

FERTILITY OF A COMMUNITY IN TRANSITION: THE CASE OF JAMES BAY INDIANS, CANADA

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Abstract / Résumé

This is an in-depth study of procreative behaviours of the Indian community in the James Bay area, based on a socio-demographic survey carried out there in 1968, along the two axes—the level and the tempo of reproduction. A wide range of underlying social, cultural and biological factors are explored. Shifts in infant lactation, from breast to bottle-feeding, and from a nomadic to a sedentary life are prominent factors in the post-war increase in the natural fertility of Indian people. Attitudes towards procreation and practices of birth control in this isolated community suggest that at the time of the survey a reappraisal of traditional natalist values for a more selective fertility was in the offing.

Mettant à profit une abondante statistique démographique, tirée de l'enquête auprès des Indiens de la Baie James en 1968, cette étude entreprend une analyse approfondie de leurs comportements procréateurs sous la double dimension du niveau et du calendrier (tempo) de la reproduction. Les facteurs socioculturels, démographiques et biologiques sous-jacents sont explorés à tour de rôle. Le passage de l'allaitement naturel à l'allaitement au biberon, ainsi que la sédentarisation des populations indiennes se traduisent par une hausse de la fécondité naturelle dans les années d'après guerre. L'étude des attitudes à l'égard de la procréation et des pratiques anticonceptionnelles suggère qu'une réévaluation des préceptes traditionnels natalistes vers les normes d'une fécondité sélective se soit déjà manifestée à l'époque de l'enquête.

Introduction

This article explores a unique set of data collected by the socio-demographic survey, carried out in the summer of 1968 in the six Indian settlements of the Eastern and Western shores of James Bay,¹ namely Moosonee, Moose Factory, Fort Albany, Attawapiskat, Fort Rupert and Fort George, with a total population of about 3500 inhabitants of which 2,678 (1404 males and 1274 males) were actually canvassed. In terms of households, 474 were visited, but those that did avail themselves to the interview represent 74.5%; the remaining 25.5% were not interviewed for different reasons (refusal, too old, sick, absent). This is not a poor response rate considering the extent to which Indians on reserves are inundated with all kinds of inquiries.² The survey includes a wide range of demographic variables – age, marital status, family and household composition, mortality, migration. Particular emphasis was placed on fertility. Complete reproductive histories were obtained for 427 women. With this wealth of information, the article undertakes a comprehensive, in-depth study of the procreative behaviours of an Indian community at an exceptionally important stage of its demographic development.

Indeed, the survey caught the Indians of James Bay, and to a great extent Indians in Canada in general, at a particular juncture in their demographic history. While still preserving many of the traditional attributes of their demography, they were just entering, in the post-war years, the process of modernisation that triggered a cycle of rising natural fertility before setting, as of the mid-sixties, on a course of long term fertility decline. These shifts in procreative behaviour come to light when older and younger mothers' generations are compared. As such the survey sheds light, depending on the cohorts of women considered, on pre-modern, traditional fertility patterns, on post-war early modernisation, and the onset of the transition to modern childbearing norms.

A number of articles of this survey have been featured earlier (Piché, 1977; Romaniuk, 1974; Romaniuk, 1981), on various demographic aspects, particularly on procreative behaviours. The approach in issuing the information was piecemeal rather than comprehensive. A number of variables, more notably those on the attitudes towards procreation and practices of birth control were entirely left out. Yet, reliable historical data on the demography of Canada's Aboriginal peoples are so rare that I felt the information was too important not to be made available to potential researchers, even at this late date.

The Indians of the James Bay region are known as the Swampy Cree who belong to the Algonkian linguistic group. In the past, they relied on hunting, fishing, trapping and fur trading as their main sources of subsistence. In the post-war years they started to abandon their no-

madic way of life and adopted a sedentary one. Their traditional means of subsistence were replaced by government relief schemes, supplemented by income from the few wage-earning opportunities available in the region. At the time the survey was taken, they still lived in relative isolation from mainstream Canada. Their contacts were limited to a few missionaries, traders and administrators living in the region, but they were by that time opening up to the wider world. Indeed, shortly thereafter, they began the transition towards modern childbearing norms. As Aboriginal populations in general, they have yet to catch up to the Canadian population in this regard.

The article is made up of three sections: the first presents the estimates of natality (birth rates) and fertility levels; the second examines the reproductive patterns, with special attention to child-spacing; and the third and final section explores a range of underlying biological, social and cultural factors.

Section 1: Levels of Natality and Fertility

To approximate the overall childbearing performance of the James Bay Indian population, use is made of the crude birth rate and the total fertility rate or average number of children born to a woman past reproductive age. As for the former, three kinds of estimate are produced:

1. Direct estimate, by conventional method, based on the number of births reported to have occurred in the last 12 months preceding the survey. There were 121 such births recorded for a population of 2,556 individuals (present residents), who have been surveyed. This yields a birth rate of 47.34 per 1000 population.
2. Indirect estimate, in Table 1, derived from the proportions of children under age 15, by means of stable population models. Data on the age distribution for the six villages surveyed are taken from the population registers kept by the Department of Indian Affairs and Northern Development. Conceptually this is a *de jure* population; it includes all residents, present and absent.
3. Indirect estimate, in Table 1a, by means of stable population models, derived from the proportions of children under age 15 of the population covered by the 1968 James Bay survey.

Table 1
Estimates of Birth Rate Derived from the Proportion of Children in
the Specified Age-Group, by Coale-Demeny Stable Population
Model West, James Bay Indians, Using data from Resident
Population Registers kept by DIAND (see note below), 1968

Age Group	Proportion in specified age group in per cent*	Birth rate** per 1000 population	Birth rate adjusted for late births reporting***	Birth rate adjusted for gains in survivorship****
(1)	(2)	(3)	(4)	(5)
0-4	19.64	46.7	50.4	49.9
0-9	35.59	46.8	48.8	48.5
0-14	47.90	45.8	47.0	46.8

Notes:

- * Children proportions in col. (2) are averages for three year (1966, 1967 and 1968) period data on Indian residents, present and absent, registered by the Department of Indian Affairs and Northern Development (DIAND).
- ** Birth rate derived by the Coale/Demeny stable population model, from the age proportions in col. (2). To this end, an estimate of mortality level was required. According to the life tables for the Canadian Indian population, available for the 1967-68 period, the expectation of life at birth was 63 years. For the purpose of estimating the birth rate for the James Bay, the expectation of life for this relatively isolated community was assumed to be in the vicinity of 60 years. For rationales underlying use of the stable population models in estimating vital rates for Indian population of Canada, see Romaniuk and Piché (1972).
- *** Births in Indian reserves are generally reported with some delays which in some case can be months, even years, and therefore registered child population under age 1 can be under-estimated as much as by 10 per cent. This percentage decreases with age (for the adjustments for late reporting see Piché and George (1973).
- **** Since 1945 or so the survival rate of children has increase gradually, quite significantly. The infant mortality, for example, has dropped from about 170 infant deaths for 1000 births just after the war to about 60 by 1970. The birth rates in col. (5) are adjusted (downward) to take into account the gains in proportion of children due to increased survivorship.

Table 1a
Estimates of Birth Rate Derived from the Proportion of Children in the Specified Age-Group, by Coale-Demeny Stable Population Model West, Using Data from the James Bay Indian Survey, 1968

Age Group	Proportion in specified age group in per cent*	Birth rate per 1000 population**	Birth rate adjusted for gains in the survivorship, per 1000 population***
(1)	(2)	(3)	(4)
0-4	20.42	49.2	48.7
0-9	37.55	50.5	50.2
0-14	51.72	51.6	51.4

Notes:

* Based on the 1968 James Bay Survey data for present resident population (visitors not included).

** See note in Table 1 for the estimation method.

*** See note **** Table 1

It is important to underscore that the three sets of estimates are independent of each other, either in regard to the source of data (survey v. administrative records), the reference population (*de jure* v. *de facto*) or in regard to the method of estimation (conventional v. non-conventional stable population). Yet the beauty of the exercise is that it yields birth rates remarkably close to each other, clustering in the narrow range of 46 to 50 births per 1000 population. It is difficult to be firm on any of the estimates. The direct estimate is based on a rather small number of births, subject to annual fluctuations. Estimates in Table 1a based on the survey data may be somewhat skewed toward households with children and therefore produce a birth rate which leans towards the high side. Perhaps the preferred estimates are those in Table 1, based on a three year average of the whole resident population (present and absent), included or not in the survey. As such these estimates are grounded on a more stable data base.

As to the total fertility rate, that is, the cumulative rate of the current age-specific fertility rates (births occurred during the 12 month preceding the survey, over the childbearing range up to mothers' 45 years of age), this posed a problem. There were not enough births (only 121 for 381

women in reproductive ages 15 to 45) to calculate reliable age-specific fertility rates. Therefore, to approximate the total fertility rate (the number of children born to women over their reproductive age span), it was necessary to resort once again to the indirect method of stable population, as per Table 2. In order to convert the birth rates (BR) in Table 1 (col.5) into gross reproduction rates (GRR), and then into average number of children per woman, two additional pieces of information were required: (1) the mean age of women at birth of their children (mean age of fertility) and (2) the masculinity ratio at birth. Neither of these parameters is exactly known for the Indians of James Bay, but plausible approximations are available (see Table 5 for average age of fertility). To be on the safe side, it has been assumed that the mean age of fertility is in the range of 28 to 30 years. As to the masculinity ratio, required to convert gross reproduction rate into the total fertility rate or mean number of births per woman, it is assumed to be 1.03, a ratio observed in many human populations.

Table 2
Gross Reproduction Rate and Average Number of Children,
Derived from the Estimated Birth Rates by Age Group Shown in
Table 1 (col. 5) for Specified Means Ages of Childbearing

Mean age at child-bearing	Gross reproduction rates (GRR) corresponding to birth rates in Table 1 (col. 3), derived from the specified age groups			Average number of births or total fertility rate (GRR X 2.03)		
	0-4	0-9	0-14	0-4	0-9	0-14
28.0	3.48	3.40	3.27	7.08	6.90	6.64
29.0	3.63	3.56	3.42	7.38	7.23	6.95
29.5	3.72	3.65	3.51	7.55	7.41	6.11
30.0	3.83	3.73	3.58	7.77	7.57	7.27

Source: The 1968 James Bay Demographic Survey

Table 3 offers yet another approach to estimate the average number of children born to women by age, for fertile women and all women, in taking into account their marital status. One begins by calculating the average number of births occurred to fertile ever-married women. Fertile women are assumed in this instance to be those who have given birth to at least one child. (It is deemed that data for fertile ever-married women,

as defined here, are likely to be more reliable than for never-married, single women or ever-married reported childless). In multiplying the average number of children per ever-married fertile woman in each age group, by the proportion of ever-married women in the corresponding age group, one obtains the average number of births of fertile women of all marital statuses (married and not married). Finally, adjustment is made for a 6% sterility rate to generate the average number of births for all

Table 3
Number of Births to Woman, in Specified Age Groups, by Marital and Fertility Status,
James Bay Indians, 1968

Age	Number of fertile ever- married women	Number of live births to ever- married	Average number of births per mother (3:2)	Percentage of ever- married women*	Fertility rate adjusted for:	
					Ever- married women (4x5)	Assumed 6% sterility
1	2	3	4	5	6	7
Under 20	5	10	2.00	11.57	0.23	
20-24	50	130	2.60	61.39	1.60	
25-29	46	220	4.78	81.82	3.91	
30-34	54	340	6.30	95.00	5.91	
35-39	40	293	7.33	95.00	6.96	
40-44	42	373	8.88	95.00	8.44	7.93
45-49	32	273	8.53		8.10	7.61
50-59	52	415	7.98		7.58	7.13
60-70	25	211	8.44		8.02	7.54
70 et plus	23	157	6.83		5.92	5.56
Age unknown	10	63	6.30	---	---	---
Total	379	2,485	---	---	---	---
45 and over	132	1,056	8.14	95.00	7.60	7.14

Source: The 1968 James Bay Demographic Survey

* The 95 percent of ever-married women for ages over 30 is a rounded figure.

women (fertile or not and ever-married or not). Note, that according to the survey only 2.1% of ever-married women who survived to 45 years of age have never given birth to a live child. However, it is likely that this is an underestimation given that the survey was so heavily oriented towards fertile women. For Canada as a whole, the childlessness among ever-married Indian women, past 45 years of age, is about 6% according to the 1961 and 1971 censuses.

Thus, according to these estimates, women who at the time of the survey (1968) were over 45 years old, have been fertile (had at least one child) and have been ever-married, produced on the average 8.0 children. When adjusted for childlessness (sterility) and marital status (all women ever-married or not), the average number of children turns out to be 7.14. Note, however that these averages are significantly higher for younger generations, respectively 8.9 and 7.9 (for 40-44 age group).

From the above estimation, it is safe to conclude that for the James Bay Indians the crude birth rate in the in the upper forties (47-50 per 1000) (Table 1). The exact period prior to 1968 to which these rates apply depends on the particular age group from which they are derived: past 7.5 years for the proportion of children under age 15, and past 2.5 for the proportion of children under 5 years of age. But broadly, these rates reflect the childbearing performance of generations of women who were in childbearing ages in the post-war years up to 1968.

For a historical perspective of the dynamics of fertility among the James Bay Indians, the reader is referred to Appendix Table 1, which exhibits birth rates over a broader time range, from 1972 back to 1920s. As we go back in time, to the 1930s and 1920s, the crude birth rate hovers around 40 per 1000, thus reflecting the traditional Indian child-bearing regime. As elsewhere in Canada, the post-war years brought the James Bay Indians an increase in natural fertility (Romaniuk, 1981). Historically, the estimates of birth and fertility rates, derived from the 1968 Survey, are near their peak value. From there on, they set on the course of a rapid fertility decline (Romaniuc, 1987), as did Indians in general but with a time lag of a few years, probably on the account of their relative isolation.

Section 2: Reproductive Patterns

It is customary in the analysis of fertility to make a distinction between its two dimensions: the level or quantity/intensity; and the age pattern or tempo of childbearing. In the preceding section we dealt with the former, whereas in this section we shall turn our attention to latter dimension. The age at which women start and terminate having children, the age at which they have them, the speed (interval) at which

children are born, are important features of the procreative behaviour of a population.

The 1968 James Bay survey has collected complete reproductive histories for 427 mothers. They include such information as dates of successive confinements, whether confinement is a live birth, a still-birth or a miscarriage, whether the child is still alive or deceased and the child's date of death, mother's age at delivery, her marital status. With these data it was possible to calculate average intervals, cross-classified by mother's age at the time of the survey, birth order, duration of child survival, intervals containing pregnancy wastage (still born and/or miscarriage), all relevant to the study of the tempo of reproduction.

The following presents, first, the basic parameters of fertility age patterns and the reproductive span, then in greater detail the analysis of child-spacing.

Reproductive Span; Average Age at Maternity

The age, at first and the last confinements for live births, as well as mean length of reproductive life for mothers who have survived to at least age 45 and were still married at 45 although not necessarily to the same man, are shown in Table 4. They are compared with a few historical high fertility populations.

Table 4
Mean Age of Mothers at Birth of Their First and Last Child, and Mean Reproductive Span, for James Bay Indians and a Few Selected Earlier Populations Known for their High Fertility

Population	First Child	Last Child	Mean reproductive span (in years)
James Bay Indians (1)(*)	21.9	38.7	16.8
Hutterites (2)(**)	22.2	40.9	18.7
Cocos Keeling Islands (3)(***)	19.4	39.1	19.7
French Canadians (4)(****)	23.2	41.0	17.8
Punjab villages (5)(*****)	20.0	37.0	17.0

Sources: (1) The 1968 Demographic Survey; (2) Tietze, 1957; (3) Smith, 1960; (4) Henripin, 1954; (5) Potter Jr., et al, 1965. See references for complete identification of sources.

Notes:

- (*) For James Bay Indians the age at first confinement (live births) and the age at last confinement are based on, respectively, 101 and 107 recorded cases of women who at the time of the survey were 45 years and over, and who were married to age 45, though not necessarily to the same man. For 88 ever-married women the dates both at first and last confinement have been recorded, and they yield an average reproductive span of 16.6, a very close figure to the one reported in the table.
- (**) For Hutterites the estimates of the age at first and last confinements are based on records for 209 mothers who married prior to the age of 25, married only once, and were living with their husband to age 45.
- (***) For Cocos Keeling Islands there was no information on the mean age at first birth. This had to be estimated by adding to the age at first marriage (18.1), the interval between marriage and the first child birth, assumed to be 16 months. As to the age at last birth, this is based on records for 84 mothers who were still married, though not necessarily to the same husband, at age 47.
- (****) For French Canadians the age at first birth is estimated by this writer by adding to the age at first marriage (21.9), the interval between the latter and the first birth assumed to be 16 months. Jacques Henripin estimates the latter interval at 15.8 months. However, this amounts to 16.8 months when prenuptial conceptions are excluded. He considered this to be a somewhat inflated average since some of the prematurely deceased first-born infants may not have been recorded, and the interval may in fact include a first or even second child.
- (*****) For the eleven Punjab villages the age at first birth is an approximation. It is not quite clear whether the last birth was meant to be only live or also still-birth. Furthermore, the authors of the Punjab study find the average age of 37 at last confinement to be young enough to raise suspicion that some birth control may have been practised among these populations late in the reproductive period.

There are three particular features about reproductive life of the James Bay Indian mothers that call for comments.

First comment refers to the relatively late start in childbearing as compared, not only to the populations listed in Table 4, but also to many populations with high fertility in developing countries. Various hypotheses of this relatively late start of childbearing of Indian women may be advanced, though none are empirically verifiable. One such hypothesis is that some deliberate birth prevention was taking place at the time the

older generations, considered here, started procreation, and that their statements to the contrary during the interview may have to be accepted with reservation. Another hypothesis might be that sexual partnership in Indian society was not as indiscriminate as it might appear in light of the observed high prenuptial fertility. Finally, one may speculate about the delaying effects on childbearing of the poor health and living conditions that prevailed in earlier times. This could result in later start of menstruation, puberty, complications for very young girls to get pregnant or their incapacity to carry to term a live-born child.

Second, what stands out is the relatively early termination of childbearing. This seems to occur about two years earlier than among the Hutterites or the French Canadians of the XVIII century. Forty, instead of 38, as observed in the James Bay Indians, probably was the average age at last confinement for most Western populations in the past when little or no birth control within marriage was practised. Here again little can be offered in the way of explanation. One may hypothesise that some birth control was actually practised by James Bay women in their late reproductive life. Poor health conditions and the hardships of the nomadic mode of life may have caused reproductive impairments and premature sterility. The longevity of reproductive life may have been curtailed by lesser exposure to sexual intercourse, as they advanced in age.

Third, as a result of a later start and earlier termination of childbearing, Indian women are left with a reproductive span that is shorter by about two or even three years than that prevalent among populations known for their high fertility. As we shall see later, when analysing child spacing, earlier generations of Indian women took a comparatively longer time to resume conception.

It should be noted, however, that there is only a weak correlation (.26) between the ages at first and at last confinements. It follows that the age at which women start to bear children has little effect, if any, on the age at which they terminate it.

The average age of women at which their children were born, shown in Table 5, stands at 30.2 years for mothers over 45 years of age, an indication of relatively old fertility age pattern. French Canadian women of the XVIII Century experienced, like Indians, a relatively late entry into childbearing. But, unlike the former, they had many children. The combination of the two makes the average age at their children's birth even higher, 32.2. Most of the high fertility African and Asian populations start having children at very young age (see Congo as an example).

Table 5
Average Age of Women at Birth of their Children

Specification	Average age
James Bay (mothers over 45 years of age) Number of cases: 759 children	32.2
French Canadian (XVIII Century) (women with completed families)	30.2
Canada Indians*	27.6
R.D. Congo**	27.0

Notes:

- * Based on the age specific fertility rates recorded for 1968 for all Indian population of Canada.
- ** Based on the age specific fertility rates for women 15 to 45 years in 1956 (Romaniuk, 1967)

Next we turn to a more detailed examination of child spacing by resorting to the data from the James Bay survey on the successive birth intervals.

Child-spacing

The interest in child-spacing to be analysed hereafter is two-fold: first, more general, to infer the level and age pattern of fertility; and second, more specific, to probe into intergenerational changes in procreative behaviours and thus get some sense of the time trends over the period that James Bay women were interviewed for their fertility.

In what follows, I shall examine the successive birth intervals cross-classified by: (1) age of mothers at time of the survey; (2) age of mothers at the commencement of interval, and (3) birth order (parity). For each of these cross-classifications, two series of birth intervals are presented: the observed and the adjusted. Given the rather small number of intervals and abnormal departure from the prevailing patterns in a few cases, it was deemed advisable to smooth the observed birth interval series. To this end, use was made of a first degree polynomial, that is, a linear regression method of fitting to the observed data. (Adjustment by a second degree polynomial was also tried but the fit was very close to that of

first degree). Unless otherwise indicated, the calculated intervals are between successive live births.

Let us focus first on Table 6 showing birth intervals at a mother's age at the time of the survey (1968). What is striking in this table is the trend of birth intervals to diminish from older to younger mothers' generations. From slightly over 32 months for mothers over 60 years old to slightly less than 20 months for mothers under age 25.

Table 6
Mean Birth Intervals Between Recorded Successive Live Births of Mothers Continuously Married during Interval by Age of Mother at Time of Survey, 1968

Mothers' age in 1968	Number of intervals	Average interval in months:		Standard deviation
		Observed	Adjusted	
-20	5	17.80	17.20	3.71
20-24	74	18.69	18.80	6.56
25-29	168	19.33	20.41	7.96
30-34	261	22.19	22.02	9.56
35-39	217	23.94	23.63	10.25
40-49	457	26.07	26.04	12.94
50-59	226	29.34	29.26	16.19
60 +	11	32.39	31.77	19.49
Unknown	10	24.20		9.31
All ages	1529	24.91	—	13.07

Source: The 1968 James Bay Demographic Survey

There may be at least four reasons for the observed decrease in the length of the birth interval from older to younger generations. First, there has been a real change in intergenerational procreative behaviours. As we shall see later, younger generations have largely given up breast-feeding for bottle-feeding which may entail an earlier resumption of the ovulation and exposure to pregnancy. Second, it is well-known that fecundity decreases as women reach higher ages and higher parities. Third, the effect of so-called "truncated intervals," that is open intervals, may be greater for young mothers, as some of them may have had their next child well after the survey. The exclusion of the latter cases from the observation field may introduce a shortening bias in the intervals. The

fourth reason is the tendency of old mothers to neglect to report some of their children, particularly those who died at very young ages. Intervals exceeding 48 months represent 6.5% of all intervals and some of them may actually conceal unreported dead children. Short intervals, less than 12 months, account for 4.5% of intervals. Unusually short intervals may be due to erroneous recording of birth dates or still-birth being mistaken for live birth. The removal of the unusually long (over 48 months) and unusually short (less than 9 month intervals) will bring down the length of the average interval from 25 to about 23 months for all ages

Table 7
Mean Birth Intervals between Recorded Successive Live Births of Mothers Continuously Married during Interval by Age of Mother at Commencement of Interval, James Bay Indians, 1968

Age of mother at the commencement of interval	Number of intervals	Average interval in months:		Standard deviation
		Observed	Adjusted	
Less than 16	7	21.29	--	10.86
16	11	18.00	21.31	4.75
17	30	20.27	21.65	9.37
18	46	22.61	21.98	10.37
19	66	22.29	22.32	12.11
20	98	23.91	22.66	17.54
21	79	21.23	22.99	8.89
22	100	23.09	23.33	16.60
23	88	23.73	23.66	14.54
24	87	24.59	24.00	11.93
Less than 20	160	21.66	22.16	10.78
20-24	452	23.35	23.69	14.53
25-29	367	25.75	25.22	14.71
30-34	255	28.74	26.75	15.84
35-39	144	26.51	28.29	11.32
40 and over	29	29.90	29.82	12.27
All ages	1407	25.22	—	14.31

Source: The 1968 James Bay Demographic Survey

combined, and from about 32 months to about 27 months for mothers over 60 years old, while that of women under 30 remains the same, about 19 months – a rather substantial gap of about eight months between older and younger generations.

Further insights into the dynamics of child-spacing may be gained from the intervals cross-classified with the mother's age at the commencement of the birth interval, shown in Table 7. As one can see, the length of interval increases gradually with the mother's age at the beginning of the interval: almost 22 months for those under 20 years of age; nearly 26 months for those 25 to 29 years old; and close to 30 months for women who started childbearing at more advanced ages. The interpretation thereof is complicated by the fact that thus ordered intervals confound the generational and birth order effects. The increasing length of birth interval with age at the commencement of the interval may reflect the fact that women who enter later into childbearing are precisely those who are less fecund or are less fit to carry pregnancy to term. It is also well established that increasing pregnancy wastage, longer post-partum amenorrhoea, lesser fecundity due to either physiological causes or lesser exposure to sexual intercourse are associated with the mother's age.

Table 8

Mean Birth Intervals between Recorded Successive Live Births of Mothers Continuously Married during Interval by Birth Order, James Bay Indians, 1968

Birth order	No of intervals	Average intervals in months:		Standard deviation
		Observed	Adjusted	
1-2	256	22.71	23.96	11.46
2-3	232	24.44	24.23	15.11
3-4	224	23.64	24.57	12.13
4-5	195	25.61	24.88	13.89
5-6	167	25.86	25.18	12.91
6-7	135	26.22	25.49	12.53
7-8	103	27.64	25.79	16.37
8-9	82	27.13	26.10	11.79
9-10	64	24.47	26.40	9.28
10 and plus	71	25.62	26.71	9.97
All orders	1529	24.95		13.07

Source: The 1968 James Bay Demographic Survey

Finally, to cast some light on the relationship between birth order or parity and the length of intervals, we shall turn to Table 8. The reading of this table, as in the previous case, is complicated by the fact that it mixes up various generations, older and younger, which as we have already seen, exhibit different patterns of procreation. To neutralise, to some extent, the latter problem, the very least we can do is separate the older generations with already completed childbearing (which to a large extent represent more traditional childbearing behaviours), from the younger generations, under age 40 at the time of the survey, (which represent more modern childbearing patterns). This is what is done in Tables 9 and 10 respectively.

Table 9
Mean Birth Intervals between Recorded Successive Live Births of Mothers Continuously Married during Interval by Birth Order, for Mother Under 40 Years Old at the Time of the Survey, James Bay Indians, 1968

Birth order	No of intervals	Average intervals in months:		Standard deviation
		Observed	Adjusted	
1-2	157	20.67	21.87	9.19
2-3	134	21.61	21.81	9.75
3-4	126	21.09	21.74	8.76
4-5	103	23.13	21.68	10.48
5-6	74	22.31	21.62	8.77
6-7	53	23.62	21.56	10.12
7-8	29	20.24	21.50	8.06
8-9	20	21.70	21.44	7.44
9-10	14	21.21	21.38	7.65
10 and plus	15	20.33	21.32	7.12
All orders	725	21.66		9.35

Source: The 1968 James Bay Demographic Survey

Table 10

Mean Birth Intervals Between Recorded Successive Live Births of Mothers Continuously Married during Interval by Birth Order, for Mothers Over 40 Year Old at the Time of the Survey, James Bay Indians, 1968

Birth order	No of intervals	Average intervals in months:		Standard deviation
		Observed	Adjusted	
1-2	97	26.05	27.75	13.82
2-3	96	28.29	27.77	19.81
3-4	96	26.93	27.79	14.80
4-5	90	28.63	27.81	16.58
5-6	91	28.71	27.83	14.92
6-7	82	27.90	27.85	13.60
7-8	74	30.54	27.87	17.82
8-9	62	28.89	27.89	12.38
9-10 1	50	25.38	27.90	9.48
0 and plus	56	27.04	27.9	10.14
All orders	798	27.88		15.15

Source: The 1968 James Bay Demographic Survey

When one compares the two aggregates, older versus younger generations, respectively in Tables 9 and 10, two distinct features stand out. One is the invariability of the birth intervals, though at different levels, for each generational aggregate. In other words, for a given generational aggregate intervals appear to be more or less of the same length irrespective of the birth order. This at first view is somewhat surprising because one would expect the length of intervals to increase with age for reasons mentioned earlier. On the other hand, shorter intervals are required to achieve large family size, say 10 and more offspring. Those who achieve such a high level of pregnancy may be precisely the women enjoying excellent reproductive health. Those who suffer from reproductive impairments may not go beyond two or three children, and to do even that may take a much longer time.

The second feature that stands out, when comparing the two generational aggregates, is the significant difference in their respective length of intervals. The latter is about six months shorter for the younger, as compared to the older generations, a clear indication of inter-generational change in the dynamics of reproduction.

Table 11 lines-up intervals for James Bay (older and younger generations separately) and for two high fertility populations, Cocos Keeling Islands and the Hutterites. The significantly longer overall average interval for the older mothers' generations of James Bay is striking. Their tempo of reproduction is clearly slower; they take comparatively longer to produce progeny.

Table 11
Average Live Birth Intervals between Successive Live Births for James Bay Indians (1968) and a Few High Fertility Populations (in Months)

Population	Average interval in months
James Bay Indians:	
All generations combined (1)	25.2
Those who at the time of survey were over 40 years old	27.9
Those who at the time of survey were over 50 years old	30.3
Those who at the time of survey were over 60 years old	32.4
The Cocos Keeling Islands (2)	24.4
Hutterites (3)	25.4
Punjab Villages (4)	30.0

Sources: (1) The 1968 James Bay Demographic Survey; (2) Smith, 1960. (3) Tietze, 1957. (4) Potter, 1965. See references for complete identification of the sources.

Notes: *For James Bay Indians, weighted average of mean birth intervals for ages 50-59 and 60 and over.

The reported average live birth intervals, respectively for old and younger generations of the James Bay Indian mothers, are consistent with the range of the theoretical or hypothetical intervals calculated under the specified assumptions regarding the individual components of the live birth intervals, as per Table 12. The chief differentiating factor between the two generations appears to be the duration of breast-feeding, long for the older and much shorter for the younger generations. Reduction in the period of ovulatory exposure to pregnancy, and that of pregnancy wastage are contributing factors.

Table 12
Expected Average Intervals Separately for Older and Younger
Generations, Under Specified Assumption, James By Indians, 1968

Assumptions	Old generations (prolonged lactation)	Young generation short or no lactation)
1. Gestation period	9	9
2. Unovulatory cycle (1)	2	2
2. Ovulatory exposure (2)	6-10	5-7
4. Added pregnancy wastage (3)	2.5	1
5. Lactational amenorrhoea (4)	9-10	3-5
Total	28.5-33.5 months	20-24 months

Notes: (1) Resumption of menstruation after the delivery is assumed to be 2 months. (2) Longer ovulatory exposure for older generations is assumed on account of their nomadic mode of life. (3) See Potter's estimates of the contribution of the pregnancy wastage to the length of live birth interval in Table 26. It is further assumed that due to health improvement and sedentary life of younger generations the pregnancy wastage-related delay is reduced from 2.5 to 1 month. (4) The lactational amenorrhoea is a function of the duration of the breast-feeding (see text later).

One closing comment: the two dimensions—the level or in demographers' jargon intensity or quantity of fertility, and the tempo of child-bearing—are not independent of each other. One would indeed expect an inverse correlation between the two. The shorter intervals, in the absence of systematic birth controls, will tend to produce larger offspring, and vice versa. In order to check for consistency between quantity and tempo, Table 12(a) has been constructed. Note also a high degree of constancy between expected number of births per woman as derived from birth intervals (col.2), and the estimates for the same in col. 4., taken from Table 3 col. 4.

Table 12(a)
Average Birth Intervals and Average Number of Births per Woman,
Expected and Estimated

Generations	Average Interval	Expected average number of births	Estimated average number of births
(1)	(2)	(3)	(4)
Older generations:			
Over 40	27.9	8.24	8.21
Over 50	30.3	7.67	7.83
Over 60 old	32.4	7.23	7.67
Younger generation: under 45 years of age			
	25.2	9.02	8.00

Notes: Reproductive span is taken to be 16.8 years or 202 months as per Table 4. To calculate expected values for average number of births (col.3) the reproductive span of 202 months is divided by the number of birth intervals (col.2), and add one birth. Estimated values in col. 4, are taken from Table 3 col. 4.

Section 3: Factors in fertility

This section deals with a range of factors deemed to influence, directly or indirectly, the intensity and the tempo of reproduction. Specifically, such factors as marital status, illegitimacy, lactation practices, pregnancy wastage, some reproduction-related features of nomadic way of life, and finally attitudes toward childbearing and birth control, stand to receive due attention in this section. In doing so, the dichotomy of older and younger generations should be kept in mind.

Nuptial (marriage) Patterns

The age at which people enter conjugal unions appears, in the light of statistics collected for various populations, to be a significant factor in fertility, especially among those with little or no birth control practice.

Marriage, as an institution, undoubtedly offers the optimum conditions for bearing and upbringing children. Almost invariably, regular unions sanctioned by law or by custom, stand to produce larger offspring than do the more vulnerable and unstable consensual unions. Acute marital instability, often a symptom of social disorganisation, has a depressing effect on fertility because of women's lesser exposure to sexual intercourse or because women with conjugal problems are more prone to resort to contraception and abortion. If accompanied by wide-spread sexual promiscuity, conjugal mobility (divorce and remarriage) will act as a medium for dissemination of venereal diseases, known to cause impairments of reproductive organs and sterility (Romaniuk, 1968). These observations suffice to justify the need to acquaint ourselves with the marital patterns as background to a better understanding of the Indian procreative behaviour.

Table 13
Single Indian Females in Specified Age Groups, in Percent

Age	Canadian Indians	James Bay Indians
10-14	100.0	100.0
15-19	83.8	88.4
20-24	39.1	38.6
25-29		18.2
	}15.7	}10.8
30-34		3.1
35-39		2.3
	}7.4	}4.5
40-44		6.4
45-49		2.7
	}4.4	}4.5
50-54		6.9
55-59		0.0
	}3.7	}2.0
60-64		5.3
	}3.2	
65 and over		2.5

Sources: For Indians the 1961 Census, Canada Statistics Canada, Demography Division; for James Bay Indians the 1968 Demographic Survey.

The overall picture that emerges from Table 13 is that female marriage among Indians, if not universal, comes close to it. Those remaining single, among both Indians generally and the Indians of James Bay, hardly exceed five percent of the women by the time they reach menopause and are no longer fertile. Only in the 25-34 age group, the proportion of women remaining single in James Bay appears to be significantly lower as compared to all-Indian population, respectively 10.8% and 15.7%. In general, a lower percentage of singles among James Bay Indians might be due to a somewhat more liberal definition of "conjugal unions" adopted in the James Bay survey as compared with the census definition. Whereas in the 1961 census definition only those who are "legally married" are considered to be married, the James Bay survey may have included cases of *de facto* unions.

But surprisingly enough, the age pattern of Indian marriage is relatively late, compared to populations of many developing countries, with which Canadian Indians otherwise share many demographic features. Even in the age group of 20 to 24 nearly 40% still remain unmarried, both for Indian women in Canada as a whole and for the James Bay Indians.

Table 14
Estimates of Mean Age at First Marriage for James Bay Indians
and a Few Selected High Fertility Populations

Population	Females	Males	Difference
Indians (James Bay, 1968)			
Direct method	22.7	25.6	2.9
Stable population	22.5	24.6	2.1
Hajnal method	21.6	24.7	3.1
<hr/>			
Cocos Keeling Island ⁽¹⁾	18.1	-	-
Hutterites ⁽²⁾	20.7	-	-
French Canadians (18th century) ⁽³⁾	21.9	26.8	4.9
Congo (Stable Population method) ⁽⁴⁾	16.7	21.5	4.8
Ukraine (1891) ⁽⁵⁾	19.5	20.5	1.0

Sources: (1) Smith, 1960; (2) Tietze, 1957; (3) Henripin, 1954; (4) Romaniuc, 1967; (5) Romaniuc and Chuiko, 1999. See References for complete identification of the sources.

One important feature of the nuptiality of any population is age at marriage. Table 14 highlights the estimates of the mean age of marriage for Indian males and females, and compares them with a few populations known for their high fertility.

Age at marriage has been recorded for 86 James Bay women who at the time of the survey (1968) were 45 years and over. The average age at first marriage for these women is 22.7, exactly the same as for Canadian women in 1970. Similar figures have been derived by two indirect methods of estimating the mean age at marriage. One, devised by Hajnal (1953), derives mean age at marriage from the proportion of single by age under age 50. The other consists of equating the mean age at marriage with the age at which the proportion of single under age 50 corresponds to the proportion of single in a distribution by age in the Coale-Demeny stable population model family West (1966).

Illegitimacy (out-of wedlock births)

Prevalence of a high incidence of illegitimacy is another distinctive feature of both matrimonial and procreative behaviours of the Indians. As shown in Table 15, mothers who conceived at least one child prior to marriage represent 26% of all mothers. According to this Table the incidence of prenuptial conceptions tends to increase from older to younger generations. One line of interpretation thereof could be that as Indian society becomes more and more caught up in the modernisation process, there is an increasing relaxation of sexual discipline. Another interpretation might be that we are faced partly with a statistically spurious phenomenon, caused by memory lapse, which increases with age. The likelihood is also that as mothers regularise their matrimonial status after the child is conceived, they may deliberately conceal or post-facto 'legitimise' the prenuptial conceptions experienced in the more or less remote past.

If this latter interpretation is correct, then the incidence of prenuptial conception might be more in the vicinity of 40%, as for the younger generations of women, rather than the 26% average for all generations.

The high incidence of out-of wedlock births is by no means inherent to the Cree group alone. It is rather a general feature of Indian communities in Canada, as revealed in Table 16. About 38% of all children born in 1969 are reported illegitimate. The term 'illegitimacy' seems to include children normally born to unwed mothers, and probably, children born to women not 'legally' married. The increase in the illegitimacy ratio by age of mothers, from older to younger, actually reflects the fact that most of the illegitimate births are first births.

Table 15
Women Who Gave Birth to at Least One Child Prior to Marriage or
During the First 8 Months Following Marriage, by Age Group,
James Bay Indians, 1968.

Age of mothers at the time of survey (1968)	Number of mothers	Percentage of mothers with prenuptial conception
Under 15	-	-
15-19	110	4.5
20-24	92	42.4
25-59	62	38.7
30-34	65	33.8
35-39	43	23.3
40-44	47	25.5
45-49	35	34.3
50-54	27	25.9
55-59	32	31.3
60-64	19	26.3
65-69	7	14.3
70 and over	34	5.9
All ages	572	26.0

Source: The 1968 James Bay Demographic Survey

Table 16
Illegitimate Births as Percentage of all Births Reported in 1969 for
Status (Registered) Indians of Canada

Age group	All births	Illegitimate births as percentage of all births
Under 20	1,697	64.2
20-24	2,892	43.6
20-29	1,888	27.6
30-34	1,163	22.6
35-39	700	16.7
40-44	292	17.8
45-45	32	3.1
50 and over	70	4.3
Total	8,734	37.9

Source: Department of Indian Affairs and Northern Development

Lactation Practices

The 1968 Survey included a series of questions purporting to determine the habits of the James Bay Indian mothers with regard to lactation. Each mother was asked whether she breastfed her children in general, and more specifically whether she breastfed her first and last born child, and if so, for how long. It was felt that there was something to be gained from confining the interview on lactation to only these two birth orders, since the extension of this question to all children could have caused unnecessary respondents fatigue and result ultimately in stereotype answers. The last-born child is the one least subject to biases due to memory lapses. The first birth, which is the most important event in motherhood, is also likely to be better remembered than events associated with subsequent births. Since there was particular interest in the changes in procreative behaviour over time, the span between first and last child was in many cases long enough to make the comparison in lactation practice at both ends of motherhood meaningful. The mothers who indicated that they did not breastfeed their first or last child or both were asked to specify, in each case, the reasons why they did so and what other means they resorted to for nursing their babies.

The responses to the questions on duration of breastfeeding, asked separately for the first and last child, were cross-classified with the child's birth period and with the mother's age at the time of the survey. In the context of this study, our interest lies not only in the absolute level of lactation incidence, but also in the shifts that have taken place over time and from one generation to the next in lactation duration. Relevant data are presented in Tables 17, 18 and 19. The figures therein do not include children still being lactated – the case for many "last born" children. Nor do they include those cases where lactation was terminated by the child's death. Excluded also were a few cases where the date of the child's death was incomplete and, hence, it was not clear whether the termination of lactation was prior to or coincident with the infant's death.

It would be overly optimistic to assume that all the information on lactation practices is accurate, and that all respondents correctly reported the number of months they breastfed their first and last born baby. It is generally known that data on lactation are prone to various errors, the most common of which are due to memory lapses, which increase with the mother's age. Biases associated with the attraction of certain numbers such as 6, 12, and 24 months are frequently found in lactation surveys. Certain mothers, notably the older ones, indicated that they did not remember how long they had lactated, while others stated that they did so until "the child was able to take food" or "until a new pregnancy occurred." As to the non-lactating mothers, the reasons they

gave for not breastfeeding appeared to be credible, such as "sickness," "lack of milk," "on doctor's advice," "other woman breastfed the child," or "used bottle." The kind of responses gathered suggests that a certain amount of effort of recollection was made by respondents, and that the questions on lactation were not taken lightly by most of the mothers interviewed.

The 1968 James Bay Survey is of particular interest as it reflects not only the most recent status of breastfeeding in this remote area of Indian settlements but also intergenerational changes. Those who breastfed for only short periods, and those who did not breastfeed at all, are rapidly increasing in number with age. The proportion of non-lactating first-child mothers increased from about 4%, for children born prior to 1940, to 25% for children born after 1960. The proportion of mothers who reported having breastfed over a period of 9 to 15 months diminished from 43 to 23%, according to the data in Tables 17. Similar conclusions can be drawn from the data in Table 18 referring to the last child's lactation experience. Among mothers who gave birth to their last child after 1960, a high proportion, about 40%, reported that they had not breastfed at all their last-born child.

Table 17
Percentage Distribution of Women According to Duration of Lactation, Classified by Period of Children's Birth, First Child, (Children Surviving to at least Two Years), James Bay Indians

Lactation duration	Children born since 1960	Children born 1950-1959	Children born 1940-1949	Children born prior to 1940
Non-lactating	24.7	15.7	11.3	4.0
Lactating				
3 months and less	31.2	25.3	12.9	9.2
4-8 months	20.8	13.5	11.3	6.6
9-15 months	23.4	32.6	45.2	43.4
16-24 months	---	6.0	14.5	14.5
Over 24 months	---	3.6	3.2	10.5
"Until next pregnancy"	---			
"Until they could eat food"		3.6	1.6	11.8
Total	100.0	100.0	100.0	100.0
Number of cases: 298	77	83	62	76

Source: The 1968 James Bay Demographic Survey

Note: Cases of mothers with one child have been classified in the "first child" category.

Table 18

Percentage Distribution of Women According to Duration of Lactation, Classified by Period of Children's Birth, Last Child, (Children Surviving to at least Two Years) James Bay Indians

Lactation duration	Children born since 1960	Children born 1950-1959	Children born 1940-1949	Children born prior to 1940
Non-lactating	41.4	35.7	8.3	11.1
Lactating				
3 months and less	24.0	21.4	8.3	7.4
4-8 months	15.4	7.1	---	---
9-15 months	16.0	14.3	37.5	44.4
16-24 months	2.4	14.3	16.7	18.5
Over 24 months	---	2.4	25.0	7.4
"Until next pregnancy" or "Until they could eat food"	1.8	4.8	25.0	11.1
Total	100.0	100.0	100.0	100.0
Number of cases: 262	169	42	24	27

Source: The 1968 James Bay Demography Survey.

Note: Cases of mothers with one child have been classified in the "first child" category.

Average duration of breastfeeding by age of mother, for the first and last-born child for mothers who breastfed, is shown in Table 19. This duration dropped for lactating mothers from about 16 months for those over 50 years of age to about five for those 15-24 years of age. The consistently shorter duration of lactation of the last-born child for all mothers (lactating and non-lactating) may reflect the more recent trend among mothers of all ages to adhere to modern infant diet.

What is true for the James Bay Indian mothers, also holds for Indian mothers across Canada. For proof, let us turn to Table 20 drawing from data of the 1962 National Health Survey among Indian mothers living on reserves. Through this survey, 5,552 infants, accounting for approximately 70% of all Indian children born in 1962, were closely followed from birth to their first birthday by nurses of the Federal Medical Services. Records were kept on the method of nursing and on the health of both the infants and mothers. Children who were either never breastfed, or were breastfed less than one month, represented 64% of those surveyed. Only 18% of the mothers breastfed their children for 6 months or more.

Table 19
Mean Duration of Lactation Period (in Months) by Age of Mother at the Time of the Survey, (Children Surviving to at least Two Years), James Bay Indians, 1968

Age of Mother at Survey	Lactating and Non-lactating:		Lactating Only:	
	First Child	Last Child	First Child	Last Child
14-24	3.7	2.6	5.3	4.6
25-29	6.3	3.2	7.6	5.7
30-34	6.7	3.6	8.1	6.1
35-39	9.5	4.9	10.5	7.3
40-44	10.8	5.2	12.1	9.1
45-49	12.1	6.9	12.7	10.3
50+	15.0	11.9	16.7	15.9
All ages	9.2	6.1	10.9	9.6
Number of cases	285	248	243	158

Source: The 1968 James Bay Demographic Survey

Table 20
Percentage Distribution of Children Born to Canadian Indian Women Living on Reserves by Duration of Lactation, 1962

Duration of Breastfeeding	Percentage Distribution of Births
Under 1 month	33
1 month but less than 2 months	5
2 months but less than 3 months	4
3 months but less than 4 months	3
4 months but less than 5 months	2
5 months but less than 6 months	4
6 months or more	18
Presumed not breast-feeding	31
Total Percentage	100
Total number of births observed	5,552

Source: Survey of Maternal and Child Health of Canadian Registered Indians, 1962, Medical Services, Department of National Health and Welfare, Ottawa.

It is clear from the above that a revolutionary change has taken place in baby-nursing practices among Indians. Prolonged breastfeeding was common among Indians in earlier days. "The total absence of milk, except what the mother herself could provide and the absence of cereal among all but the agricultural tribes, lengthened the period of lactation, because no infant under the age of three years could assimilate a diet solely of meat and fish; and prolonged lactation affected the fertility of the women, making the average family small, although the Indians were naturally as fecund as Europeans" (Diamond, 1932, p. 51). This quotation is probably a fair summary assessment of the lactation status and

Table 21
Intervals Between Successive Confinements for Mothers Continuously Married During Interval, According to Duration of Child Survival (Intervals Containing Miscarriages or Stillbirths Are Excluded), James Bay Indians, 1968

Specifications	After stillbirth	Infant surviving:				
		Less than 1 month	1 to 6 months	7 to 12 months	13 to 23 months	At least 24 months
Average interval as reported	18.23	20.42	21.48	23.40	26.22	25.05
Average interval as adjusted	19.98	20.12	20.80	22.56	24.87	26.49
Standard deviation	8.82	10.98	12.09	13.26	7.34	13.76
Number of Intervals	24	27	49	37	12	1249

Source: The 1968 James Bay Demographic Survey

Note: If intervals smaller than 9 and larger than 48 months are excluded from the calculation, the pattern remains practically the same.

its likely reproductive repercussion in traditional Indian society. Since then the diet of Indian peoples has undergone such a radical transformation that nutritionists speak of the profound food acculturation of contemporary Indian society. The changes in infant feeding practices among North American Indians and Inuit include a drastic reduction in breastfeeding and an increasing use of bottle-feeding (Carlile et al., 1972; Schaefer, 1975; Smith, 1975).

It remains to be seen what the childbearing implications are of this shift in nursing habits. Two pieces of indirect evidence, particular to the James Bay Indians, are illuminating in this regard. According to the first evidence, in Table 21, the interval between successive live births increases with the duration of child's survival. For example, it takes only 18 months for a birth to occur after a stillbirth and 26 months if the child survived to at least 24 months. According to the second evidence, in Table 22, there is a significant positive correlation between the duration of the first child lactation and the interval between the first and second live births. It should be noted that intervals between the first and second birth exceeding 48 months were eliminated from the calculation of the correlation coefficients. It has indeed been assumed that such long intervals must be due to causes other than lactation.

Both pieces of evidence produced here tend to suggest that lactation is indeed a factor in the duration of the postpartum amenorrhea, the resumption of menstruation and fecundity cycle, and hence in the duration of live birth intervals.

Table 22
Correlation Coefficient between Period of First Child Breastfeeding and Length of Interval Between Birth of First and Second Child, James Bay Indians, 1968

Villages	Correlation coefficient	Number of cases
Fort Albany	0.68	28
Attawapiskat	0.30	17
Moosonee	0.46	33
Moose Factory	0.43	43
Rupert House	0.61	30
Fort George	0.62	45
All villages	0.66	184

Source: The 1968 James Bay Demographic Survey

This conclusion is consistent with various theoretical models and empirical findings done elsewhere (Tietze, 1961; Potter, 1963; Potter et al., 1965; Berman et al., 1972; Knodel and Van de Walle, 1967). Lesthaeghe and Page (1980) have developed a model by means of which the median length of postpartum amenorrhea can be predicted from the median duration of natural lactation. If we assume the relationship implied in this model holds true for the James Bay Indians, then a reduction from, say, 15 to 5 months in the average duration of breastfeeding experienced by Indian mothers, as per Tables 17-21, will cause the length of postpartum amenorrhea to diminish approximately from 9.0 to 3.0 months. Therefore, for the level of incidence of breastfeeding observed among James Bay Indians, a 10-month reduction in lactation entails a reduction by about 6 months in the length of postpartum amenorrhea. The proportionally lesser decrement in the latter reflects the curvilinear shape of the Lesthaeghe/Page model.

In conclusion, the analysis of lactation data offers strong indirect evidence to the effect that the massive, almost abrupt, shift from prolonged breastfeeding to bottle-feeding is a potent factor in the cycle of rising natural fertility among James Bay Indians, as in general among Canadian Indians, observed in the post-war years and up to about the mid-1960s.

In what follows we shall take a look at two other factors that may have contributed to the curtailment of birth intervals and therefore to the increase of natural fertility among Canadian Natives.

Reproductive Health/Pregnancy Wastage

According to the James Bay Survey, 726 of deliveries occurred in hospitals, and that among these 16, or 2.2%, were stillbirths. Reported stillbirths for all women, irrespective of the place of delivery, was 2%, which is most likely an understatement. One would expect the stillbirth ratio to be higher for women of older generations who used to deliver at home or in the bush. Only 5% of mothers interviewed stated that they had had a miscarriage.

Table 23 reveals the impact that the presence of pregnancy wastage can have on birth intervals. Thus intervals containing one reported miscarriage are roughly eight months longer than those containing no pregnancy wastage, whereas those containing one reported stillbirth are about 15 months longer, on average. This comes close to Potter's estimates (1963) according to which a three-month miscarriage or a stillbirth add to the length of an interval between successive live births, 9 and 16 months respectively. Hence, the number of months which a miscarriage or a stillbirth adds to the over-all average length of the

inter-live-birth-interval depends on the level of pregnancy wastage, as is illustrated in Table 26, calculated by a procedure worked out by Potter. So if, for example, in the absence of any pregnancy wastage the average interval between successive live births is 24 months, the prevalence of 10% of miscarriages and 2% of stillbirths will elongate the average interval by 1.4 months.

Table 23
Reported Live Birth Intervals Comprising Cases of Pregnancy Wastage, James Bay Indians, 1968

Type of pregnancy	Average between-live-birth interval (in months)	Number of reported cases (1)
Live birth interval including one miscarriage	31.56	42
Live birth interval including one still-birth	38.66	16
Live birth interval including more than one miscarriage or still birth	77.54	4
Live birth intervals (all ages) free of any miscarriage or still birth	24.00 (estimate)	1,472

Source: The 1968 James Bay Demographic Survey.

Note: (1) It can be suspected that intervals containing still-births and particularly miscarriages are under-reported. The average intervals may however stand as order of magnitude.

There is no direct data to document the reduction in the levels of pregnancy wastage experienced by the James Bay Indians over time. However, it can be surmised from indirect evidence that some reduction in pregnancy wastage must have taken place as a result of significant improvements in medical care in this otherwise remote and isolated area. Twenty years prior to the 1968 Survey only a few births occurred in hospitals; since then practically all deliveries occurred there, as shown in Table 24. Furthermore, there was a rapid decline in infant mortality in the last two decades prior to the survey, as illustrated in Table 25. Finally, it

is worthwhile noticing that the proportion of stillbirths has fallen in Canada as a whole from 1.5% in 1955 to 1.1% in 1968. Not necessarily representative of the James Bay Indians, these figures are nevertheless indicative of the reduction in the level of pregnancy wastage that can be achieved when modern medical facilities are available to the potential mothers.

In brief, the shortening of the birth interval due to reduction in pregnancy wastage is probably something in the order of 1.5 months, a small, but not negligible, gain in the reproductive tempo of the James Bay women, for the period covered by the survey.

Table 24
Place of Deliveries in Percentage by Period of Birth,
James Bay Indians, 1968

Place of delivery	Prior to 1940	1940-49	1950-59	1960 and after
Home	54.98	52.74	25.19	5.32
Bush	43.41	39.95	19.34	3.47
Hospital	1.29	7.31	55.32	91.09
Undetermined	0.32	---	0.15	0.12
Total	100%	100%	100%	100%

Source: The 1968 James Bay Demographic Survey

Table 25
Infant Mortality During the First 3 Months by Period of Birth,
James Bay Indians, 1968

Period of birth	Death ratio per 1000 live births
Children born prior to 1940	65.14
Children born 1940-49	73.68
Children born 1950-59	50.38
Children born after 1960	18.96

Source: The 1968 James Bay Demographic Survey

Table 26
Time Added to a Live Birth Interval for a Given Level of Pregnancy Wastage (Proportion to the Total Pregnancies)

Proportion of miscarriage	Proportion of stillbirth	Average time added to an average interval between successive live births (in months)
0.05	0.01	0.6484
0.10	0.02	1.3856
0.15	0.03	2.2317
0.20	0.04	3.2104

Source: Potter (1963, see references)

The Shift From a Nomadic to a Sedentary Mode of Life; Prolonged Conjugal Separation

Over several decades, and especially in the post-war years, Indians have gradually shifted from a semi-nomadic hunting and gathering society to a sedentary one. By the time, the survey was taken, an overwhelming majority of them lived on reserves, working in or close by, or, in the absence of wage earning, benefiting from welfare and various government subsidies.

The nomadic life, which Indians adopted in the past, remains an under-explored area in terms of how it may have affected the reproductive health and procreative behaviours. It can however be surmised that pregnancy accidents such as miscarriages or protracted secondary sterility, missed opportunities to get pregnant because of admittedly lower exposure to sexual intercourse and the heavy burden to which women, in particular, were subjected to during moves, and other hardships of nomadic life, have negatively affected fertility. Conversely, some of these liabilities may have been lifted up as they adopted a sedentary and more comfortable way of life. The hypothesis is corroborated by Eric Roth (1981) who, using genealogical data of the pre-1900 and post-1900 cohorts, among Kutchin Athapaskans in the furthest North of Canada, observed an increase in fertility rate as they were brought to adapt a sedentary mode of life.

A somewhat related question that needs some consideration refers to the temporary separation of spouses in earlier Indian society, due either to the nomadic way of life and/or to customs requiring the periodic return of wives to their families. The following quotes taken from early research on the Northern Ojibwe by Dunning cast some light on

the residential patterns of couples or couples-in-making in traditional Indian communities

"Each man hunts for himself, alone on his trails, the hunters scattering as widely as possible in order to make the most of the thin supply of game. The household of wife and children, who depend upon the man's hunting, lives in complete isolation during the winter season (November to March)." (1937: 5)

"After marriage the daughter remains close to her mother at least until she moves to her husband's camp. Visiting back and forth is frequent, and the girl's mother remains attentive and concerned for the well-being of her grandchildren. The warmth and solidarity of mature women who are sisters, centred around their ageing mother, is a notable feature of Pekangekum society." (p.97)

"During the summer and fall of 1954, the first suitor took up residence openly with the girl at her home, thus symbolising a sanctioned marriage. It was not until winter, after he had made several short visits from his winter trapping camp, that he was able to persuade her mother to let the woman accompany him to his own camp. Although it was several months before the girl was permitted to join her husband at his camp, the change in residence was more rapid than for most marriages. (...) C. Noose and the girl were married and although the marriage has been nearly broken up by the girl's going home to her parents, they are at the present time still married." (p.145)

As shown in Table 27 a significant proportion of wives were born in other villages, and it can be assumed, given the strong filial ties of Indian people, that they periodically took time to return to their kin. Improved means of transportation, aeroplanes and boat, to cover the several hundred miles that separate villages, particularly in the North, may have increased the frequency of family visits but, possibly, shortened their duration. It might be argued, on the other hand, that the early tendency for periodical absence of a spouse, whether driven by the search for a means of subsistence (hunting, trapping) or by customs, may have been replaced by modern patterns of migration, wage- or education-driven (Piché, 1977).

If, on balance, the incidence of prolonged conjugal separation has diminished because of some of the factors suggested above, then this quite probably has contributed to the shorter birth intervals noted for the younger generations of Indian women. Although this hypothesis re-

quires further empirical testing, it is consistent with reports in the literature concerning similar strong social customs found among preliterate and pre-industrial societies (Romaniuc, 1967). Potter and his colleagues (1965) have attributed the relatively low pregnancy performance of Punjab females to their custom of making long visits to their parental homes during the first few years of marriage.

Table 27
Percentage of Wives Born in Villages different from their Husbands', by Age Group, James Bay Indians, 1968

Age group	Percentage
14-19	33.3
20-29	36.3
30-39	43.9
40+	37.4

Source: The 1968 James Bay Demographic Survey

Attitudes Toward Procreation and Birth Control

Our understanding of the James Bay Indians' procreative behaviour, and by inference that of Indians in general, may further be enhanced by examining information on their attitudes toward procreation, family size preferences and practice of birth control.

Table 28 lines up responses to three questions, designed to assess women's attitudes towards procreation, administered to single and ever-married. One particular feature that emerges from this Table and which requires our immediate attention is the rather high rate of "non-response." It is not unusual to find a high non-response rate in this type of questions among traditional populations. In some cases it meant respondents' unwillingness to answer the question, though few outright "refusals" were recorded by interviewers. Recorded reasons for non-response include "absent," "had to go to work" and "unable to continue the interview," "illness," etc. To the extent one can infer from interviewers' notes, non-responses resulted primarily from respondents' inability to communicate or verbalise in a coherent way situations that may have been for them somewhat ambivalent. Instances where mothers had illegitimate births before marriage is an example thereof. While having children may have been their genuine desire, the arrival of yet another child before they eventually did marry, may have been looked upon with apprehension.

Table 28
Attitudes Towards Procreation, in Percentage, James Bay Indians, 1968.

Age	Pop.*	Q.1: Before your last pregnancy, did you want another child?				Q.3: Do you feel that one or more of your pregnancies came sooner than you wanted?				Q.4: How would you feel if you didn't have any children?			
		Yes	No	Ind.	NR	Yes	No	Ind.	NR	Good	Bad	Ind.	NR
14-24	70	59.6	23.1	1.9	15.4	30.8	44.2	0.0	25.0	5.8	71.2	5.8	17.3
25-34	110	55.0	23.1	1.1	20.9	35.2	48.4	3.3	13.2	6.6	75.8	8.8	8.8
35-44	83	34.7	44.4	4.2	16.7	37.5	51.4	0.0	11.1	6.9	77.8	5.6	9.7
45 +	136	27.9	59.5	3.6	9.9	25.2	61.3	1.8	12.6	6.3	67.6	14.4	12.6
Unknown	13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All ages	412	41.9	40.1	2.8	15.3	31.5	52.6	1.5	14.8	6.4	72.5	9.5	11.6

Source: The 1968 James Bay Demographic Survey

* Population: Number of women with at least one live birth, single and ever-married. Among these women there were 379 with at least one live birth and at least once married. There were 327 women who were actually interviewed on the attitudes towards procreation.

Notes: Ind. = Indifferent; NR = No response.

Turning our attention to the answers to question 1 in Table 28, designed to probe into the desirability of the last pregnancy, one finds that the "Yes" answers decrease and the "No" answers increase with the respondent's age. More than half of the respondents over 45 years old answered that they did not desire their last pregnancy to occur. As women get older and achieve a certain family size, they may regard children in excess of that size as surplus, if not necessarily a liability, serious enough to induce them to take preventive measures.

It is more difficult to surmise the reasons behind the posture of those younger mothers, who in quite significant proportions, stated that they did not want their last pregnancy. Perhaps for many them the family size was already a matter of concern – the first step in internalising modern norms of procreation.

To question 3, "Do you feel that one or more of your pregnancies came sooner than you wanted?", the "No" heavily outweighed the "Yes" answers. But the latter were sufficiently numerous to suggest that the timing of births may have been already of some concern to many women, particularly the younger ones.

Finally, to question 4, "How would you feel if you didn't have any children?", the overwhelming majority of respondents stated that they would feel "bad." One would of course expect this to be the answer of the members of a society known for its pro-natalistic cultural values. But for the same reason, one may find it surprising that 6.4% felt a need to state that they would feel "good" and that even more, 9.5%, stated that they would be "indifferent" if they had no children. Either the sincerity of these answers is questionable or they suggest that there was already a minority, a core of women who tend to adopt non-conformist attitudes toward the norms of procreation prevalent in traditional Indian society.

Responses to the three questions, intended to test the family size preference are confined to Table 29. The first two questions aimed at determining the maximum and minimum number of children, which, in the respondents' opinion, a couple should have. The maximum number given varied from 12 for the respondents over 45 to slightly below 10 for those under 25 years old, whereas the minimum number varied for the two age categories from an average of 3.4 to 2.8, respectively. The minimum and maximum numbers stated might be viewed as the average family size, which the respondents perceive as being the ideal in their community.

The question 8, "If you could have just the number of children you want, what would that number be?", was intended to determine the respondents' desired family size, that is, the number of children they con-

sidered as desirable for themselves. This number varied from 7.6 for respondents over 45 years old to 4.9 for those under 25 years of age. It may be worthwhile noticing that desired family size, given here, and ideal family size, referred to in the above paragraph, falls short only by a small margin for the older generations, whereas, in the case of respondents under age 25, the former deviates downward quite significantly from the latter. One would be tempted to interpret this as an indication that younger generations tend to adopt standards of procreation that are not only lower than those adhered to by older generations, but that are even lower than those which they still consider as being ideal for their society. As to question (9) "Of these how many would you like to be girls and how many boys", the score was almost equal, 3.14 and 3.47 respectively. There seems not to be any sex preference.

Table 29
Desired Family (Average) Size, James Bay Indians, 1968

Age	Number of respondents	Q.6: In your opinion, what is the maximum number of children a couple should have?	Q. 7: In your opinion, what is the minimum number of children a couple should have?	Q.8: If you could have just the number of children you want, what would that number be?
14-24	107	9.75	2.80	4.86
25-34	97	10.68	2.99	6.86
35-44	73	11.87	2.81	8.87
45 and over	114	12.00	3.43	7.57
All ages	391	11.05	3.03	6.67

Source: The 1968 James Bay Demographic Survey.

Findings elicited by the questions about attitudes towards, knowledge and practice of birth control are presented in Tables 30 and 31. Of all fertility questions, these caused the greatest concern to the survey takers. Matters related to birth control were considered by many Indians too intimate to be discussed with strangers. To minimise the risk of mas-

sive non-response, it was decided to restrict the administration of the birth control module to four villages, where on the basis of prior information obtained through the informants, it was sensed that the inhabitants might be more receptive.

As limited as the results obtained may be in terms of coverage, they nevertheless tell us some interesting stories about the status of birth control among James Bay Indian communities. First of all, those who approved of birth control constitute a rather large proportion of the respondents, 37.0%. If those who gave a qualified approval "depends" are included, their proportion would rise to 44.5%. This is a rather unexpected result for a community reputed for its traditionally pro-natalist stance. Interestingly enough, there does not seem to be any association between age and proportion of those approving of birth control. Both younger and older generations uttered similar attitudes in this regard. This apparent high degree of tolerance of birth control contrasts rather sharply with the extent of the avowed knowledge, and in particular with its actual practice, as per Table 31. Those who stated knowledge of some method of preventing births were significantly fewer in number than those who declared their approval. Those who stated that they tried to prevent or to delay pregnancy at some time in their life were few in number, barely 4.0% of all respondents.

How can one reconcile this, real or apparent, incongruity between the stated attitudes towards, and the actual practice of, birth control among James Bay Indian women? The author is inclined to accept the results as truthful in regard to both the attitudes and the practices of birth control. As a result of outside influence, Indian society, by the time the survey was conducted, matured enough to accept the idea of birth control and acquired some limited knowledge of its methods. At the same time, some rather fundamental changes may have actually been taking place therein in regard to procreative norms. The findings that a large proportion of women did not want their last pregnancy to occur are significant thereof. A fair proportion also expressed concern about the timing of births, and younger generations stated a desire for a family size smaller than that of older generations.

But the reappraisal of traditional values of procreation did not go far enough to entail a consequential birth control practice. Its level at the time of the survey may have been still as low as it seems to have been formerly in traditional Indian society. The picture revealed by this survey is consistent with findings on birth intervals in this article's earlier section, and also with observations by anthropologists. Thus Dunning (1959) who has studied Northern Ojibwe, a neighbouring group of the James Bay Cree, remarks: "...during the time of my field work I found the peo-

ple most willing and prepared to have large families. There was no idea on the part of any married persons to limit the size of their families."

Likewise, Honingmann in his study (1956:60) of Attawapiskat (James Bay), states that "Occasionally, coitus interruptus is utilised to forestall conception but this practice seems to be definitely limited."

Table 30
Attitudes towards Birth Control, in Percentage, James Bay Indians, 1968

Age group	Number of respondents	Q. 12: Today, some married couples try to limit the number of their children for health considerations or because of their desire to give their children greater care, or because they are not able to support large family, or for other reasons. Do you approve or disapprove their doing to this kind of things?				
		Approve	Disapprove	Depends	Don't know	No response
14-24	78	32.05	25.64	11.54	25.64	5.13
25-34	63	44.44	30.16	4.76	14.29	6.35
35-44	51	33.33	25.49	7.84	23.53	9.80
45 and plus	62	38.71	25.81	4.84	20.97	9.68
All ages	254	37.01	26.77	7.48	21.26	7.48

Source: The 1968 James Bay Demographic Survey.

Note: Data collected only in Rupert House, Moose Factory, Fort George and Moosonee.

Table 31

Knowledge and Use of Birth Control, in Percentage, James Bay Indians, 1968

Age group	Number of respondents	Q. 13: Do you know of any methods to keep from getting pregnant that are used by married couples?			Q. 14: Have you ever tried to prevent or delay pregnancy in any way?		
		Yes	No	No response	Yes	No	No response
14-24	78	21.79	62.82	15.38	1.28	75.64	23.08
25-34	63	36.51	55.56	7.94	11.11	79.37	9.52
35-44	51	23.53	58.82	17.65	1.96	74.51	23.53
45 and plus	62	19.35	62.99	17.74	1.61	79.03	19.35
All ages	254	25.20	60.24	14.57	3.94	77.17	18.90

Source: The 1968 James Bay Demographic Survey.

Note: Data collected only in Rupert House, Moose Factory, Fort George and Moosonee.

It should be reiterated that findings reported in this section refer to the periods prior to 1968. Since then, the transition from traditional high to low modern fertility patterns took hold among Canadian Indians, including those of James Bay, albeit with some time lag in the latter. Birth control must now be a wide spread practice in order to curtail so drastically childbearing performance.

Summary and Conclusions

Although each of the miscellaneous pieces of evidence brought forward in this study has shortcomings, when considered in combination they provide a consistent picture of the James Bay Indians procreative behaviours as they appear in light of the 1968 survey. More specifically, the survey captures the succession in time of three patterns of procreative behaviours, which, while overlapping to some extent, present sufficiently distinct features to warrant special consideration. Thus, we can speak of:

- the traditional patterns of childbearing, represented by the older generations of women who at the time of the survey were over 50 years old, and who entered, if not altogether completed, their childbearing prior to 1945;
- the cycle of a rising natural fertility associated with the process of modernisation which the Indian population started to undergo in the post-war years and which in terms of fertility is represented by the younger generations of women who entered childbearing in the post-war years and reached their peak in the years prior to 1968;
- the incipient transition to modern low fertility, represented by some of the youngest generations who, while still adhering to the traditional norms of childbearing, may have already begun to assimilate some of the modern practices of selective childbearing, including birth control.

Let's briefly describe each of these fertility regimes.

The traditional Indian fertility regime, in light of the evidence produced in this study, was characterised by a relatively low intensity and relatively slow tempo of reproduction. The crude birth rate was most likely in the range of 40 to 42 births per 1000 population, and a family size of about six or seven children per woman, hence well below the levels observed among high fertility populations with a birth rate in excess of 50 per 1000, and eight or nine children per woman. As to the tempo of reproduction, compared to some high fertility populations, Indian women used to start having children at a somewhat later age (21.9) and stopped having them at a somewhat earlier age (38.7), according to our estimates based on the data for older generations of mothers. Hence their reproductive span was somewhat shorter, by about two years, as compared to high fertility populations. At the same time, the intervals

between successive live births was rather long, close to 32 months, as compared to about 25 observed among such high fertility populations as the Hutterites or Cocos Island.

The factors underlying this relatively low intensity and slow tempo of childbearing are not all too clear. Two, however, stand out most prominently as being procreation-inhibiting in traditional Indian society. One, breastfeeding, which in the absence of animal milk and with a diet relying heavily on meat and fish was, by necessity, long and as such had the tendency of delaying the resumption of ovulation and fecundity. The other restrictive factor was the nomadic mode of life and hardships associated with it, likely to have caused pregnancy accidents and possibly lesser exposure to conjugal intercourse. All this may have caused a high level of pregnancy wastage, longer temporary and premature permanent sterility. The relatively late entry of Native women into stable unions may have also been a factor. Even though out-of-wedlock pregnancies were relatively frequent in traditional society, transient, unstable relations do not offer the best conditions for procreation. The combination of all these biological and cultural factors resulted in a childbearing performance that I would qualify as sub-optimal.

As Indian populations began to undergo the process of modernisation in the post-war years, traditional procreation-inhibiting factors were weakened or altogether removed. As Indians switched from a nomadic to a sedentary, more comfortable, mode of life, pregnancy accidents most likely subsided as did the level of pregnancy wastage with practically all women being able now to enjoy medical assistance during delivery, and pre- and post-natal medical follow-ups. But the most potent factor, no doubt, was the massive switch from protracted breastfeeding to bottle-feeding as milk became commercially available. The switch to bottle-feeding was apparently triggered also by medical considerations as a way to avoid transmission from mother to infant of possible infections, in particular tuberculosis. Child-spacing has been reduced to an average of about 23-25 months among the youngest generations. It should be noted that this change in lactation practices took place before large-scale birth control took hold. As well, family allowances, introduced in Canada in the 1950s, may have acted as a financial incentive to have children. The combination of these factors led the birth rate to jump to a level of about 48 or even to 50 births per 1000 population from 40-42 experienced by older (pre-war) generations.

The transition to low modern fertility was not yet in evidence among younger generations when the 1968 survey was taken. But data on the attitudes to procreation and knowledge of birth control method revealed that many young women were already mentally prepared to control the

timing of childbearing and limit family size. As of the mid-sixties, Indians, in particular in the southern stretch of their habitat in Canada, embarked on a course of rapid fertility decline. The James Bay Indians, as subsequent data have revealed, followed the move with a lag of a few years. The birth rate of Indians in Canada fell to 15 per 1000 population and total fertility to 2.4 births per woman in 2000.

Can the demographic experience of the James Bay Indians, as described in this study, be extrapolated to the whole of Indian populations in Canada? The question cannot be answered unambiguously. A country the size of Canada is the habitat of many Indian nations, spread over a wide territory, each with their distinctive features. But to the same extent that we can speak of Western European or African patterns of fertility, we can speak of Canadian Indian fertility patterns. It is fair, therefore, to imply that much of what was learnt from the James Bay survey can be applied with due caution to Canada's Indian population as a whole.

As this piece of research is being drafted, 35 years have elapsed since the 1968 Survey was conducted in the James Bay region. The time may be ripe to take stock of the changes in the region's socio-demographic landscape that have taken place since, not least under the impact of Hydro Power developments.

Appendix Table
Percentage of Children in Specified Age Groups and the
Corresponding Estimates of Birth Rate for James Bay Indians

Year	Percentage of Children aged		Corresponding Birth Rate	
	0-4	0-14	0-4	0-14
1974	15.6	45.6	-	-
1973	15.7	45.9	-	-
1972	17.1	46.7	41.1	-
1971	16.9	46.7	41.5	-
1970	17.2	47.1	45.4	-
1969	17.7	47.1	45.9	-
1968	18.1	47.3	46.5	-
1967	18.3	46.9	47.1	47.3
1966	18.9	46.9	47.7	47.8
1965	18.7	45.1	48.2	48.9
1964	na	na	48.8	48.9
1963	na	na	48.6	49.7
1962	na	na	-	50.3
1961	na	na	-	50.0
1960	na	na	-	49.7

1959	18.3	44.0	-	48.4
1958	na	na	-	-
1957	na	na	-	-
1956	na	na	46.2	-
1955	na	na	-	-
1954	15.8	39.2	-	-
1953	na	na	-	-
1952	na	na	40.5	47.3
1951	na	na	-	-
1950	na	na	-	-
1949	16.9	38.3	-	-
1948	na	na	-	-
1947	na	na	44.5	42.9
1946	na	na	-	-
1945	na	na	-	-
1944	12.8	38.2	-	-
1943	na	na	-	-
1942	na	na	34.0	42.6
1941	na	na	-	-
1940	na	na	-	-
1939	16.8	41.3	-	-
1938	na	na	-	-
1937	na	na	44.9	42.9
1936	na	na	-	-
1935	na	na	-	-
1934	14.5	36.9	-	-
1933			-	-
1932			39.1	46.8
1931				-
1930				-
1929				-
1928				-
1927				41.9

na = not available

Notes: For the method used to convert child proportions into birth rate estimates refer to the Technical Appendix in Romaniuc (1981). Increase in Natural Fertility during the Early Stages of Modernisation: Canadian Indian Case Study, *Demography*, Vol. 18, No 2, pp.157-172. The time lag between reported child proportions, 0-4 and 0-14, and estimated thereof birth rates is respectively 2.5 and 7.5 years.

Because of changes in settlements, it was not possible to reconstruct child/population ratio series for years prior to 1934 for James Bay.

Notes

1. What is known as James Bay administrative area comprises eight major settlements, four on the Quebec side and four on the Ontario side. For logistical reasons only the six villages mentioned above were surveyed, the remaining which were not are Winisik on the West, and East Main and Paint Hills the East shore. The total population of the eight James Bay villages in 1968 was 6,124 according to the population registers of the Department of Indian Affairs and Northern Development.
2. The survey received the support of local Aboriginal authorities and the Fathers Oblate mission in Moosonee. It was undertaken by the author, at the time professor of Demography at the Department of Sociology, University of Ottawa, with a team of students from the same university. Funding for the survey was provided by the Population Council (currently SSHRC). For more details on the James Bay Indian demographic survey see V. Piché and A. Romaniuk, (1972)

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