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ABSTRACT

Vital rate estimates for Canadian Registered Indians were presented in this paper. The population under age one in a particular year becomes the population one year old the following year. When this information was examined for 10 years, it was found that there was an increase in survivors from year to year, and that there were inconsistencies ascribed to the late registration of Indian births. It was further found that in 1970, the Indian population was increasing at a rate of approximately 3%. Suggestions for further research included using data on age patterns of fertility, age at marriage, illegitimacy rates, birth intervals, and family planning. (PS)

STATISTICS CANADA

ESTIMATES OF VITAL RATES FOR THE CANADIAN INDIANS

1960-1970

by

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Estimates of Vital Rates for the Canadian Indians, 1960-1970*

1. Introduction

Little is known on the demography of North American Indians living both in Canada and in the United States. A bibliographical research which attempted to put together all relevant demographic materials pertaining to Canadian Indians until recently confirmed the non-existence of any important studies in this area (Piché, 1971). The wide range of anthropological and sociological data available on the Indians contrast with the lack of information on their vital rates and fundamental characteristics. Apart from the need for reliable demographic statistics on the Indian population for various purposes, a study of the North American Indian population offers many points of interest mainly because its demographic features are more similar to the population in the majority of developing countries than to the North American population as a whole. Furthermore, from the point of population theory and policy, it would be revealing to follow its transition from high to low birth rates and know when such a transition does occur. The present paper is an attempt to prepare estimates of vital rates for Canadian Registered Indians. Registered Indians are those who have retained legal "Indian status" as defined in the Indian Act and listed on the official register maintained by the Department of Indian Affairs and Northern Development. In 1970 the official register listed 250,781 persons as "Indians".

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* This is a revised and updated version of a paper originally presented at the PAA meetings in Toronto, April, 1972.

The authors are grateful to the Department of Indian Affairs and Northern Development, particularly the Departmental Statistics Division for supplying the required data and for all the cooperation in undertaking this study. Thanks are also due to Drs. A. Romaniuk and I. Pool for their helpful comments on an earlier version of the paper, and to the anonymous referees for their valuable suggestions for revision. However, the authors are solely responsible for any blemishes or errors or misjudgement that may appear in the paper.

The main sources of demographic data on Indian population are: (i) the annual census of the Indian population, 1864-1917; (ii) quinquennial censuses of Indians, 1924-1959; (iii) annual registration data since 1960; (iv) data on Indians in the Canadian Population Censuses; and (v) the vital statistics compiled by the Health and Welfare Division, Statistics Canada. Of these, the registration data collected by the Membership Section of the Department of Indian Affairs and Northern Development provide the most up-to-date demographic information on the Indian population. These data collected annually provide statistics on registered Indian Population by age, sex, marital status, and province of residence, and relevant vital events, such as births and deaths, for the period since 1960. A cursory examination of these data for the purpose of developing various demographic indices and for making future estimates of population indicated certain anomalies which called for a careful appraisal of the data. The present paper is an attempt to evaluate the registered data and to prepare vital rates for 1960-1970 using the adjusted data.

2. Nature of the Problem

The first problem to be dealt with relates to the inconsistency in the reporting of births. A preliminary test to examine the accuracy of reported births may be to compare reported births with the "expected population". Table 1 gives (i) the population under one year of age as of December 31, of each year, and (ii) the population aged 'one' the following year. The population under age one in a particular year becomes the population one year old the following year. In a closed population where population changes as a result of births and deaths only, the number among the survivors of a birth cohort should not exceed the initial number.

TABLE 1. Population One Year Old Compared with Population Under Age One in the Preceding Year, 1960-1970

Year	Population under age one	Population one year old	Increase to the initial cohort
1960	7,052	—	—
1961	7,362	7,544	492
1962	7,408	7,880	518
1963	7,531	7,957	549
1964	7,527	8,127	596
1965	7,482	8,199	672
1966	7,189	8,382	900
1967	7,041	8,188	999
1968	7,017	8,080	1,039
1969	6,719	8,160	1,143
1970	6,511	7,942	1,223

Source: Derived from data obtained from Department of Indian Affairs and Northern Development.

The data given in Table 1 show instead an increase in the number of survivors from year to year. Thus, for example, in 1960, 7,052 children were registered as under one year old at the end of the year; at the end of the following year (1961), the survivors of those who became one year old were shown as 7,544 an increase of 492. The same pattern is shown for all the years with a progressive increase in the number of survivors from year to year.

The unusual pattern shown by the data in Table 1 makes one suspect the reliability of the birth data. The extent of the inconsistencies can be measured by considering Table 2 which gives births reported by age and clearly shows that many births reported in one year belong to preceding years.

TABLE 2. Births Reported by Year and Age, 1965-1970

Age	1965*	1966	1967	1968	1969	1970
Under 1	7,793	7,488	7,300	7,288	6,929	6,762
1		1,135	1,208	1,240	1,307	1,379
2		106	148	170	140	182
3		46	72	78	83	98
4		37	73	59	66	55
5		35	43	45	38	55
6	1,175	24	30	27	36	29
7		26	15	43	35	28
8		12	16	25	23	24
9		9	8	12	14	22
10		1	10	14	18	20
Over 10		23	33	31	46	51
TOTAL	8,973	8,942	8,956	9,032	8,735	8,705

* Not available by age.
Source: Department of Indian Affairs and Northern Development.

In fact, it is only since 1965 that the extent of the problem of late registration of births became apparent because of the possibility of getting the breakdown of births by age. For example, of the 8,973 births reported in 1965 only 7,793 belonged to 1965, the remaining belonged to previous years. The data show late registration of births that belong to even 10 years and over preceding the year of registration.

The observed inconsistencies must be ascribed to the late registration of Indian births. Some estimates of late registration of births have been prepared by Graham-Cumming (1968). His method consists mainly in adding births reported in the year of birth and the following year, ignoring the late registration from the second year and over after birth. From the data on late registration available for 1965-1968, he concluded that births reported in the year of birth and the following year represented 98 per cent of all births (Graham-Cumming, 1968, 6). He made the estimates of late reporting on the basis of this finding and the assumption that births registered after the end of the year following birth are children born to Indians out of Indian status at the time of birth and later readmitted to the "band" as registered Indians.

Although Graham-Cumming's estimates are useful in making users aware of the problem, the procedures he used for adjustment have certain limitations which need to be pointed out. First, births reported after two years cannot be considered as "immigrants" as he claims because while coding the registered data, immigration is taken as a separate event and the immigration of a young child of two, three or four years old is coded as "legitimation-addition" and not as a birth. On the other hand, a birth reported two, three or four years later is coded as a "birth". Therefore, all births, regardless of their reporting date, should be considered in the estimation of adjusted births.

Second, Graham-Cumming disregards the mortality factor affecting all those births reported at a later date. There is no doubt that some have died each year so that late reports include only the survivors. Consequently, some mortality correction is desirable in estimating births.

The second problem, as noted earlier, is the tendency for late registrations to increase from year to year. The number of births reported in one year and belonging to previous years has increased both in absolute numbers and in percentage terms from 13.1 in 1965 to 22.3 percent in 1970 (for more details see Piché and George, 1970). Data in Table 1 also show such a trend; the difference between the number of those under age one and those who became one year old in the following year increased from 492 in 1961 to 1,223 in 1970.

The precise reasons for the late registration of births are not known. However, one plausible reason may be the increased outward movement among Indians from their reserves (see Hawthorn et al. 1966: 308) and the consequent delay in reporting the births. It becomes increasingly arduous for the Indian agent to keep track of such mobile Indians. The greater numbers of inconsistent cases in the reported births for the Indians "off" the reserve than those "on" the reserve support such a possibility.

3. Estimation of Adjusted Births for Canada and Provinces

The nature of the data available makes it necessary to investigate the problem separately for 1960-64 and 1965-70 and develop suitable estimation procedures. This is because unlike for the period after 1965, the registered births are not available by age for 1960-64.

3.1 Period 1960-1964

Because official data supplied by the Indian Affairs Department for the years 1960-1964 give only the total number of births reported in each year, estimates of late reporting of births for these years have to be made by indirect methods. A combination of two methods was used here: one, based on the well-known "balancing equation" technique, and the other, using the distributions of births by age at the time of registration available from 1965.

The first procedure consists essentially in a comparison of the number of children registered in each year by age with the corresponding numbers of births registered in the preceding years, allowance being made for the deaths and migratory movements, if any, by which the surviving cohorts were affected (United Nations, 1955).

Briefly, the application of this method consists in following all cohorts under age one to each higher ages: age one, age two, etc. Thus, the cohort under one in 1960 becomes one year old in 1961, two years old in 1962, and so on up to five years old in 1965. The effect of mortality on the original birth cohorts should also be considered in applying this method. It is assumed for the purpose here that the population is closed, i.e., not affected by external migration. There is a certain amount of "enfranchisements" of children by which they lose their Indian Status but the number is insignificantly small. The excess in the number of survivors over the original cohort was taken as the estimates of late reported births. By the second procedure, births reported from 1965 to 1970 but belonging to the period 1960-1964 were re-allocated to their respective years and added to the results of the former, allowance being made for mortality (see next section for details of the latter procedure).

The number of late reported births thus estimated were finally added to the original cohort (cohort under age one for each year) and obtained the corrected numbers of births for the years 1960-1964. The results are given below.

Year	1960	1961	1962	1963	1964
Estimated Births	8,529	8,860	8,917	9,170	9,237

3.2 Period 1965-1970

From 1965 the data available relating to births gave a better picture of late registration since the data permitted the determination of how many births reported in one year did belong to that year and how many were from previous years. In estimating births for this period, although various procedures were tried, only the one finally used is presented here. The procedure involves three basic steps.

First, because the data are available only for six years, the number of births belonging to each year and reported in the year of birth plus those reported in three years following year of birth was calculated. These are presented in Table 3.

TABLE 3. Distribution of Births by Year of Birth and Year Reported, 1965-1970

Year Reported / Year of Birth	1965	1966	1967	1968	1969	1970
Year of Birth	7,798	7,488	7,300	7,288	6,929	6,762
One Year After Birth	1,135	1,208	1,240	1,307	1,379	1,642
Two Years After Birth	148	170	140	182	256	(330)*
Three Years After Birth ...	78	83	98	113	(128)*	(143)*
Total	9,159	8,949	8,778	8,890	8,692	8,877

* These figures are estimates based on extrapolation using the data in Table 2.
Source: Same as Table 1.

Second, in order to estimate the number of births that will be reported four or more years after birth, ratios were calculated for each year by dividing the sums of births reported in 1969, 1970 and 1971 for ages four to ten by the numbers of births reported under one for the corresponding year. An average ratio of 0.0412, derived from these was then applied to the numbers of births reported under one for each year, and thereby the estimates of late reported births were obtained. This procedure takes into account the increasing trend in late reporting of births (see page. 3). Furthermore, the data used for this purpose represent the average experience of the period with which we are concerned.

Third, late reports of births give only those who have survived and do not take into account the deaths among the children. A mortality ratio should therefore be applied to the numbers of late registration. The effect of mortality was calculated as follows:

1. Appropriate forward survival ratios were calculated from life tables based on average mortality ratas for 1965-1968 (Canada, 1969). The survival ratios used were as follows: $S_{o-1} = .95125$
   $S_{o-2} = .94729$
   $S_{o-3} = .94456$
   $S_{o-10} = .93528$

2. The numbers of births registered late were then divided by the corresponding survival ratios and obtained the estimated numbers of late registrations for each year (Table 4).

It can be seen from Table 4 that 77.8 percent of the estimated births are reported in the year of birth and 14.8 percent are reported in the years following the year of birth.

TABLL 4. Final Estimates of Adjusted Births by Year Reported, 1965-1970

Year Reported	Final estimates of adjusted births					
	1965	1966	1967	1968	1969	1970
Year of Birth	7,798	7,488	7,300	7,288	6,929	6,762
One Year After Birth	1,193	1,270	1,304	1,374	1,450	1,726
Two Years After Birth	156	179	148	192	270	348
Three Years After Birth	82	88	104	120	136	151
From Four to Ten Years After Birth	385	370	360	360	342	334
Total	9,614	9,395	9,216	9,334	9,127	9,321

3.3 Estimates for Provinces

The detailed balancing equation method on a cohort basis used for estimating late reported births for Canada for the period 196[illegible]-1964 could not be used to make similar estimates for the provinces due to the lack of required data. Single year age distribution was not available for the provinces. Therefore, estimates were obtained by the conventional balancing equation method on the basis of totals of population, births and deaths. These estimates were further adjusted on a pro rata basis using the national estimates of births which were obtained from more refined data than were available for the provinces. For 1965-1970, the same procedure used for Canada and outlined above was used for the provinces. The results are shown in Table 5.

TABLE 5. Estimated Births, Canadian Registered Indians, Canada and the Provinces, 1960-70

Provinces	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Prince Edward Island	10	10	14	16	11	17	12	13	22	11	10
Nova Scotia	98	150	127	134	109	134	137	139	142	148	141
New Brunswick	131	139	157	130	124	140	131	141	144	127	145
Quebec	893	859	780	873	860	892	766	799	809	817	811
Ontario	1,689	1,677	1,781	1,710	1,795	1,892	1,832	1,647	1,640	1,650	1,713
Manitoba	1,284	1,379	1,316	1,472	1,439	1,535	1,571	1,597	1,555	1,535	1,614
Saskatchewan	1,325	1,369	1,460	1,535	1,654	1,605	1,720	1,651	1,822	1,675	1,737
Alberta	1,026	1,115	1,101	1,179	1,181	1,215	1,238	1,258	1,236	1,231	1,137
British Columbia	1,743	1,839	1,813	1,846	1,802	1,786	1,684	1,605	1,623	1,556	1,704
Northwest Territories	268	219	252	198	209	398	227	232	265	277	264
Yukon	62	104	116	77	103		77	134	76	109	45
CANADA	8,529	8,860	8,917	9,170	9,237	9,614	9,395	9,216	9,334	9,127	9,321

4. Population Adjustments for Canada and Provinces

Once births are adjusted for late registration, the data on registered population should be adjusted accordingly. Since births are reported up to ten years after birth, the population as registered for ages under one to ten needs to be corrected. For example, to the population under one year old in 1960 must be added all those births reported after 1960, i.e.,

$$P_o^{C,1960} = P_o^{R,1960} + (B_1^{1961} + B_2^{1962} + B_3^{1963} + \ldots + B_{10}^{1970})$$

where: $P_o^{C,1960}$ is the corrected population under age one in 1960

$P_o^{R,1960}$ is the registered population under age one in 1960

B_1^{1961} is births reported at age one in 1961

B_2^{1962} is births reported at age two in 1962, and so on.

Similarly,

$$P_1^{C,1960} = P_1^{R,1960} + (B_2^{1961} + B_3^{1962} + \ldots + B_{10}^{1969})$$

and so on up to age ten.

The required data for proper adjustments were available only for 1960 and 1961. Therefore, the population aged under one to ten was rejuvenated on the basis of the above equations for the years 1960 and 1961. Then, an average ratio for the two years was calculated by dividing the corrected population for ages under one to ten by the corresponding registered population, i.e.,

$$P_{o-10}^{C} \Big/ P_{o-10}^{R} .$$

This ratio was applied to the registered populations, 1962-1970. The results thus obtained are given in Table 6 for Canada and the provinces.

TABLE 6. Adjusted Calendar Year and Mid-year Indian Population, Canada and Provinces, 1960-1970

Province	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Prince Edward Island	346	351	366	377	380	398	403	413	424	435	440
Nova Scotia	3,662	3,782	3,869	3,973	4,034	4,149	4,229	4,329	4,459	4,586	4,706
New Brunswick	3,309	3,430	3,556	3,664	3,754	3,870	3,953	4,076	4,195	4,318	4,468
Quebec	21,336	22,002	22,578	23,267	23,947	24,808	23,336	25,926	26,563	27,266	27,999
Ontario	44,152	45,374	46,594	47,719	48,952	50,096	53,173	52,390	53,632	54,773	56,053
Manitoba	24,823	25,928	26,920	28,048	29,123	30,361	31,500	32,721	33,853	35,058	36,308
Saskatchewan	24,490	25,577	26,725	27,941	29,205	30,453	31,807	33,039	34,415	35,698	36,936
Alberta	20,228	21,132	22,006	22,959	23,880	24,887	25,700	26,739	27,614	28,531	29,529
British Columbia	37,701	38,987	40,148	41,388	42,565	43,777	44,682	45,594	46,535	47,426	48,785
Yukon	1,940	2,025	2,115	2,163	2,237	2,320	5,796	5,980	6,175	6,384	6,541
Northwest Territories	4,799	4,962	5,155	5,286	5,437	5,637	2,363	2,506	2,584	2,676	2,516
CANADA	186,786	193,550	200,032	206,785	213,514	220,756	226,942	233,714	240,449	247,151	254,281

Adjusted Mid-year Population

Prince Edward Island	344	348	358	372	378	389	400	408	418	430	438
Nova Scotia	3,620	3,722	3,825	3,921	4,003	4,092	4,189	4,279	4,394	4,522	4,646
New Brunswick	3,250	3,370	3,493	3,610	3,709	3,812	3,912	4,014	4,136	4,257	4,393
Quebec	20,944	21,669	22,290	22,923	23,607	24,378	24,072	24,631	26,244	26,914	27,632
Ontario	43,555	44,763	45,984	47,156	48,336	49,524	51,634	52,782	53,011	54,203	55,413
Manitoba	24,311	25,376	26,424	27,484	28,586	29,742	30,931	32,110	33,287	34,455	35,683
Saskatchewan	23,950	25,034	26,151	27,333	28,573	29,829	31,130	32,423	33,727	35,057	36,317
Alberta	19,788	20,680	21,569	22,482	23,420	24,383	25,293	26,220	27,177	28,072	29,030
British Columbia	37,026	38,344	39,567	40,768	41,976	43,171	44,230	45,138	46,064	46,981	48,106
Yukon	1,904	1,982	2,072	2,139	2,200	2,278	2,341	2,435	2,545	2,630	2,596
Northwest Territories	4,704	4,880	5,058	5,220	5,361	5,537	5,717	5,888	6,048	6,279	6,462
CANADA	183,396	190,168	196,791	203,408	210,149	217,135	223,849	230,328	237,081	243,800	250,716

5. Adjustments of Infant Deaths Among Indians for Canada and Provinces

Deaths under one as shown in the Indian register appear to be erroneous from 1960 to 1965. During that period, age at death was calculated by using the year of birth only and not the date of birth. In such a case, a certain number of deaths at age one are actually of age under one. For example, a child born in December and died in January the following year is considered a death at age one although he is only a few weeks old. However, since 1966 a more exact estimate of age at death was derived using information on the actual date of birth and of death. Using the 1966-1968 experience, an average ratio of deaths under one to deaths zero to four years old was calculated and applied to deaths zero to four years old for the previous years, which yielded the adjusted number of deaths under age one for 1960-1965. The results are given in Table 7 for Canada and for the Provinces.

TABLE 7. Adjusted Deaths Under Age One for Canada and the Provinces, Canadian Indians, 1960-1970

Provinces	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Prince Edward Island	2	1	—	—	1	2	1	—	2	—	—
Nova Scotia	—	4	5	4	6	5	8	11	2	—	3
New Brunswick	9	2	3	3	3	5	4	2	2	5	7
Quebec	61	66	61	55	32	40	30	22	29	23	24
Ontario	119	100	95	99	81	61	56	54	53	32	35
Manitoba	120	110	112	118	113	85	80	79	72	60	61
Saskatchewan	102	117	106	118	113	88	95	105	103	82	64
Alberta	84	76	74	74	54	52	53	57	46	57	42
British Columbia ...	156	157	156	139	134	113	110	114	83	85	70
Yukon	—	3	10	6	10	9	7	4	7	7	13
Northwest Territories	42	26	27	19	18	14	12	10	16	8	6
CANADA	695	662	649	635	565	474	456	458	415	379	325

6. Estimates of Vital Rates, 1960-1970

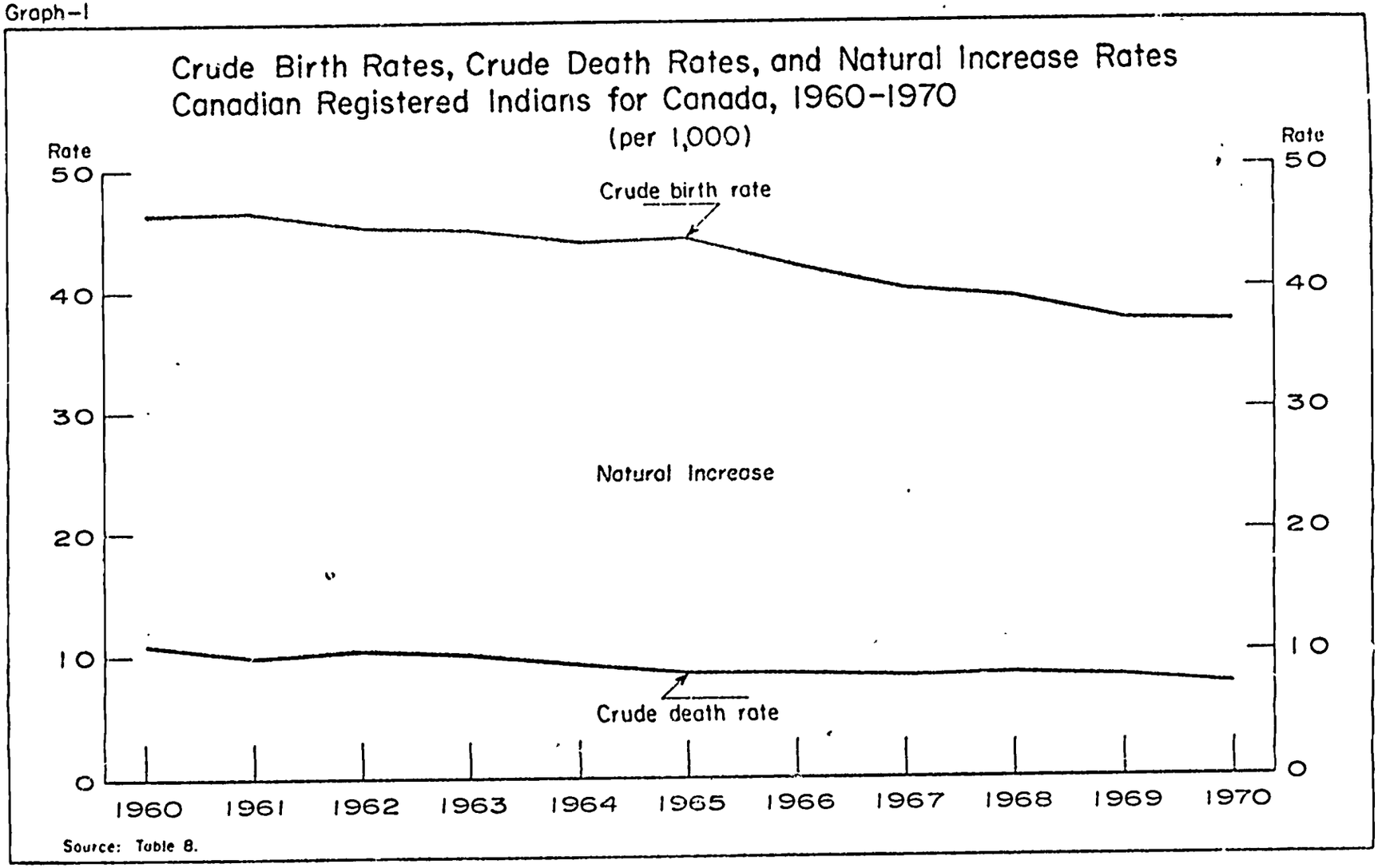
Using the data presented in Tables 5 and 6, and the corresponding statistics on deaths, the birth and death rates were calculated. These are given in Table 8 and Graph 1.

TABLE 8. Crude Birth Rates and Crude Death Rates, Canadian Registered Indians, Canada and Provinces, 1960-1970

(per 1,000 population)

Province	1960		1961		1962		1963		1964		1965		1966		1967		1968		1969		1970	
	B.R.	D.R.	B.R.	D.R.	B.R.	D.R.	B.R.	D.R.	B.R.	D.R.	B.R.	D.R.	B.R.	D.R.	B.R.	D.R.	B.R.	D.R.	B.R.	D.R.	B.R.	D.R.
Atlantic	33.1	8.9	40.2	7.5	38.8	8.3	35.4	6.8	30.2	10.1	35.1	8.0	32.9	6.9	33.7	8.2	34.4	5.7	31.1	5.4	31.2	7.6
Quebec	42.6	9.1	39.6	10.1	35.0	9.2	38.1	8.4	36.4	7.2	36.6	6.7	31.8	6.4	32.4	6.4	30.8	6.7	30.4	6.3	29.4	5.8
Ontario	38.8	10.8	37.5	9.0	38.7	10.0	36.3	10.5	37.1	9.0	38.2	8.2	35.5	8.9	31.2	7.9	30.9	8.6	30.4	8.8	30.9	7.4
Manitoba	52.8	10.8	54.3	9.7	49.8	10.2	53.6	10.6	50.3	9.8	51.6	8.2	50.8	8.5	49.7	8.3	46.7	8.5	44.6	7.0	45.2	7.6
Saskatchewan	55.3	10.7	54.7	10.1	55.8	9.9	56.2	9.7	56.1	8.8	53.8	9.1	55.3	8.9	50.9	8.8	54.0	8.8	47.8	8.0	47.8	7.5
Alberta	51.8	9.9	53.9	8.7	51.0	8.2	52.4	7.8	50.4	7.9	49.8	6.8	48.9	7.8	48.0	7.3	45.5	8.3	43.9	8.0	39.2	7.0
British Columbia	47.1	12.1	48.0	12.1	45.8	13.2	45.3	11.8	42.9	11.0	41.4	11.5	38.1	10.7	35.6	10.6	35.2	10.0	33.1	10.5	35.4	8.8
Yukon & Northwest Territories	49.9	15.0	47.1	10.2	51.6	10.4	37.4	11.7	41.3	9.1	50.9	8.3	37.7	6.9	44.0	5.8	39.5	8.5	42.3	9.0	34.1	7.2
CANADA	46.5	10.9	46.6	9.9	45.3	10.3	45.1	10.0	44.0	9.2	44.3	8.7	42.0	8.6	40.0	8.3	39.4	8.5	37.4	8.3	37.2	7.5

Graph-1



Source: Table 8.

1 Birth Rates

Two observations on the level and trend in birth rates may be made on the basis of the data in Table 8: (i) the birth rate for the total Indian population has dropped from 46.5 in 1960 to 37.2 in 1970, and (ii) even in 1970 the rate was still relatively high, i.e., more than double the rate for the Canadians as a whole.

A look at the birth rates for each province or region shows tremendous annual fluctuations largely due to either small numbers involved in certain provinces, particularly in the Atlantic provinces or to the limitations in the basic data or both. These should be kept in mind in the interpretation of the data presented in Table 8. The Prairie provinces (Manitoba, Saskatchewan and Alberta) had the highest birth rate of 54.3 in 1961 and it was still over 50 in 1966. In 1970, the Prairie provinces still had the highest birth rate of 44.1. Quebec and Ontario had the lowest rates: 29.4 and 30.9, respectively. British Columbia and the Atlantic provinces (Prince Edward Island, Nova Scotia and New Brunswick) had the next lowest rates with 35.4 and 31.2, respectively. Yukon and the Northwest Territories had a high birth rate of 34.1 in 1970. Furthermore, as for Canada as a whole, the provinces are experiencing a decline in fertility. It should be noted that the provincial distribution of the Indian birth rate follows basically the same pattern as that for Canadians as a whole (Statistics Canada, 1970).

6.2 Death Rates and Infant Mortality Rates

Despite the yearly fluctuations, the crude death rates for the Canadian registered Indians as a whole have decreased from 10.9 in 1960 to 8.3 in 1969 and then to 7.5 in 1970. From the available data it is too early to say whether the observed drastic decline in death rate between 1969 and 1970 is actual or an artifact of the statistics used. The provinces undergo a similar de-

crease. However, the rates for British Columbia are consistently higher than those for the other provinces and for the total Indian population.

The infant mortality rates calculated for Indians (Table 9) indicate a significant reduction in infant mortality during the 1960's. For Canada as a whole the rate has decreased by 57.2 percent from 81.5 per 1,000 births in 1960 to 34.9 in 1970. Despite the substantial reduction in recent years, infant mortality rate among Indians is about twice the level of the total Canadian Population. The provincial pattern of infant mortality is more or less consistent with that of crude death rates. Among the provinces, British Columbia, Yukon and the Northwest Territories have the highest rate followed by the Prairie Provinces.

TABLE 9. Infant Mortality Rates by Sex for Canada and Provinces, Canadian Indians, 1960-1970 (per 1,000)

Province	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Atlantic	46.0	23.4	26.8	25.0	41.0	41.2	46.4	44.4	19.5	17.5	33.8
Quebec	68.3	76.8	78.2	63.0	37.2	44.8	39.2	27.5	35.8	28.2	29.6
Ontario	70.5	59.6	53.3	57.9	45.1	32.2	30.6	32.8	32.3	31.5	20.4
Manitoba	93.5	79.8	85.1	80.2	78.5	55.4	50.9	49.5	46.3	39.1	37.8
Saskatchewan ..	77.0	85.5	72.6	76.9	70.4	54.8	55.2	63.6	56.5	49.0	36.8
Alberta	81.9	68.2	67.2	62.8	45.7	42.8	42.8	45.3	37.2	46.3	36.9
British Columbia	89.5	85.4	86.0	75.3	74.4	63.3	65.3	71.0	51.1	54.6	41.1
Yukon & Northwest Territories	127.3	89.8	100.5	90.9	89.7	57.8	62.5	38.2	67.4	39.8	61.5
CANADA ...	81.5	74.7	72.8	69.2	61.2	49.3	48.5	49.7	44.5	41.5	34.9

Table 10 gives the rates of natural increase for the Indians as a whole and for each province. With a declining mortality rate and a relatively high birth rate, the Indian population is increasing rapidly (3.0 per cent in 1970). The rate of natural increase has decreased consistently from 3.6 per cent in 1960 to 3.0 per cent in 1970 due mainly to the declining birth rate.

TABLE 10. Rates of Natural Increase, Canada and Provinces, Canadian Indians, 1960-1970 (%)

Province	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Atlantic	2.4	3.3	3.1	2.9	2.0	2.7	2.6	2.6	2.9	2.6	2.4
Quebec	3.4	2.9	2.6	4.7	2.9	3.0	2.5	2.6	2.4	2.4	2.4
Ontario	2.8	2.8	2.9	2.6	2.8	3.0	2.7	2.3	2.2	2.2	2.4
Manitoba	4.2	4.5	4.0	4.3	4.0	4.3	4.2	4.1	3.8	3.8	3.8
Saskatchewan ..	4.5	4.5	4.6	4.7	4.7	4.5	4.6	4.2	4.5	4.0	4.0
Alberta	4.2	4.5	4.3	4.5	4.2	4.3	4.1	4.1	3.7	3.6	3.2
British Columbia	3.5	3.6	3.3	3.6	3.2	3.0	2.7	2.5	2.5	2.3	2.7
Yukon & Northwest Territories	3.5	3.7	4.1	2.6	3.2	4.3	3.1	3.8	3.1	3.3	2.7
CANADA	3.6	3.7	3.5	3.5	3.5	3.6	3.3	3.2	3.1	2.9	3.0

Source: Calculated from Table 8.

Consistent with the trend for Canada as a whole, each province (except the Atlantic) is experiencing a declining trend in the rate of natural increase. Among the provinces, the Prairie provinces registered the highest rates of natural increase throughout 1960-1970. By Canadian standards, this rate of natural increase is still very high; a 3 per cent annual increase implies a doubling of the population in 23 years.

7. Some Explanations of the Observed Vital Rates

The low crude death rates present no serious problem for explanation. The Canadian Indians, both adults and children, have benefited from modern medical facilities which have brought about drastic decline in death rate among most people in the world. The reasons for this are well documented (see Milbank Memorial Fund Quarterly, 1956).

The trends in birth rates represent an intriguing case: in 11 years, there has been a 20% drop. This decline is extremely rapid but by no means exclusive for Canadian Indians. For example, in a period of 4 years, i.e., 1962-66, a 12% decrease in the crude birth rate of the Maori population has been noted (Pool, 1970; 2). Furthermore, there is other evidence suggesting that the American Indians are also experiencing a decline in their birth rate (Rabeau & Reaud, 1969). Nevertheless, one has to ask the question whether the observed decline is a real one or only an artifact of the statistics used.

The problem discussed in the first section of this paper relating to late registration is certainly not an easy one to deal with. Indians are migrating out of their reserves and hence it is possible that while a certain number of births are reported late, some are not reported at all. The extent to which births remain unreported, although believed to be small by Indian Affairs personnel, is still unknown. Moreover, there is an additional problem, caused by the assimilation process whereby Indians and non-Indians intermarry, and it is not clear to what extent this will effect birth registrations.

Is there an actual decline in the birth rate of the Canadian Indians? To answer this question, one could compare alternative estimates by indirect procedures (e.g., using reverse survival ratios) but unfortunately, these techniques suffer the same limitations since both births and population data originate from the same register. Consequently, the age distributions are affected as much

by defects due to late registrations as are births themselves. Thus, the use of stable population techniques, for instance, yields similar results as those obtained by conventional calculations (Romaniuk and Piché, 1972). Another way to answer this crucial question is to look at indirect evidence such as age-specific fertility rates, age at marriage, illegitimacy rates, and family planning.

Age-specific fertility rates are presented in Table 11. The main point as shown in Table 11 is that there has been a decrease in the birth rate since 1964 at all ages except for the group 15-19 where it has increased. This is in keeping with many other empirical findings in comparable situations which have found a similar pattern, i.e., where fertility has recently declined. For example, in the case of Taiwanese and Maori populations, the decreases have occured at the older ages while the women aged 15-19 years have increased their fertility (Pool, 1970; Freedman & Adlakha, 1968).

TABLE 11. Indices of Changes in Age-Specific Fertility Rates, Canadian Indians, 1931-1968 (Base Year: 1964)

Year	Age of the Mother						
	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Group 1							
1931	55.3	64.4	62.4	61.9	68.6	83.2	160.2
1941	94.9	96.2	92.1	91.2	100.0	93.7	217.2
1961	139.3	140.3	136.1	141.6	144.0	142.3	191.4
Group 2							
1964	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1965	100.4	103.4	93.0	97.7	100.2	108.1	135.5
1966	101.7	96.1	85.5	89.5	87.1	87.4	131.2
1967	104.1	92.4	86.1	80.4	82.4	78.9	98.9
1968	106.0	90.1	78.3	74.3	78.0	70.4	91.4
Group 3							
1968	107.5	90.6	80.6	78.7	74.6	74.8	109.7

Sources: Group 1: Vital Statistics and Census (Canada).
Group 2: Vital Statistics and Department of Indian Affairs.
Group 3: Department of Indian Affairs.

Adequate data for the examination of the effect of age at marriage on fertility are not available. However, Table 12 gives the percentages of ever married women by age for the total Indian population in 1951 and for the registered Indian population in 1966, 1967 and 1968. Two points can be made: first, the proportion of ever married women is small in the age group 15-19 (16% in 1951); this proportion increases to 60% in the next age group. Thus, 40 per cent of women remain single in the age group 20-24. This indicates a high age at marriage which was estimated to be around 25-26 for females in 1968 (Chénier, 1971: 45). Henripin (1968: 182 and 415) also mentions the high age at marriage for Canadian Indians. Secondly, and most importantly, there seems to have been an increase in age at marriage: from 16% in 1951, the proportion of women married in the age group 15-19 has decreased to 9% in 1968.

TABLE 12. Percentage of Women ever Married by Age, 1951-1968

Note: Data for 1961 are not available in standard 5-year age groups.

Age	1951(a)	1966(b)	1967(b)	1968(b)
15-19	15.8	9.6	9.5	9.0
20-24	59.7	42.5	41.5	40.4
25-29	79.0	62.1	60.8	60.6
30-34	90.0	72.2	72.0	73.4
35-39	94.0	78.6	77.6	76.6
40-44	95.0	84.3	83.2	78.8

Sources: (a) Census of Canada.
(b) Department of Indian Affairs and Northern Development.

A high birth rate combined with a high age at marriage (although it is decreasing) could be accounted for by high illegitimacy rates. The available data for recent years show indeed a very high level of illegitimacy. The percentage of illegitimate births to total births shows an increase of 20.1 per cent in six years, from 31.7

per cent in 1965 to 39.2 per cent in 1970.

On the question of fertility control, no data are available except for the study of the "Six Nations" band mentioned in the Hawthorn Report (1966, p. 100). According to this study, it appears that this community has knowledge of, accepts and practices methods of birth control. Moreover, since Indians are increasingly migrating out of their reserves to more urban communities, it can be safely hypothesized that they are adopting norms of family size more similar to those of the Canadians as a whole.

Consequently, according to patterns of age-specific fertility rates, ages at marriage and family planning, it is reasonable to believe that the birth rate of Canadian Indians is actually declining. A supplementary piece of evidence is the demographic experience of the Maori population of New Zealand (Pool, 1967). This population is interesting from our point of view since it can be easily compared with the Indians: both are minority native groups living in highly industrialized countries while exhibiting demographic features more similar to developing countries than to the countries to which they belong. Recently, Pool has noted a very rapid decline in the birth rate of the Maori population. Since he had more data available than we have, he was able to conclude that "Maori fertility has definitely declined. Whether it will continue to do so cannot be determined at this juncture although the data as presented here point to a further decrease" (Pool, 1970: 12). The main factor accounting for this decrease relates to the acceptance by the Maori population of new norms regarding family planning.

If the Maori experience holds good for the Indian population as well, it may be tentatively concluded on the basis of the age-specific fertility and nuptiality patterns and other related information, that the decline in the birth rate of Canadian Indians is real. However, this conclusion needs to be qualified since it is impossible at the moment to determine precisely the amount of late registration and to what extent it has a downward effect on the birth rate. Our hypothesis is that part of the rapid

decline in the birth rate is due to underestimates of births and part is a real decline due to increased family planning practices.

8. Summary and Concluding Remarks

Using adjusted data, vital rates for the Canadian Indians were estimated for the period 1960-70. Crude death rates have decreased from 10.9 in 1960 to 7.5 in 1970. Infant mortality rates have also drastically declined from 81.5 deaths to 1,000 births in 1960 to 34.9 in 1970. The birth rate has also dropped from 46.5 to 37.2, although part of this decline may be due to underregistration. In 1970, the Indian population was increasing at a rate of approximately 3 per cent. Provincial rates show similar trends.

The present estimates are not intended to be a final solution to the problem of estimating the vital rates for the Indian population. We can only maintain that they are reasonably consistent with all the bits of information now available. When the data become available for a few years after 1970, it will again be possible to repeat the entire process followed here, probably with refinements.

In conclusion, two points may be emphasized. First, one must be cautious in using and interpreting the data supplied by the Membership Section of the Department of Indian Affairs and Northern Development. The increasing migration of the Indians out of their reserves to more urban communities and the consequent increasing delay of birth registration render future use of these statistics highly difficult without proper adjustments. Furthermore, the conclusions based on these data must be supplemented by further research. Special tabulations from the 1971 Census (not yet available) may throw some light on the hypothesis that the birth rate of the Canadian Indians is declining. As to the explanation of this decline, more research is required using data on age patterns of fertility, age at marriage, illegitimacy rates, birth intervals, and family planning.

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