters of that distribution by Maximum Likelihood (Stuart and Ord, 1987, Volume 1).

Following the Elderton (1930) procedure, most of the parameters are calculated from the first four moments of the frequency distribution. As these models are being tested against historical data, Verma and Ford (1992) obtained the parameters from the distribution of the age-specific fertility rates (f(x)). The necessary computational formulas are given below:

Total Fertility Rate	$= \int_0^\infty x^i f(x)dx$
Mean	$\mu_1 = \mu_1'$
Variance	$\mu_2 = \mu_2' - \mu_1'^2$
Third moment about the mean	$\mu_3 = \mu_3' - 3\mu_2'\mu_1' + 2\mu_1'^3$
Fourth moment about the mean	$\mu_4 = \mu_4' - 4\mu_3'\mu_1' + 6\mu_2'\mu_1'^2 - 3\mu_1'^4$
Index of assymetry	$\beta_1 = \mu_3^2 / \mu_2^3$
Index of Kurtosis	$\beta_2 = \mu_4 / \mu_2^2$

(formulas in which μ' are the observed moments of the distribution)

1.3 Selection Criteria

To select a curve which best fits the historical data of birth series and best predicts the values of age-specific fertility rates, Verma and Ford (1992) use two selection criteria. The first criterion examines the κ values, and the second criterion uses the parameters β_1 and β_2.

1.3.1 The *Kappa* Criterion

Karl Pearson developed a whole system of curves to fit skewed bell-shaped patterns by modifying the equation for a normal curve and based on a criterion, the κ criterion, for selecting the proper equation and formulas for computing the constants or parameters of the equations. The derivation of the formulas involves the use of moments about the mean.

The κ criterion is given by:

$$\kappa = \frac{\beta_1(\beta_2 + 3)^2}{4(2\beta_2 - 3\beta_1 - 6)(4\beta - 3\beta_1)}$$

where: $\beta_1 = \mu_3^2 / \mu_2^3$

$\beta_2 = \mu_4 / \mu_2^2$

μ_2, μ_3, and μ_4 are the second, third and fourth moments about the mean. The kappa criterion measures the extent of deviation from the symmetrical curve. If the value of kappa is negative, then the curve in question is negatively asymmetrical; if on the other hand, the value of kappa is positive, then the curve is positively asymmetrical. The κ criterion may have any value from $-\infty$ to $+\infty$, and the different types of Pearsonian curves cover all these possible values without overlap.

The following diagram shows which curve in the Pearson system fits according to the computed value of kappa (Elderton and Johnson, 1969).

Verma and Ford (1992) computed kappa values from age-specific fertility rates from 1971 to 1989 for Canada, provinces and territories[4]. For each year, the kappa values are negative for Canada, provinces and territories. Over the period, 1971-1989, kappa values have been increasing steadily with the exception of a number of years which show a slight variant from this trend. On the whole, the kappa values are getting closer to zero.

1.3.2 β_1 and β_2 Coefficients

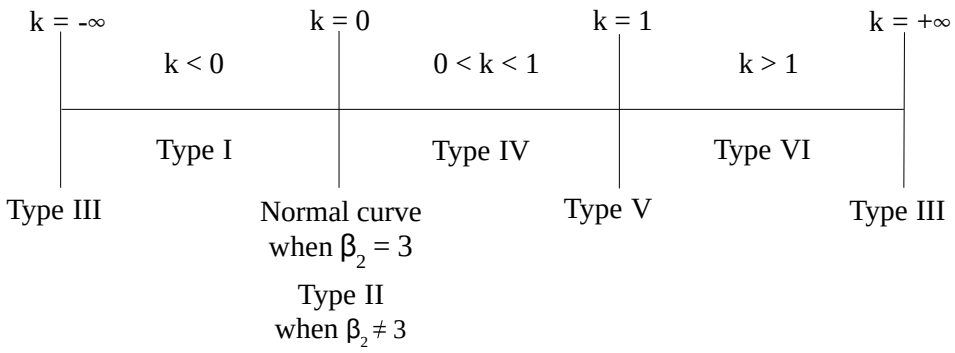
The second criterion involves the analysis of two parameters computed from the fertility distribution, namely, β_1 and β_2. The coefficient β_1 is a measure of skewness of the fertility distribution. If the distribution is symmetrical, β_1 vanishes. A positive value of β_1 means that the upper tail of the distribution is heavier and that mean > median > mode. Conversely, a negative value of β_1 indicates that the lower tail of the distribution is heavier and mode > median > mean. The β_2 coefficient of the fertility distribution measures the kurtosis. For the normal curve to exist, β_2 must be equal to 3 and β_1 must be equal to 0. For regular unimodal distribution:

$$\beta_1 < 1.8 \quad \text{and} \quad \beta_2 > 1 + \beta_1$$

For the normal, Type I and III curves, Mitra (1992) suggested the following limits of β_1 and β_2:

Curve	*Limits*
Normal	$\beta_1 < 0.02; \lvert(\beta_2-3)\rvert < 0.02$
Type II	$\beta_1 < 0.02; \beta_2 < 2.98$
Type III	$\lvert(2\beta_1 - 3\beta_2 - 6)\rvert < 0.02$

Diagram 1



Since values of kappa are negative for Canada, provinces and territories, there are only four Pearsonian curves conforming to the selection criteria which should be analysed. These are Types I, II, III and the normal curve. The operational limits of each of these curves are very narrow, for example, for the normal curve and type II, the operational limit for kappa is in the neighbourhood of zero (plus or minus 0.02). Thus, only the Type I and III curves meet the criteria of kappa under -0.02.

The decision process to select a Pearson curve using the kappa value is not always reliable. The value of kappa is found to be abnormal when the value of $2\beta_2 - 3\beta_1 - 6$ is in the neighbourhood of zero (Mitra, 1992). In view of this, Verma and Ford (1992) explored the values of β_1 and β_2 to determine the appropriate curve which would best fit the fertility data.

[4] For details on the values of kappa, refer to Appendix 1 in Verma and Ford (1992).

Stuart and Ord (1987) have also devised a β_1 and β_2 chart for the Pearson system. From the chart, it appears that the normal, Types II and III curves should be accepted under the following limits of β_1 and β_2:

Curve	*Limits*
Normal	$\beta_1 = 0; \beta_2 = 3$
Type II	$\beta_1 = 0; 2 < \beta_2 < 3$
Type III	$0 < \beta_1 < 1.8; 2 < \beta_2 < 3$

Over the nineteen years, 1971 to 1989, analyses of the β_1 coefficients show that they are all positive for Canada, provinces and territories. Over the years 1971 to 1989, the β_1 coefficients have declined to become very low. This suggests that the fertility curve by age is becoming symmetrical.

In general, β_2 coefficients of the fertility distribution computed for Canada, provinces and territories from 1971 to 1989 are between 2 and 3. However, in 38 out of 225 cases, β_2 coefficients are slightly higher than 3.

The values of the above-mentioned three parameters indicate that the Type III curve should be selected and the 38 cases, where the violation occurred, could be treated as outliers. However, in all these 38 cases, the Type III model still produced adequate results in the testing for goodness of fit.

1.4 Tests of Validity

Besides using the two criteria to select a best fit model, Verma and Ford (1992) also rely on three different tests of validity in determining which model best represents the true fertility pattern. Firstly, the index of dissimilarity is used to compare the two distributions of computed and actual age-specific fertility rates. Secondly, the frequency distribution of number of births by age of mother is analysed graphically to investigate how closely the models fit the actual data. Thirdly, the ratios of the actual number of births to the number of births generated by the four different models for the same period are computed and compared. It is important to note that the last test is used mainly as a guideline measure to determine if the model can accurately project the annual number of births, ***but not as a test to examine if the model best fits the age-specific fertility rates***. It is possible for the model not to fit the age-specific fertility rates but still result in a favourable ratio of actual to estimated births due to the distribution of the number of women in the child-bearing years.

In summary, the results of the analyses reveal that for the period 1971 to 1989 the Pearson Type III curve is more suitable than the Type I model to graduate the age-specific fertility rates for Canada, provinces and territories. Thus, for the 1993-based population projections, the Pearson Type III curve, was used to project the age-specific fertility rates for Canada, provinces and territories.

1.5 Formal Structure of the Type III Model

The Type III curve can be expressed as:

$$f(x) = y_0 (1 + x/\alpha)^{\gamma\alpha} e^{-\gamma x}$$

where x is measured as the deviation from the mode.

This curve has the characteristic that it has unlimited range in one direction. The Type III curves are usually bell shaped, but they can sometimes be J-shaped depending on the values of the parameters.

The parameters, γ and α are calculated as follows:

$$\gamma = 2\mu_2 / \mu_3$$

$$\alpha = (2\mu_2^2 / \mu_3) - (\mu_3 / 2\mu_2)$$

$$\text{Mode} = \text{Mean} - 1 / \gamma$$

In order to apply the Type III model to project the age-specific fertility rate, projections of its four parameters must be developed first. The parameters are the total fertility rate, the mean age of fertility (μ_1), the variance (μ_2), and the third moment of the fertility distribution (μ_3). The first parameter provides a convenient measure of the level of fertility while the latter three provide a measure of the age pattern of childbearing. The application of the model rests on an analysis of each of these parameters, and the formulation of assumptions on their future course over the projection period.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Chapter 2

TRENDS IN FERTILITY

2.1 Total Fertility Rates Based on Adjusted Population

2.1.1 The Impact of Adjustment

In general, coverage errors in the censuses vary by period, province, age group, and sex. Based on the reverse record check, the under-coverage rate in the 1991 Census was estimated to be of the order of 3.4% for Canada, varying from 1.7% in Prince Edward Island to 5.7% in the Northwest Territories. Undercoverage is not evenly distributed among age groups, but tends to be higher in certain age segments, e.g. among young adults aged 20 to 34. The under-coverage rates of the 1991 Census for the 20-24 and 25-34 age groups were found to be 8.2% and 5.6%, respectively. When these rates were broken down by sex, the highest under-coverage rates for males was also concentrated in the 20-24 and 25-34 age groups, 9.0% and 7.3%, respectively. For females, on the other hand, the undercoverage rate tended also to be highest in the 20-24 age group, 7.4%; followed by the 5-14 age group, 4.3%; and 25-34 age group, 4.0%.

The adjustment of net census undercoverage will have an impact on the observed total fertility rates, in most cases underenumeration in the censuses has resulted in an overestimation of the total fertility rates. The number of births used to derive total fertility rates are taken from vital statistics, and estimated as exact while the denominator is taken from the censuses and the postcensal population which are subject to coverage errors[5]. The adjustment for under-coverage have changed the historical series of total fertility rates, as the undercount in the censuses is heavily concentrated among females aged 20-34 years old, the age group most prone to child-bearing. Thus, fertility assumptions for the 1993-based population projections are formulated on the basis of the total fertility rates and other fertility parameters calculated with the adjusted situations of population.

Table A1 shows the historical series of total fertility rates calculated with the revised estimation of population from 1971 to 1993[6], (data for Newfoundland are not available from 1971 to 1973). On the whole, the new rates are slightly lower than the previous ones, with the exception of Prince Edward Island in 1989 and 1990. The discrepancies are largest among the territories and they are also notable among the four largest provinces. Yet, the differences are never very large. The largest discrepancy is the total fertility rate for the Northwest Territories in 1990: the revised figure shows 3.12 children per woman while the revised value is 2.78, a difference of 0.34 children per woman or 12%.

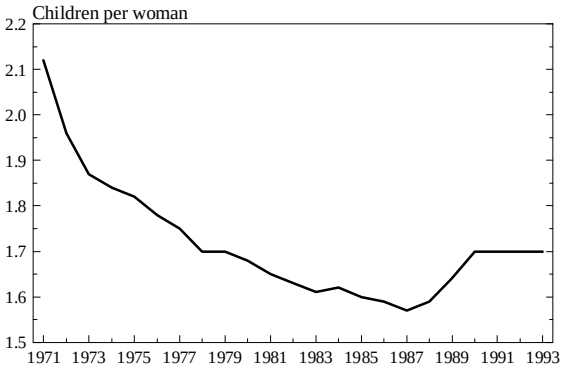
2.1.2 Trends in Total Fertility Rates

It can be seen from Figure 1 that total fertility rate was declining steadily from 1971 to 1987: from 2.12 children per woman to 1.57. This was followed by a steady increase in the next three years, from 1.57 children per woman in 1987 to 1.70 in 1990. Then the rates remained constant at the level reached in 1990 until 1993, the last year that data are available.

[5] The revised estimation of population also assures the consistency between the numerators and denominators. The non-permanent residents are now included in the revised population (they were not before) while the numerators have always counted the births of non-permanent residents.

[6] The 1993 total fertility rates for Canada, provinces and territories were estimated from the total number of births, data by age was not available.

Figure 1. Total Fertility Rates, Canada, 1971-1993



Source: Table A1.

All of the Atlantic provinces in 1974, had higher total fertility rates than the national average, but by 1993, only Prince Edward Island's total fertility rate remained higher. The total fertility rates of the Atlantic provinces declined steadily from 1974 to the mid-1980s. In the last ten years, with the exception of Newfoundland, there have been few fluctuations in these provinces' fertility rates. Newfoundland's total fertility rate declined steadily, until by 1993 its total fertility rate (1.49 children per woman) was the lowest in Canada.

Table A1 shows that Quebec's fertility has changed substantially in the last twenty years. In 1971, Quebec had the lowest provincial total fertility rate at 1.82 children per woman, compared to 2.12 children per woman for Canada as a whole. After stabilizing near 1.70 children per woman during the latter 1970s, total fertility rates in Quebec declined dramatically to 1.35 children per woman by 1987, the lowest provincial total fertility rate ever recorded in Canada. Similar to the trend in total fertility rates for Canada as a whole, the fertility rate in Quebec also experienced an increase and a subsequent stabilization between 1987 and 1992.

Because of the large population of the province, Ontario's total fertility rate closely resembled that of Canada as a whole. Between 1971 and 1981, Ontario's total fertility rate declined from 2.14 children per woman to 1.57, a decrease of 27% in ten years (Table A1). During the 1980s, there appeared to be a stabilization in Ontario's total fertility rate near 1.6 children per woman. In 1990, Ontario's total fertility rate increased slightly to 1.66 children per woman and remained virtually unchanged in the next three years.

In 1993, total fertility rates in Manitoba, Saskatchewan and Alberta were the highest among the provinces. Between 1971 and 1993, the trend in Manitoba's fertility can be generally summarized in two parts: steady decline during the first eleven years and gradual increase in the latter period (Table A1).

In 1993, Saskatchewan was the only province to record above replacement level fertility, 2.13 children per woman. Between 1978 and 1993, Saskatchewan consistently had the highest provincial total fertility rate (prior to 1978 Newfoundland had the highest total fertility rate). However, it can be seen in Table A1 that Saskatchewan's fertility was in a state of sharp decline between 1971 and 1987, from 2.66 children per woman to 1.97 children per woman, a decline of 26% in sixteen years. Its total fertility rate next remained relatively stable at approximately 2.00 children per woman between 1987 and 1992, followed by a slight recovery to 2.13 children per woman by 1993.

Table A1 shows that total fertility rates in Alberta and British Columbia were relatively stable between 1976 and 1993. During this period, Alberta's total fertility rate fluctuated within a close margin of 1.80 and 1.98 children per woman, while the total fertility rate of British Columbia varied between 1.59 and 1.68 children per woman.

It can be seen from Table A1 that total fertility rate of the Yukon and Northwest Territories,

tended to fluctuate more than corresponding provincial rates due to their smaller population base, and to a lesser extent to the late reporting of births (Stout and Verma, 1992, p. 41). Throughout the 1971-1993 period, the two territories continued to have a higher fertility rate than the national average, except in 1993, the total fertility rate of the Yukon was .05 children per woman lower than that of Canada. A gradual decrease in fertility has occurred in the two territories. In 1971, the Yukon had a total fertility rate of 3.03 children per woman; by 1993, it dropped to 1.65 children per woman. Similarly, between 1971 and 1993 the total fertility rate of the Northwest Territories declined from 4.49 children per woman to 2.71.

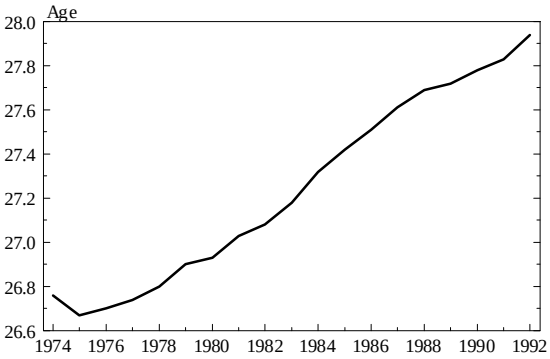
2.2 Age Patterns of Fertility Based on Adjusted Population

Table A2 presents the historical series of mean age of fertility for Canada, provinces and territories. It is evident that the mean age of fertility in Canada was increasing steadily over the last two decades (Figure 2). In 1974 the mean age of motherhood was 26.76 years, by 1992 it was 27.94 years, an increase of 1.18 years in eighteen years. This rise in the average age of child-bearing reflects the recent phenomenon of Canadian women delaying their child-bearing and older women making up for their postponed first births (Romaniuc, 1991, Loh and Ram, 1990).

From 1974 to 1992, the average age of mothers at childbirth varied among the provinces and territories, and instead of displaying a consistent pattern of increase like that of the nation as a whole, the provincial averages tended to fluctuate (Table A2).

In 1974, Quebec (27.59) and Prince Edward Island (26.85) were the only two provinces to have a mean age of fertility higher than that of Canada (26.76). However, the mean ages of fertility for Ontario (26.67),

Figure 2. Mean Age of Fertility, Canada, 1974-1992



Source: Table A2.

Saskatchewan (26.57), Manitoba (26.54) and New-foundland (26.50) were close to the national average. In contrast, Yukon (25.26) and Nova Scotia (26.13) had the lowest mean age of child-bearing.

In 1992, Ontario had the highest mean age at childbirth in Canada (28.48 years). This was more than half a year higher than the national average of 27.94 years. Next to Ontario came British Columbia (28.09), Quebec (27.90), Prince Edward Island (27.53), Yukon (27.52) and Alberta (27.49). The Northwest Territories had the lowest mean age of child-bearing (26.04 years) which was almost two years lower than that of total Canada.

Despite some minor annual fluctuations, the overall trend of the mean age of child-bearing among the provinces and territories is upward between 1974 and 1992, except for the Northwest Territories. The mean age of fertility in the Northwest Territories decreased slightly during this period, from 26.23 to 26.04 years. On the other hand, the mean age of mother at childbirth increased by more than two years in the Yukon, from 25.26 years in 1974 to 27.52 years in 1992. Similarly, Ontario and British Columbia experienced increases in their mean ages of fertility of more than one-and-a-half

years. The provinces of Nova Scotia and Alberta also had increases of more than one year in their mean ages of childbirth during this period.

The variance of the age-specific fertility rates for Canada, provinces and territories based on revised population estimates are presented in Table A3. For Canada, the variance decreased between 1974 and 1981 then it increased thereafter. Yet, the value observed in 1992 was lower than that recorded in 1974, 28.37 versus 28.80, respectively. Even though there are some ups and downs in the variance of the provinces, the trend has been declining over time for half of the provinces, with the exception of Ontario, Manitoba, Alberta, British Columbia and the Yukon.

In general, the trend in the adjusted third moment[7] of the fertility distribution is also a declining one over the period 1974 to 1992 (Table A4). For total Canada, the third moment declined steadily from 71.95 in 1974 to 15.72 in 1992. In 1974, the third moment of all the provinces and territories was larger than 50, by 1992, only the third moment of the two territories was over 50. In 1992, at the provincial level, the third moment ranged from a low of 3.04 in Ontario to a high of 34.72 in Saskatchewan. The lower values of the third moment of the age-specific fertility rate indicate the fact that the fertility curve by age is approaching more a symmetrical form (Verma and Ford, 1992).

[7] These third moments are based on revised population estimates adjusted for net census undercoverage.

Chapter 3

ASSUMPTIONS ON THE FERTILITY PARAMETERS

Among the four fertility parameters, the total fertility rate (TFR) is the most important index in the projection of births. Thus, the fertility levels and trends in terms of the total fertility rate are the prime targets of the analysis underlying the formulation of future fertility assumptions.

In developing assumptions about the total fertility rate, the experiences of other industrialized countries and previous Canadian fertility levels were examined. Various projection scenarios proposed by Stout and Verma (1992) and Ryder (1993) were also taken into consideration.

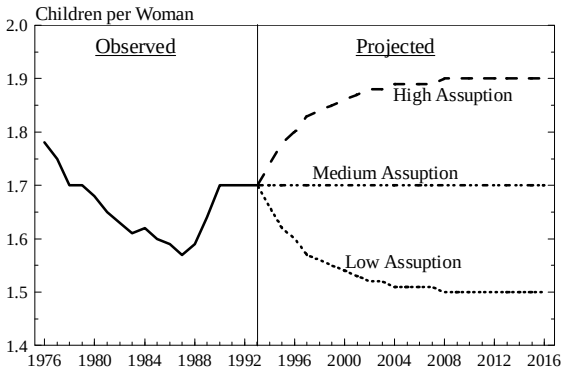
Tables A5 and A6 provide the projected TFRs and mean ages of fertility for Canada, provinces and territories and Figures 3 and 4 show the respective measures for Canada. The following outlines the three assumptions for low, medium, and high fertility based on the TFR and mean age of fertility, at the national level:

Low assumption: The total fertility rate for Canada continues to decline from 1.70 births per woman in 1993 to 1.50 by 2016. This assumption is combined with a high variant for the mean age of fertility which will increase from 27.9 in 1993 to 28.5 by 2016.

Medium assumption: The total fertility rate is assumed to remain constant at 1.70 births per woman throughout the projection period. The mean age of fertility is assumed to change slightly from 27.9 in 1993 to 28.0 by 2016.

High assumption: The increasing trend in the total fertility rate observed in the years 1987 to 1990 is assumed to continue in the future, with the total fertility rate for Canada climbing from 1.70 in 1993 to 1.90 births per woman by 2016. This assumption is combined with a low variant for the mean age of fertility decreasing from 27.9 in 1993 to 27.5 by 2016.

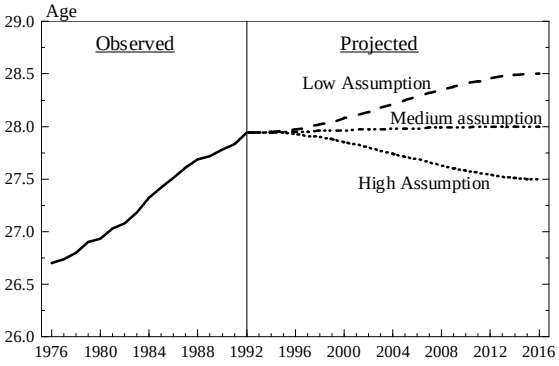
Figure 3. Total Fertility Rates Observed and Projected, Canada, 1976-2016



Source: Table A3.

The projected total fertility rates and mean ages of fertility for the intervening years were obtained by interpolation. Given the relatively narrow range between the high and the low assumptions and to provide a wider range

Figure 4. Mean Age of Fertility Observed and Projected, Canada, 1976-2016



Source: Table A4.

between the projected values in the initial years, a "decreasing slope" method was used to interpolate the TFR for both the low and the high fertility assumptions. This method assumes a geometric change of the slope of the fertility curves. Accordingly, the projected TFR values increase faster in the case of the high fertility assumption and decrease faster in the case of the low fertility assumption during the first half of the period, than in the second. At the same time, the slope of the low and high fertility curves will approach zero by 2016. The value of the slope, 0.0438, is based on the curve of the total fertility rate during the years 1987 to 1990, when the total fertility rate increased steeply from 1.57 births per woman in 1987 to 1.70 in 1990. Since the slope slowly approaches zero (.000194) by 2016 to achieve the total fertility rate of 1.90 and the slope is specified at 0.0438, the annual rate of change of the slope is estimated to be -0.2182.

If "t" is assumed to be the year in question, the equations used to generate the projected total fertility rates for Canada under the high fertility assumption are:

Year	*High Assumption*
1993 (base year)	1.70
1994	$TFR_{t-1} + 0.0438$
1995	$TFR_{t-1} + 0.0438 * (1 - 0.2182)$
1996	$TFR_{t-1} + 0.0438 * (1 - 0.2182)^2$
...	
2016	$TFR_{t-1} + 0.0438 * (1 - 0.2182)^{22}$

During the period of steady fertility decline, 1971 to 1987, the annual rate of change was -0.034. Instead of using this value to approximate the slope in the low fertility assumption, it was decided to use the same slope as in the high assumption (0.0438) as the two values are similar in terms of magnitude and in doing so, it was possible to obtain equal-distance between the medium and high, and the medium and low fertility levels. The equations for deriving the total fertility rates in the low fertility assumption are:

Year	*Low Assumption*
1993 (base year)	1.70
1994	$TFR_{t-1} - 0.0438$
1995	$TFR_{t-1} - 0.0438 * (1 - 0.2182)$
1996	$TFR_{t-1} - 0.0438 * (1 - 0.2182)^2$
...	
2016	$TFR_{t-1} - 0.0438 * (1 - 0.2182)^{22}$

A different interpolation method was adopted for generating the mean ages of fertility as the three fertility variants assumed lesser changes in the initial period than the changes in total fertility rates. The method used to interpolate the mean age of fertility was suggested by Ryder (1993). This method will be briefly discussed below.

As in any extrapolation the more recent values are more significant than the more distant ones in interpolating the mean ages of fertility, Ryder suggests fitting a straight weighted least squares line to the observed values for the data covering the past ten years in which the weights are the squared values of the order of the time scale (1,2, 3, ..., 10). With the observations being Y and X=1 to 10, the slope can be generated using the following formula[8]:

$$s = \frac{\sum(X^2Y) - 7 * \sum(XY)}{330}$$

A cubic curve is then used to interpolate the mean age of fertility, in which the initial value (YA) and the slope (s) are specified at 27.94 and 0.0813, respectively, the horizon value (YW) is provided in each of the three fertility variants, and

[8] Specific case for an analytical period of 10 observations of the general formula with x and y taking the values 1 to 10:

$$s = \frac{\sum(x_i^2 y_i) - \sum x_i^2 / \sum x_i * \sum(x_i y_i)}{\sum x_i^2 - \sum x_i}$$, in that case

$\sum x_i^2 / \sum x_i = 385 / 55 = 7$ and

$\sum x_i^2 - \sum x_i = 385 - 55 = 330.$

the horizon slope is zero. The horizon slope is set at zero to ensure that the approach to the horizon value is gradual. The formula of the curve is:

$$YA\,(q^2(1 + 2p)) + YW(p^2(1 + 2q)) + s(q^2p)$$

where p is the proportion of time elapsed from threshold to horizon, and q=1-p.

Assumptions for the total fertility rate and mean age of fertility were first developed at the national level. Projected values for provinces and territories were then derived from the national ones using an index method based on observed national/provincial ratios.

This index method is discussed extensively by Stout and Verma (1992). The relative index is calculated using the following formula:

$$PTFR_t / CTFR_t$$

where PTFR refers to the provincial total fertility rate, CTFR refers to the total fertility rate for Canada, and "t" refers to the year in question.

The provincial and territorial total fertility rates were projected as follows:

1. A relative index for each province and territory was derived for the last three years, 1991, 1992 and 1993. Then an average of the indices for these three years was calculated. For the Yukon, a 5-year average was developed due to the irregularities in the data.

2. The difference between the 3-year average provincial relative index and the 1993 provincial relative index was found.

3. In order to smooth the transition from the observed to the projected values of the total fertility rates, the differences between the index for 1993 and the 3-year average index for each province/territory were distributed over the first five years of the projection period by an exponential equation, except for Saskatchewan and the two territories. From 1998 onwards, the 3-year average provincial relative indices were assumed to remain constant for the rest of the projection period. For Saskatchewan and Northwest Territories, the differences were distributed over the first ten years of the projection period, and for Yukon, the difference was distributed over the whole projection period.

4. Lastly, the provincial total fertility rates for the low, medium, and high fertility assumptions were generated by multiplying these projected relative indices by the projected national total fertility rates of the respective fertility variants.

Unlike the previous sets of projections, the current set does not assume that the fertility rates for the provinces would converge to the national level (see Statistics Canada, 1990). The projected total fertility rates for the provinces and territories are presented in Table A5.

As the analyses of provincial and territorial mean age of fertility do not show any sign of converging during the period 1974 to 1992, and the annual fluctuations in these mean ages are small, a simpler version of the index method was adopted to project the provincial mean ages of fertility. It was assumed that the average national/provincial relative indices of the last three years (1990, 1991 and 1992) remained constant throughout the projection period. The provincial mean ages of fertility for the low, medium, and high variants were then derived by multiplying the provincial relative indices by the respective national mean ages of fertility. Table A6 presents the projected mean ages of fertility for the provinces and territories.

In order to keep the projection model simple, one assumption was developed for the other two fertility parameters, namely, the variance and the third moment of the fertility distribution (Table A7). The values of these two parameters are assumed to be constant over the projection period, using a three-year average (1990, 1991 and 1992) of provincial or territorial levels.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Chapter 4

THE RATIONALE FOR THE ASSUMPTIONS

4.1 The Low Fertility Assumption

By the 1990s, fertility decline was evident in Canada as well as in other industrialized countries. Though the pace and timing of the decline is different among the developed nations, the factors contributing to this downward trend are basically similar. The recent economic, cultural, and institutional changes throughout the industrialized world have resulted in the growth of female employment, increased knowledge and use of effective contraception, declining marriage rates, postponed marriage and child-bearing, higher rates of divorce and growth in less procreation-oriented conjugal arrangements (Romaniuc, 1991). In addition, the prevailing social values seem to favour materialism and consumerism more than family responsibilities (Lutz, 1994). All these factors are likely to exert a downward pressure on fertility.

Has the decline in fertility run its course or will it continue into the next century? Romaniuc (1991) postulates that social changes associated with the decline in fertility are likely to continue their downward pressure on fertility levels in the long run. A host of mutually-reinforcing factors are at work making low fertility a highly likely long-term prospect for advanced societies such as Canada.

The negative relationship between female labour force participation and procreative behaviour has long been established in demographic and sociological research (Devaney, 1983, Ram and Norland, 1982, Butz and Ward, 1979 and Fleisher and Rhodes, 1979). The constant desire for higher standards of living and the wider range of job opportunities for women, will exert greater and greater pressure on women to join the work force, or remain in it longer. According to recent labour force projections, close to 80% of married women aged 15-44 may be in the work force by 2011, compared to 71% in 1986 (Basavarajappa, Bender and Larrivée, 1992). Not only are more women participating in the labour force, they are holding down more permanent and more highly-skilled jobs, which require greater commitment, thus making the dual roles of parenting and working more difficult (Romaniuc, 1991). A recent study on American families observes that women, including those with young children, are likely to work outside their homes (DaVanzo, Rahman and Wadhawa, 1993). The economic opportunities for women are likely to continue to reduce the incentives to marry and have children, or lead to delayed marriage and child-bearing, and may keep the divorce rates fairly high.

During the last two decades, the institution of marriage and family have experienced some fundamental changes. The general trend has been a shift away from marriage towards other life styles such as remaining single, or living in common-law unions (Stout and Verma, 1992). The proportion of common-law unions has risen sharply in recent years, while the proportion of marriages has declined.

Keyfitz argues that below replacement fertility will continue in industrialized countries as "childrearing is an activity that is less likely to compete in attractiveness either with work or with leisure, and the child as product is of insufficient value to the parents to cause them to give up alternative commodities" (1986:148).

Table A8 presents the cumulative fertility rates up to specified ages for selected birth

cohorts from 1906 to 1975[9]. Trends in cumulative fertility rates show that after the marked upswing in the fertility rates of the cohorts of 1921 to 1931, there has been a persistent decline in the fertility rates of cohorts born in the late 1930s and later. This downward trend in cohort fertility is even more pronounced for the recent birth cohorts. Thus, it seems that having a smaller family size has become the norm or preference for the current generations.

In conclusion, the low fertility assumption implies that the recent upturn in fertility is a minor fluctuation in the total fertility rate, and that it has reached its peak in 1990 as the most recent data seem to reveal a stabilization in fertility gain. Thus, it assumes that the total fertility rate will resume its steady downward trend again and reach a level of 1.50 children per woman by 2016. This is slightly lower than the lowest fertility level of 1.57 children per woman for Canada in 1987.

4.2 The Medium Fertility Assumption

The recent trends in Canadian fertility suggested a stabilization around 1.70 children per woman. This consistent pattern in the fertility level is also noticeable among most of the provinces except Newfoundland, Manitoba, Saskatchewan and the two territories. In the United States, there are also indications that fertility levels are stabilizing and that declines have been slowing down. These may reflect the reality that having a child is a powerful norm in our society, and the vast majority of women do want and indeed do have at least one child, often two, even in the 1990s (Grindstaff, 1992).

The medium assumption generally reflects the tendency for fertility to remain unchanged at the base year level of 1.70 children per woman. Adopting the current total fertility rate as the medium assumption has in addition some analytical advantage as it opens up the possibility of examining the impact of a constant fertility level on future population growth and composition.

4.3 The High Fertility Assumption

After the baby-boom period, the total fertility rate in Canada declined steadily until the late 1980s, when there was a brief upturn, from 1.57 births per woman in 1987 to 1.70 in 1990. The chief reason for the current increase is that many of the baby-boom women (those born between 1946 and 1966) who until recently had postponed child-bearing began to have children in their thirties and early forties (Romaniuc, 1991). It appears that a substantial number of them are trying to catch-up on their delayed child-bearing before their biological clocks have run their course and having children becomes impossible. This catch-up phenomenon may continue into the next century until the baby-boom cohort exits its child-bearing years.

Another phenomenon called "shifting shares" has been suggested by demographers as a contributing factor to the recent increase in fertility (Bouvier and De Vita, 1991). As the fertility of the foreign-born population tends to be higher than that of Canadian-born women, increases in the proportion of the foreign-born population may result in an overall increase in fertility. Though the effect of this phenomenon is expected to be small, if the proportion of foreign-born women were to increase in the near future, then the fertility rate would increase accordingly (Statistics Canada, 1990; Ram and George, 1990).

For the reasons cited above, the high fertility assumption assumes that the total fertility rate in Canada will increase steadily from 1.70 in 1993 to about 1.90 births per woman by 2016. In earlier projections, the replacement level

[9] These third moments are based on population estimates adjusted for net census undercoverage.

of 2.10 children per woman has been used for the high assumption. However, Ryder (1993) has stated that there is no basis for setting the high assumption at the replacement level, in fact, "any connection between a stable population measure like this and reproductive behaviour verges on the mystical".

4.4 Relationship Between the Total Fertility Rate and the Mean Age of Fertility

The relation between the total fertility rate and the mean age of fertility can be discussed in terms of the two phases in long-term fertility decline. In the first phase, the main source of decline in the total fertility rate is the decline in higher-order fertility. Since higher-order births occur at higher ages, the decline of the total fertility rate is accompanied by a decline in mean age of fertility.

In the second phase, however, when the total fertility rate is already relatively low, further decline in high-order fertility is of much less importance, and the main determinant of the mean age of fertility becomes the mean age of first-order fertility. Trends in fertility suggest an inverse relationship between mean age at first order fertility and the level of fertility. Thus, Ryder (1993) recommends combining a low assumption for the total fertility rate with a high variant of the mean age of fertility, and a high assumption for the total fertility rate with a low variant of the mean age of fertility.


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CONCLUDING REMARKS

Given the inherent unpredictability of the fertility patterns of future generations, it is difficult to predict the future level of fertility (Stout and Verma, 1992). Projections are not predictions. They are based on stated assumptions which incorporate varying degrees of uncertainty about future levels and patterns in the components of population change (Statistics Canada, 1985). With these uncertainties, alternative projections are presented that are designed to encompass a plausible range of variations in the factors affecting the future levels of fertility. Projections are developed based on underlying assumptions determined through the analysis of previous fertility trends over time and the experience of other industrialized nations. Thus, they reflect future growth trends which would occur under the stated assumptions.

In arriving at the assumed high and low fertility assumptions, one of the considerations has been to have a narrow gap between the medium and high, and the medium and low fertility levels. This is indeed a bold attempt which has not been done in the past, though users of projections generally prefer a narrow range. According to Ryder (1993), "the case for a broader band is quasi-statistical — to set outerbounds on the phenomenon, something like 5 percent confidence intervals".

APPENDICES

Table A1. Total Fertility Rates for Canada, Provinces and Territories, 1971-1993[1]

Year	Canada[2]	Newfound-land	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatch-ewan	Alberta	British Columbia	Yukon	Northwest Territories
1971	2.12	—	2.85	2.45	2.61	1.82	2.14	2.49	2.66	2.34	2.04	3.03	4.49
1972	1.96	—	2.58	2.25	2.41	1.67	1.98	2.34	2.53	2.15	1.91	2.50	3.95
1973	1.87	—	2.26	2.11	2.21	1.62	1.89	2.20	2.37	2.06	1.80	2.06	3.49
1974	1.84	2.59	2.29	1.98	2.13	1.60	1.83	2.16	2.38	2.01	1.75	2.40	2.96
1975	1.82	2.44	2.16	1.96	2.08	1.66	1.80	2.07	2.26	2.01	1.71	1.91	3.10
1976	1.78	2.34	2.13	1.86	2.01	1.66	1.71	1.98	2.26	1.98	1.64	1.94	3.00
1977	1.75	2.29	2.09	1.75	1.91	1.67	1.67	1.93	2.24	1.92	1.64	1.82	2.97
1978	1.70	2.12	2.04	1.74	1.75	1.62	1.62	1.87	2.16	1.86	1.62	1.79	2.92
1979	1.70	2.03	1.94	1.69	1.74	1.66	1.61	1.85	2.17	1.83	1.62	1.91	3.03
1980	1.68	2.03	1.94	1.67	1.68	1.61	1.60	1.82	2.12	1.84	1.62	1.78	3.03
1981	1.65	1.97	1.88	1.61	1.67	1.56	1.57	1.82	2.10	1.84	1.62	2.04	2.83
1982	1.63	1.78	1.89	1.63	1.65	1.47	1.58	1.79	2.12	1.86	1.64	1.94	2.80
1983	1.61	1.70	1.83	1.62	1.64	1.42	1.57	1.81	2.08	1.87	1.64	2.13	2.98
1984	1.62	1.63	1.83	1.60	1.60	1.41	1.60	1.80	2.07	1.84	1.66	2.07	2.80
1985	1.60	1.62	1.86	1.59	1.56	1.39	1.59	1.84	2.07	1.84	1.64	1.83	2.65
1986	1.59	1.57	1.78	1.58	1.52	1.36	1.59	1.82	2.01	1.83	1.60	1.93	2.82
1987	1.57	1.52	1.82	1.55	1.50	1.35	1.57	1.82	1.97	1.80	1.59	1.89	2.83
1988	1.59	1.47	1.85	1.56	1.52	1.41	1.58	1.84	1.98	1.82	1.63	1.98	2.88
1989	1.64	1.54	1.82	1.61	1.54	1.51	1.61	1.91	2.04	1.89	1.64	1.85	2.68
1990	1.70	1.52	1.93	1.67	1.58	1.63	1.66	1.94	2.07	1.88	1.68	2.21	2.78
1991	1.70	1.44	1.85	1.58	1.54	1.65	1.67	1.96	2.03	1.88	1.67	2.15	2.85
1992	1.70	1.40	1.86	1.58	1.55	1.65	1.67	1.92	2.05	1.87	1.67	1.92	2.71
1993[3]	1.70	1.49	1.84	1.60	1.56	1.61	1.68	1.98	2.13	1.88	1.66	1.65	2.71

[1] Calculations are founded on revised estimates of population from Statistics Canada (1994), Catalogue no. 91-537.
[2] 1971-1973, excluding Newfoundland.
[3] Estimated.
Source: Statistics Canada, Demography Division, special tabulations.

Table A2. Mean Age of Fertility for Canada, Provinces and Territories, 1974-1992

Year	Canada	Newfound-land	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatch-ewan	Alberta	British Columbia	Yukon	Northwest Territories
1974	26.76	26.50	26.85	26.13	26.20	27.59	26.67	26.54	26.57	26.25	26.28	25.26	26.23
1975	26.67	26.31	26.47	26.12	25.83	27.42	26.66	26.47	26.07	26.15	26.34	25.72	26.29
1976	26.70	26.10	26.73	26.15	25.93	27.33	26.74	26.52	26.08	26.28	26.46	25.82	26.36
1977	26.74	26.05	26.70	26.10	25.94	27.35	26.79	26.50	26.07	26.32	26.52	26.24	26.21
1978	26.80	26.02	26.65	26.08	25.86	27.35	26.89	26.57	25.96	26.47	26.71	26.12	26.21
1979	26.90	26.09	26.81	26.15	25.99	27.39	27.08	26.56	26.13	26.52	26.74	26.43	26.44
1980	26.93	26.06	26.89	26.26	25.89	27.41	27.15	26.59	26.04	26.50	26.85	26.17	26.29
1981	27.03	25.88	27.06	26.34	26.15	27.45	27.33	26.64	26.17	26.62	26.98	25.80	25.90
1982	27.08	25.98	26.95	26.44	26.06	27.41	27.41	26.72	26.18	26.66	27.13	26.25	25.91
1983	27.18	25.96	27.10	26.65	26.28	27.42	27.56	26.75	26.17	26.88	27.28	26.40	26.30
1984	27.32	26.20	26.87	26.78	26.31	27.50	27.71	26.90	26.33	27.02	27.44	26.94	26.18
1985	27.42	26.18	27.11	27.01	26.34	27.53	27.84	27.06	26.45	27.10	27.58	26.85	25.63
1986	27.51	26.37	27.37	27.10	26.50	27.55	27.95	27.15	26.49	27.19	27.72	27.22	25.90
1987	27.61	26.46	27.11	27.16	26.91	27.56	28.09	27.17	26.61	27.28	27.83	26.91	25.42
1988	27.69	26.48	27.26	27.10	27.06	27.60	28.21	27.17	26.61	27.38	27.92	27.16	25.78
1989	27.72	26.49	27.32	27.14	26.49	27.63	28.29	27.16	26.58	27.41	27.87	27.05	25.65
1990	27.78	26.58	27.27	27.25	26.64	27.70	28.32	27.19	26.67	27.40	27.98	27.08	25.79
1991	27.83	26.72	27.48	27.19	26.60	27.77	28.40	27.11	26.65	27.37	27.98	27.18	25.84
1992	27.94	26.79	27.53	27.31	26.72	27.90	28.48	27.24	26.80	27.49	28.09	27.52	26.04

Note: Calculations are founded on revised estimates of population from Statistics Canada (1994), Catalogue no. 91-537.
Source: Statistics Canada, Demography Division, special tabulations.

Table A3. Variance of the Age-specific Fertility Rates for Canada, Provinces and Territories, 1974-1992

Year	Canada	Newfound-land	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatch-ewan	Alberta	British Columbia	Yukon	Northwest Territories
1974	28.80	38.80	33.15	31.53	31.56	26.12	28.39	30.78	30.97	27.95	27.58	28.33	45.23
1975	28.03	37.66	29.59	30.73	28.21	25.55	27.62	30.45	29.37	27.84	27.39	33.54	40.90
1976	27.53	36.06	30.87	29.80	28.75	24.94	27.54	29.12	28.94	27.23	26.73	30.60	41.77
1977	26.75	32.64	29.80	29.17	27.47	24.23	26.64	28.51	28.47	26.92	26.21	29.43	41.86
1978	26.18	32.00	29.33	27.81	25.86	23.33	26.19	28.88	27.67	26.78	26.11	31.96	43.82
1979	25.72	32.32	27.35	27.43	25.36	22.66	25.91	27.74	26.99	26.64	25.62	26.24	43.16
1980	25.48	29.71	29.46	26.62	24.31	22.58	25.47	27.66	26.54	26.71	25.70	26.48	45.04
1981	25.47	30.38	28.41	26.25	25.16	22.13	25.48	27.55	26.57	27.54	25.91	27.10	38.97
1982	25.78	30.18	26.63	26.17	24.75	22.59	25.73	27.65	26.44	27.87	26.32	26.33	39.08
1983	25.52	29.64	27.82	26.61	24.78	22.25	25.31	28.14	26.25	26.93	26.49	27.15	41.40
1984	25.57	28.74	27.92	26.55	24.39	22.29	25.51	27.67	26.44	26.93	26.36	31.37	40.50
1985	25.75	28.32	27.01	26.82	23.94	22.48	25.72	28.19	26.47	27.24	26.36	31.85	34.86
1986	26.22	28.26	29.02	26.21	24.68	23.11	26.13	28.35	26.91	27.48	27.15	30.49	38.09
1987	26.58	28.61	27.35	26.46	24.57	23.42	26.49	29.33	27.63	28.21	27.16	33.92	35.50
1988	26.95	28.83	26.29	27.28	25.43	23.74	26.63	29.32	27.47	28.81	28.01	31.59	39.51
1989	27.35	27.09	26.99	27.63	25.06	23.76	27.43	30.30	27.33	28.95	28.64	30.34	35.61
1990	27.61	27.71	27.43	28.59	25.16	23.99	27.67	29.71	27.69	29.71	29.02	35.02	34.31
1991	28.09	27.55	28.42	28.41	25.28	24.09	28.37	30.12	28.05	30.59	29.50	32.39	36.25
1992	28.37	27.08	27.38	28.90	27.11	24.51	28.58	31.10	28.54	30.30	29.67	33.37	35.98

Note: Calculations are founded on revised estimates of population from Statistics Canada (1994), Catalogue no. 91-537.
Source: Statistics Canada, Demography Division, special tabulations.

Table A4. Third Moment of the Age-specific Fertility Rates for Canada, Provinces and Territories, 1974-1992

Year	Canada	Newfound-land	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatch-ewan	Alberta	British Columbia	Yukon	Northwest Territories
1974	71.95	141.84	83.45	97.89	109.45	65.18	65.63	79.01	93.01	80.38	68.11	84.63	187.95
1975	66.68	139.20	62.61	98.60	85.90	59.67	60.23	78.96	92.02	76.52	63.41	96.49	145.44
1976	61.06	134.64	74.89	86.83	91.36	52.70	57.12	61.85	84.13	68.12	56.92	102.45	146.10
1977	53.54	107.18	62.55	73.26	77.30	46.84	49.65	55.05	83.27	59.84	50.92	48.58	130.39
1978	48.74	100.14	63.48	62.45	63.22	44.29	45.55	58.12	75.12	53.23	46.94	59.62	146.52
1979	45.06	98.41	57.04	63.84	58.07	38.77	42.79	51.68	64.89	54.00	41.34	44.57	136.88
1980	41.13	83.64	74.83	57.17	52.20	38.12	37.37	46.08	62.86	48.50	35.98	19.62	160.81
1981	38.48	90.28	49.61	49.80	54.45	36.47	35.27	47.56	59.28	46.15	33.86	42.22	102.83
1982	37.98	90.64	39.19	47.19	59.56	38.22	31.35	43.73	53.85	46.03	36.88	31.40	139.09
1983	34.06	80.99	51.37	42.91	52.50	36.80	26.20	41.73	48.53	40.10	33.38	42.60	143.67
1984	29.91	71.19	45.16	37.34	47.80	32.80	23.81	28.76	43.01	32.32	30.95	49.16	125.01
1985	27.69	60.45	46.92	38.31	36.33	31.04	21.00	30.92	37.40	32.04	29.12	46.26	87.83
1986	26.41	53.22	38.96	27.15	40.89	31.56	19.95	26.47	39.46	24.05	27.94	40.96	114.42
1987	23.73	56.49	28.99	28.22	28.05	29.81	16.78	29.08	36.29	24.45	23.45	43.65	118.79
1988	23.30	48.88	25.60	27.78	37.32	31.13	13.20	30.76	37.38	29.01	22.41	35.49	121.81
1989	22.05	32.15	33.84	28.22	37.79	28.34	12.62	29.08	37.11	23.67	21.66	48.04	99.93
1990	19.42	27.92	26.34	23.73	31.90	25.93	9.92	26.94	31.11	26.26	20.72	53.60	97.29
1991	18.03	38.81	25.85	26.58	30.50	25.88	5.50	26.18	34.12	27.27	17.42	61.79	91.58
1992	15.72	29.54	13.37	23.10	32.75	22.97	3.04	27.63	34.72	23.46	16.87	58.91	98.41

Note: Calculations are founded on revised estimates of population from Statistics Canada (1994), Catalogue no. 91-537.
Source: Statistics Canada, Demography Division, special tabulations.

Table A5. Observed and Projected Total Fertility Rates for Canada, Provinces and Territories, 1993-2016

Year	Canada	Nfld	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta	B.C.	Yuk.	N.W.T.
	Low Assumption												
1993[1]	1.70	1.49	1.84	1.60	1.56	1.61	1.68	1.98	2.13	1.88	1.66	1.65	2.71
1994	1.66	1.44	1.80	1.56	1.52	1.58	1.63	1.93	2.07	1.83	1.62	1.62	2.64
1995	1.62	1.40	1.76	1.52	1.49	1.55	1.60	1.88	2.02	1.79	1.58	1.60	2.59
1996	1.60	1.37	1.73	1.50	1.46	1.53	1.57	1.85	1.98	1.76	1.56	1.59	2.55
1997	1.57	1.34	1.71	1.47	1.44	1.51	1.55	1.82	1.95	1.74	1.54	1.58	2.53
1998	1.56	1.32	1.69	1.45	1.42	1.50	1.53	1.79	1.92	1.72	1.53	1.57	2.50
1999	1.55	1.31	1.68	1.44	1.41	1.49	1.52	1.78	1.90	1.71	1.51	1.57	2.49
2000	1.54	1.30	1.67	1.43	1.40	1.48	1.51	1.77	1.88	1.69	1.50	1.57	2.48
2001	1.53	1.30	1.66	1.43	1.39	1.47	1.50	1.76	1.87	1.69	1.50	1.58	2.47
2002	1.52	1.29	1.65	1.42	1.39	1.46	1.50	1.75	1.86	1.68	1.49	1.58	2.46
2003	1.52	1.29	1.65	1.42	1.38	1.46	1.49	1.75	1.84	1.67	1.49	1.59	2.46
2004	1.51	1.28	1.65	1.41	1.38	1.46	1.49	1.74	1.84	1.67	1.48	1.60	2.45
2005	1.51	1.28	1.64	1.41	1.38	1.45	1.48	1.74	1.84	1.67	1.48	1.61	2.45
2006	1.51	1.28	1.64	1.41	1.38	1.45	1.48	1.74	1.83	1.66	1.48	1.62	2.44
2007	1.51	1.28	1.64	1.41	1.37	1.45	1.48	1.73	1.83	1.66	1.48	1.63	2.44
2008	1.50	1.28	1.64	1.40	1.37	1.45	1.48	1.73	1.83	1.66	1.47	1.64	2.44
2009	1.50	1.28	1.63	1.40	1.37	1.45	1.48	1.73	1.83	1.66	1.47	1.65	2.44
2010	1.50	1.27	1.63	1.40	1.37	1.45	1.48	1.73	1.83	1.66	1.47	1.66	2.44
2011	1.50	1.27	1.63	1.40	1.37	1.44	1.48	1.73	1.83	1.66	1.47	1.67	2.43
2012	1.50	1.27	1.63	1.40	1.37	1.44	1.48	1.73	1.83	1.66	1.47	1.68	2.43
2013	1.50	1.27	1.63	1.40	1.37	1.44	1.48	1.73	1.83	1.66	1.47	1.70	2.43
2014	1.50	1.27	1.63	1.40	1.37	1.44	1.48	1.73	1.83	1.66	1.47	1.71	2.43
2015	1.50	1.27	1.63	1.40	1.37	1.44	1.48	1.73	1.82	1.66	1.47	1.72	2.43
2016	1.50	1.27	1.63	1.40	1.37	1.44	1.48	1.73	1.82	1.66	1.47	1.74	2.43
	Medium Assumption												
1993[1]	1.70	1.49	1.84	1.60	1.56	1.61	1.68	1.98	2.13	1.88	1.66	1.65	2.71
1994	1.70	1.48	1.84	1.60	1.56	1.62	1.67	1.98	2.12	1.88	1.66	1.66	2.71
1995	1.70	1.47	1.85	1.60	1.56	1.62	1.67	1.97	2.11	1.88	1.66	1.68	2.72
1996	1.70	1.46	1.85	1.59	1.56	1.63	1.67	1.97	2.11	1.88	1.66	1.69	2.72
1997	1.70	1.45	1.85	1.59	1.55	1.63	1.67	1.96	2.10	1.88	1.66	1.70	2.73
1998	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.10	1.88	1.67	1.72	2.73
1999	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.09	1.88	1.67	1.73	2.74
2000	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.09	1.88	1.67	1.74	2.74
2001	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.08	1.88	1.67	1.76	2.75
2002	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.77	2.75
2003	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.78	2.76
2004	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.80	2.76
2005	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.81	2.76
2006	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.82	2.76
2007	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.84	2.76
2008	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.85	2.76
2009	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.87	2.76
2010	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.88	2.76
2011	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.89	2.76
2012	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.91	2.76
2013	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.92	2.76
2014	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.94	2.76
2015	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.95	2.76
2016	1.70	1.44	1.85	1.59	1.55	1.64	1.67	1.96	2.07	1.88	1.67	1.97	2.76
	High Assumption												
1993[1]	1.70	1.49	1.84	1.60	1.56	1.61	1.68	1.98	2.13	1.88	1.66	1.65	2.71
1994	1.74	1.52	1.89	1.64	1.60	1.66	1.72	2.03	2.18	1.93	1.70	1.71	2.78
1995	1.78	1.54	1.93	1.67	1.63	1.70	1.75	2.06	2.21	1.97	1.74	1.75	2.84
1996	1.80	1.55	1.96	1.69	1.65	1.73	1.78	2.09	2.24	1.99	1.77	1.79	2.89
1997	1.83	1.56	1.98	1.71	1.67	1.75	1.80	2.11	2.26	2.02	1.79	1.83	2.93
1998	1.84	1.56	2.00	1.72	1.68	1.77	1.81	2.12	2.27	2.03	1.80	1.86	2.96
1999	1.85	1.57	2.02	1.73	1.69	1.78	1.82	2.13	2.28	2.05	1.82	1.89	2.99
2000	1.86	1.58	2.03	1.74	1.70	1.79	1.83	2.15	2.29	2.06	1.83	1.91	3.01
2001	1.87	1.59	2.04	1.75	1.71	1.80	1.84	2.16	2.29	2.07	1.83	1.93	3.02
2002	1.88	1.59	2.04	1.75	1.71	1.81	1.85	2.16	2.29	2.07	1.84	1.95	3.04
2003	1.88	1.60	2.05	1.76	1.72	1.81	1.85	2.17	2.29	2.08	1.85	1.97	3.05
2004	1.89	1.60	2.05	1.76	1.72	1.82	1.86	2.17	2.30	2.08	1.85	1.99	3.06
2005	1.89	1.60	2.06	1.77	1.72	1.82	1.86	2.18	2.30	2.09	1.85	2.01	3.06
2006	1.89	1.61	2.06	1.77	1.73	1.82	1.86	2.18	2.30	2.09	1.85	2.03	3.07
2007	1.89	1.61	2.06	1.77	1.73	1.82	1.86	2.18	2.30	2.09	1.86	2.05	3.07
2008	1.90	1.61	2.06	1.77	1.73	1.82	1.86	2.18	2.31	2.09	1.86	2.06	3.07
2009	1.90	1.61	2.06	1.77	1.73	1.83	1.87	2.18	2.31	2.09	1.86	2.08	3.07
2010	1.90	1.61	2.06	1.77	1.73	1.83	1.87	2.18	2.31	2.09	1.86	2.10	3.08
2011	1.90	1.61	2.06	1.77	1.73	1.83	1.87	2.18	2.31	2.10	1.86	2.11	3.08
2012	1.90	1.61	2.07	1.77	1.73	1.83	1.87	2.19	2.31	2.10	1.86	2.13	3.08
2013	1.90	1.61	2.07	1.77	1.73	1.83	1.87	2.19	2.31	2.10	1.86	2.15	3.08
2014	1.90	1.61	2.07	1.77	1.73	1.83	1.87	2.19	2.31	2.10	1.86	2.16	3.08
2015	1.90	1.61	2.07	1.77	1.73	1.83	1.87	2.19	2.31	2.10	1.86	2.18	3.08
2016	1.90	1.61	2.07	1.77	1.73	1.83	1.87	2.19	2.31	2.10	1.86	2.20	3.08

[1] Estimated.

Source: 1993: Statistics Canada, Demography Division, special tabulations. 1994-2016: Projected rates as described in the text.

Table A6. Observed and Projected Mean Age of Fertility for Canada, Provinces and Territories, 1993-2016

Year	Canada	Nfld	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta	B.C.	Yuk.	N.W.T.
	Low Assumption												
1993[1]	27.94	26.79	27.52	27.34	26.74	27.88	28.50	27.27	26.80	27.51	28.11	27.35	25.98
1994	27.95	26.79	27.52	27.34	26.75	27.89	28.50	27.27	26.80	27.52	28.12	27.35	25.98
1995	27.96	26.80	27.54	27.35	26.76	27.90	28.51	27.28	26.81	27.53	28.13	27.37	25.99
1996	27.97	26.81	27.55	27.37	26.77	27.91	28.53	27.30	26.83	27.54	28.14	27.38	26.01
1997	27.99	26.83	27.57	27.39	26.79	27.93	28.55	27.32	26.85	27.56	28.16	27.40	26.02
1998	28.02	26.86	27.60	27.41	26.82	27.96	28.58	27.34	26.87	27.59	28.19	27.43	26.05
1999	28.04	26.88	27.62	27.44	26.84	27.99	28.60	27.37	26.90	27.61	28.22	27.45	26.07
2000	28.08	26.91	27.65	27.47	26.87	28.02	28.63	27.40	26.93	27.64	28.25	27.48	26.10
2001	28.11	26.94	27.68	27.50	26.90	28.05	28.67	27.43	26.96	27.68	28.28	27.51	26.13
2002	28.14	26.98	27.72	27.54	26.93	28.08	28.70	27.46	26.99	27.71	28.31	27.55	26.16
2003	28.18	27.01	27.75	27.57	26.97	28.12	28.74	27.50	27.02	27.74	28.35	27.58	26.19
2004	28.21	27.04	27.79	27.60	27.00	28.15	28.77	27.53	27.06	27.78	28.38	27.62	26.23
2005	28.25	27.08	27.82	27.64	27.04	28.19	28.81	27.57	27.09	27.81	28.42	27.65	26.26
2006	28.28	27.11	27.86	27.67	27.07	28.22	28.85	27.60	27.13	27.85	28.46	27.69	26.29
2007	28.32	27.14	27.89	27.71	27.10	28.26	28.88	27.64	27.16	27.88	28.49	27.72	26.32
2008	28.35	27.18	27.92	27.74	27.13	28.29	28.91	27.67	27.19	27.91	28.52	27.75	26.36
2009	28.38	27.21	27.95	27.77	27.16	28.32	28.95	27.70	27.22	27.95	28.55	27.78	26.38
2010	28.41	27.23	27.98	27.80	27.19	28.35	28.98	27.73	27.25	27.97	28.58	27.81	26.41
2011	28.43	27.26	28.01	27.82	27.22	28.38	29.00	27.75	27.27	28.00	28.61	27.83	26.43
2012	28.46	27.28	28.03	27.84	27.24	28.40	29.02	27.77	27.29	28.02	28.63	27.86	26.46
2013	28.48	27.30	28.05	27.86	27.25	28.42	29.04	27.79	27.31	28.04	28.65	27.87	26.47
2014	28.49	27.31	28.06	27.88	27.27	28.43	29.06	27.80	27.32	28.05	28.66	27.89	26.48
2015	28.50	27.32	28.07	27.88	27.27	28.44	29.06	27.81	27.33	28.06	28.67	27.90	26.49
2016	28.50	27.32	28.07	27.89	27.28	28.44	29.07	27.81	27.33	28.06	28.67	27.90	26.50
	Medium Assumption												
1993[1]	27.94	26.79	27.52	27.34	26.74	27.88	28.50	27.27	26.80	27.51	28.11	27.35	25.98
1994	27.94	26.79	27.52	27.34	26.74	27.88	28.50	27.27	26.80	27.51	28.11	27.35	25.98
1995	27.95	26.79	27.53	27.34	26.75	27.89	28.50	27.27	26.80	27.52	28.12	27.36	25.98
1996	27.95	26.79	27.53	27.35	26.75	27.89	28.51	27.28	26.81	27.52	28.12	27.36	25.98
1997	27.95	26.80	27.53	27.35	26.75	27.89	28.51	27.28	26.81	27.52	28.12	27.36	25.99
1998	27.96	26.80	27.54	27.36	26.76	27.90	28.51	27.28	26.81	27.53	28.13	27.37	25.99
1999	27.96	26.80	27.54	27.36	26.76	27.90	28.52	27.29	26.82	27.53	28.13	27.37	25.99
2000	27.96	26.81	27.54	27.36	26.76	27.91	28.52	27.29	26.82	27.53	28.14	27.37	26.00
2001	27.97	26.81	27.55	27.37	26.77	27.91	28.52	27.30	26.82	27.54	28.14	27.38	26.00
2002	27.97	26.81	27.55	27.37	26.77	27.91	28.53	27.30	26.83	27.54	28.14	27.38	26.00
2003	27.97	26.82	27.55	27.37	26.77	27.92	28.53	27.30	26.83	27.55	28.15	27.38	26.01
2004	27.98	26.82	27.56	27.38	26.78	27.92	28.54	27.31	26.83	27.55	28.15	27.39	26.01
2005	27.98	26.82	27.56	27.38	26.78	27.92	28.54	27.31	26.84	27.55	28.15	27.39	26.01
2006	27.98	26.83	27.56	27.38	26.78	27.93	28.54	27.31	26.84	27.55	28.16	27.39	26.02
2007	27.99	26.83	27.57	27.38	26.79	27.93	28.54	27.31	26.84	27.56	28.16	27.40	26.02
2008	27.99	26.83	27.57	27.39	26.79	27.93	28.55	27.32	26.84	27.56	28.16	27.40	26.02
2009	27.99	26.83	27.57	27.39	26.79	27.93	28.55	27.32	26.85	27.56	28.16	27.40	26.02
2010	27.99	26.83	27.57	27.39	26.79	27.93	28.55	27.32	26.85	27.56	28.17	27.40	26.02
2011	28.00	26.84	27.57	27.39	26.79	27.94	28.55	27.32	26.85	27.57	28.17	27.40	26.03
2012	28.00	26.84	27.58	27.39	26.80	27.94	28.55	27.32	26.85	27.57	28.17	27.41	26.03
2013	28.00	26.84	27.58	27.40	26.80	27.94	28.56	27.33	26.85	27.57	28.17	27.41	26.03
2014	28.00	26.84	27.58	27.40	26.80	27.94	28.56	27.33	26.85	27.57	28.17	27.41	26.03
2015	28.00	26.84	27.58	27.40	26.80	27.94	28.56	27.33	26.85	27.57	28.17	27.41	26.03
2016	28.00	26.84	27.58	27.40	26.80	27.94	28.56	27.33	26.85	27.57	28.17	27.41	26.03
	High Assumption												
1993[1]	27.94	26.79	27.52	27.34	26.74	27.88	28.50	27.27	26.80	27.51	28.11	27.35	25.98
1994	27.94	26.78	27.52	27.34	26.74	27.88	28.50	27.27	26.80	27.51	28.11	27.35	25.97
1995	27.94	26.78	27.51	27.33	26.74	27.88	28.49	27.26	26.79	27.51	28.11	27.35	25.97
1996	27.93	26.77	27.51	27.33	26.73	27.87	28.48	27.26	26.78	27.50	28.10	27.34	25.96
1997	27.91	26.76	27.49	27.31	26.72	27.85	28.47	27.24	26.77	27.48	28.08	27.32	25.95
1998	27.90	26.74	27.48	27.30	26.70	27.84	28.45	27.23	26.75	27.47	28.07	27.31	25.93
1999	27.88	26.72	27.46	27.28	26.68	27.82	28.43	27.21	26.74	27.45	28.05	27.29	25.92
2000	27.85	26.70	27.43	27.25	26.66	27.80	28.41	27.18	26.71	27.43	28.02	27.27	25.89
2001	27.83	26.68	27.41	27.23	26.63	27.77	28.38	27.16	26.69	27.40	28.00	27.24	25.87
2002	27.80	26.65	27.38	27.20	26.61	27.74	28.36	27.13	26.66	27.37	27.97	27.21	25.85
2003	27.77	26.62	27.36	27.18	26.58	27.72	28.33	27.11	26.64	27.35	27.94	27.19	25.82
2004	27.74	26.60	27.33	27.15	26.55	27.69	28.30	27.08	26.61	27.32	27.91	27.16	25.79
2005	27.71	26.57	27.30	27.12	26.53	27.66	28.27	27.05	26.58	27.29	27.88	27.13	25.77
2006	27.69	26.54	27.27	27.09	26.50	27.63	28.24	27.02	26.55	27.26	27.85	27.10	25.74
2007	27.66	26.51	27.24	27.06	26.47	27.60	28.21	26.99	26.52	27.23	27.83	27.07	25.71
2008	27.63	26.49	27.21	27.03	26.44	27.57	28.18	26.96	26.50	27.20	27.80	27.05	25.69
2009	27.60	26.46	27.19	27.01	26.42	27.54	28.15	26.94	26.47	27.18	27.77	27.02	25.66
2010	27.58	26.44	27.16	26.98	26.39	27.52	28.13	26.92	26.45	27.15	27.75	27.00	25.64
2011	27.56	26.42	27.14	26.96	26.37	27.50	28.10	26.89	26.43	27.13	27.72	26.97	25.62
2012	27.54	26.40	27.12	26.94	26.36	27.48	28.09	26.88	26.41	27.11	27.71	26.96	25.60
2013	27.52	26.38	27.11	26.93	26.34	27.46	28.07	26.86	26.40	27.10	27.69	26.94	25.59
2014	27.51	26.37	27.10	26.92	26.33	27.45	28.06	26.85	26.38	27.09	27.68	26.93	25.57
2015	27.50	26.36	27.09	26.91	26.32	27.44	28.05	26.84	26.38	27.08	27.67	26.92	25.57
2016	27.50	26.36	27.09	26.91	26.32	27.44	28.05	26.84	26.37	27.08	27.67	26.92	25.57

[1] Estimated based on extrapolated values.

Source: 1993: Statistics Canada, Demography Division, special tabulations. 1994-2016: Projected rates as described in the text.

Table A7. Variance and Third Moment of the Age-specific Fertility Rates Used in the Projection Model for Canada, Provinces and Territories

Province	Variance	Third Moment
Canada	28.02	17.72
Newfoundland	27.45	32.09
Prince Edward Island	27.74	21.85
Nova Scotia	28.63	24.47
New Brunswick	25.85	31.72
Quebec	24.20	24.93
Ontario	28.21	6.15
Manitoba	30.31	26.92
Saskatchewan	28.09	33.31
Alberta	30.20	25.66
British Columbia	29.40	18.33
Yukon	33.59	58.10
Northwest Territories	35.52	95.76

Source: Projected values as described in the text.

Table A8. Cumulative Fertility Rates per 1,000 Women for Selected Birth Cohorts, Canada

Women Born in	Aged 15 in	Cumulative fertility Rates Up to Age						
		15	20	25	30	35	40	45
1906	1921	2.3	261.5	1,036.7	1,808.5	2,370.4	2,753.9	2,864.2
1910	1925	2.4	252.2	922.3	1,632.4	2,240.2	2,632.8	2,739.1
1915	1930	2.3	222.0	891.2	1,738.8	2,401.6	2,779.9	2,882.1
1920	1935	2.4	239.7	1,050.5	2,019.3	2,711.3	3,093.3	3,187.9
1925	1940	2.2	260.2	1,224.5	2,198.1	2,855.4	3,172.7	3,226.1
1930	1945	2.6	347.4	1,421.5	2,463.2	3,082.7	3,288.5	3,313.7
1935	1950	3.3	419.7	1,585.2	2,526.6	2,910.8	3,020.6	3,033.3
1940	1955	4.3	480.5	1,607.1	2,285.1	2,571.1	2,643.0	2,652.3
1945	1960	5.0	398.7	1,172.9	1,766.5	2,023.5	2,092.0	2,100.9
1950	1965	4.2	312.6	968.7	1,564.1	1,846.9	1,925.6	
1955	1970	5.6	262.6	835.8	1,420.6	1,693.5		
1960	1975	5.8	214.1	739.6	1,239.4			
1965	1980	4.8	171.6	508.9				
1970	1985	4.1	114.8					
1975	1990	4.7						

Source: Statistics Canada, Demography Division, special tabulations.

REFERENCES

Basavarajappa, K.G., R. Bender and D. Larrivée (1992). "Changing Population Composition and Its Effect on the Labour Force, Canada, 1986-2036". In ***Changing Population Age Structures, 1990-2015: Demographic and Economic Consequences Implications***. United Nations Economic Commission for Europe. Geneva.

Butz, W.P. and M.P. Ward (1979). "The Emergence of Countercyclical U.S. Fertility". ***The American Economic Review***, Vol. 69 (3), pp. 318-327.

Bouvier, L.F. and C.J. De Vita (1991). "The Baby Boom - Entering Midlife". ***Population Bulletin***, Vol. 46 (3). Washington, DC: Population Reference Bureau.

Davanzo, J., M.O. Rahman and K.T. Wadhawa (1993). "American Families: Policy Issues". ***Population Index***, Vol. 59 (4), Winter, pp. 547-566.

Devaney, B. (1983). "An Analysis of Variations in U.S. Fertility and Female Labor Force Participation Trends". ***Demography***, Vol. 20 (2), pp. 147-161.

Elderton, W.P. (1930). ***Frequency Curves and Correlation***. Cambridge: Cambridge University Press.

Elderton, W.P. and N.L. Johnson (1969). ***Systems of Frequency Curves***. Cambridge: Cambridge University Press.

Fleisher, B.M and G.F. Rhodes, Jr. (1979). "Fertility, Women's Wage Rates, and Labor Supply". ***The American Economic Review***, Vol. 69 (1), pp. 14-24.

Grindstaff, C.F. (1992). "A Vanishing Breed: Women with Large Families: Canada in the 1980's". ***Canadian Studies in Population***, Vol. 19 (2).

Keyfitz, N. (1986). "The Family that Does Not Reproduce Itself". In K. Davis, M.S. Bernstam and R. Ricardo-Campbell (eds.) ***Below-Replacement and Fertility in Industrial Societies. Population and Development Review***, supplement to Vol. 12.

Loh, S. and B. Ram (1990). "Delayed Child-bearing in Canada: Trends and Factors". ***Genus***, Vol. 46 (1-2), pp. 147-161.

Lutz, W. (1994). "The Future of World Population". ***Population Bulletin***, Vol. 49 (1). Washington, DC: Population Reference Bureau.

Mitra, S. (1992). "Some Observations on Modelling Fertility Rates". Report submitted to Demography Division, Statistics Canada, Ottawa.

Ram, B. and J.A. Norland (1982). "A Research Note on the Application of the Butz/Ward Fertility Model to Canadian Data". Demography Division, Statistics Canada, Ottawa.

Ram, B. and M.V. George (1990). "Immigrant Fertility Patterns in Canada, 1961-1986". ***International Migration***, Vol 28 (4), pp. 413-425.

Romaniuc, A. (1991). "Fertility in Canada: Retrospective and Prospective". ***Canadian Studies in Population***, Vol. 18 (2), pp. 56-77.

Romaniuk, A. (1975). "A Three Parameter Model for Birth Projections". In ***Technical Report on Population Projections for Canada and the Provinces, 1972-2001***. Catalogue no. 91-516. Ottawa: Statistics Canada.

Ryder, N.B. (1993). Memorandum to M.V. George. Demography Division, Statistics Canada, Ottawa.

Statistics Canada (1994). ***Revised Intercensal Population and Family Estimates, July 1st, 1971-1991***. Catalogue no. 91-537. Ottawa.

Statistics Canada (1990). ***Population Projections for Canada, Provinces and Territories 1989-2011***. Catalogue no. 91-520. Ottawa.

Statistics Canada (1985). ***Population Projections for Canada, Provinces and Territories, 1984-2006***. Catalogue no. 91-520. Ottawa.

Stout, C.W. and R.B.P. Verma (1992). ***Canadian Fertility: Trends and Projections (1971-2016)***. Population Projections Section, Demography Division, Statistics Canada, Ottawa.

Stuart, A. and J.K. Ord (1987). ***Kendall's Advanced Theory of Statistics***, originally by Sir Maurice Kendall, Vol. 1, Distribution Theory. New York: Oxford University Press.

Verma, R.B.P. and D. Ford (1992). "Fertility Rates by Age of Mothers: Pearson Curve Type I vs Types II, III and Normal". Paper prepared for presentation at the Federal Provincial Committee on Demography meeting, December 1-2, 1992, Statistics Canada, Ottawa.

Verma, R.B.P. and S. Loh (1992). "Evaluation of Pearsonian Type I Curve of Fertility by Age of Mother for Canada, Provinces and Territories, 1980-1989". Paper presented at the Canadian Population Society meeting, Charlottetown, P.E.I., June 2-5, 1992.