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Introduction

Changes in the size, composition, and geographic distribution of populations can have a substantial impact on the demand for a wide range of goods and services. Ways of understanding and projecting demographic changes among Canada's Aboriginal populations are critical to the development of sound social and economic policies, as well as to the design, financing, and delivery of many programs and services to Aboriginal populations and communities. Population projections not only provide critical inputs to budgeting and to policy and program development, but may also provide important information for negotiations concerning Aboriginal self-government, land claims, and treaty entitlements.

Methods used to project numbers for Canada's Aboriginal populations have evolved considerably over the course of the past 30 years. This evolution has resulted, in large part, from the recognition that factors other than the traditional demographic components of fertility, mortality, and migration also play significant (and, in some contexts, the most important) roles in shaping Aboriginal population growth and change. These other factors, which include legislation, parenting patterns, the transfer of legal entitlement and/or Aboriginal identity from one generation to the next, and ethnic mobility, present considerable challenges to the development of Aboriginal population projections. This paper discusses the nature of these factors and their implications for the development of Aboriginal population projections.

This paper is structured into four sections. Section 2 provides a brief discussion of the traditional or "closed" population projection model, its implied assumptions, and its limitations within the context of projecting Aboriginal populations. Section 3 identifies the structure and components of an alternative projection model, which incorporates the main features of an "open" population and illustrates how this type of model has be applied within the context of projecting the Registered Indian population. Section 4 extends the discussion to include additional issues and challenges which arise within the context of projecting other Aboriginal population groups. A final section looks at some of the existing gaps in demographic research, which need to be addressed in order to advance the development of more appropriate Aboriginal population projection methodologies.

The Traditional "Closed" Population Projection Model

Until recently, population projections of Canada's Aboriginal Peoples have been constructed within the context of the traditional "closed" population model. The basic form of this model explicitly incorporates five factors depicted in equation 1:

$$P_{l,t+i} = P_{l,t} + B_{l,i} - D_{l,i} + NMl_{l,i}, \quad [1]$$

where $P_{l,t+i}$ refers to the population in area ***l*** at time ***t+i***, ***Pl,t*** refers to the baseline population in location ***l*** at time ***t***, ***Bl,i*** refers to the number of births to females in location ***l*** during the time interval ***i***, ***Dl,i*** refers to the number of deaths in location ***l*** during the time interval ***i***, and ***NMl,i*** refers to the number of net migrants to/from location ***l*** during the time interval ***i***. The baseline population, deaths, and net migration parameters included in the model are configured for both age and gender groups.

The traditional closed population model implicitly assumes that:

- All survivors remain members of the population
- All descendants born to females become members of the population
- No one from outside the population can become a member of the population

Canada's Aboriginal populations display many attributes that are inconsistent with the implied assumptions of the closed population model. First and foremost is the fact that Canada's Aboriginal populations are defined not only on the basis of descent (i.e., ethnic origins) but according to other factors, such as legislation and self-identification (or ethnic affiliation).

Clatworthy (2003) has discussed how legislative amendments introduced by the 1985 *Indian Act* (Bill C-31) created the opportunity for many individuals and their children to reacquire Indian registration. The provisions in Bill C-31 have resulted in the transfer of large numbers of individuals into the registered Indian population from other Aboriginal subgroups, most notably from the non-registered Indian population. As Clatworthy (2001) has also noted, the process of reinstatement and registration under Bill C-31 is far from complete, and further additions to the population are expected to occur over the course of the next two decades. The assumptions of the traditional model that no one can enter the population except through birth to a female member of the population, or leave the population except through death, are clearly inconsistent with recent evidence.

The 1985 *Indian Act* also introduced a new set of inheritance rules governing entitlement to Indian registration for all children born to a registered Indian after April 16, 1985. The new rules, which are contained in Section 6 of the 1985 *Indian Act*, provide for registration under one of two sub-sections:

- ***Section 6(1)***, where both of the individual's parents are (or are entitled to be) registered

- ***Section 6(2)***, where one of the individual's parents is (or is entitled to be) registered under Section 6(1) and the other parent is not registered

As discussed more fully later in this paper, one of the implications of these rules is that parenting patterns are now a central factor in determining whether descendant children qualify for Indian registration. Exogamous parenting, by either males or females, will result in children who qualify for registration in situations where the Indian parent is registered under Section 6(1). In cases where an Indian parent is registered under Section 6(2), exogamous parenting will result in children who lack entitlement to Indian registration. Given this situation, the contribution of fertility to the growth of the registered Indian population cannot be captured without addressing the parenting patterns and fertility attributes of both males and females.

It is clear from the above discussion that the traditional model is inappropriate for projecting the registered Indian population. For many of the same reasons, the traditional model is also severely limited in its ability to project accurately the populations of other Aboriginal subgroups. This is the case especially with respect to Aboriginal populations that are defined on the basis of identity or self-declared affiliation.

Recent research by Guimond (1999) on the subject of ethnic mobility addresses some of the main issues in this regard. Guimond distinguishes between two types of ethnic mobility: inter-generational and intra-generational. With respect to the former, he notes: "Ethnic mobility can occur when children's identity is first identified. Parents and children do not necessarily have the same ethnic affiliation, more especially if the mother and father do not belong to the same ethnic group." Guimond's research has also identified exogamous parenting to be common among all Aboriginal groups. As such, the interplay of parenting patterns, male and female fertility, and the transfer of identity to descendant children constitutes a critical dimension of population changes among all Aboriginal groups. With respect to the latter type of ethnic mobility, Guimond notes, "Ethnic mobility may also result from a change in individuals' ethnic affiliation between two points in time." In his analysis of the demographic growth of Aboriginal populations from 1986 to 1996, Guimond clearly demonstrates that a substantial portion of Aboriginal population growth can only be accounted for by changes in how individuals reported their identity. His work also suggests that intra-generational ethnic mobility during this period involved both individuals who shifted identity from one Aboriginal group to another and individuals who shifted identity from non-Aboriginal to Aboriginal. Guimond concludes that this latter dimension of intra-generational mobility (i.e., non-Aboriginal to Aboriginal) has been responsible for much of the pronounced growth in the Aboriginal identity population as reported by the Census of Canada over the course of the period from 1986 to 1996.

An "Open" Population Projection Model

In light of the above discussion, the traditional closed population model can no longer be viewed as applicable when projecting the populations of any of the Aboriginal subgroups. For more than a decade, research has been underway to recast Aboriginal population projections using an "open" population model. The shift to an open population model involves the explicit recognition of additional factors that affect population and change. The general model of interest within the context of Canada's Aboriginal populations is depicted in equation 2:

$$P_{j,t+i} = P_{j,t} + \alpha B_{j,i} - D_{j,i} + NM_{j,i} + EIM_{j,i} + EOM_{j,i} . \quad [2]$$

The open model contains three new factors in addition to those shown in the closed population model:

- α, which refers to a set of rules or assumptions that govern how population membership (e.g., identity or registration entitlement) is transferred to or inherited by descendant children, $B_{j,I}$, born in location ***j*** during the time interval ***i***
- $EIM_{j,i}$, which refers to the number of individuals who transfer into the population (i.e., ethnic in-migrants) of location ***j*** during the time interval ***i***
- $EOM_{j,i}$, which refers to the number of individuals who transfer out of the population (i.e., ethnic out-migrants) of location ***j*** during the time interval ***i***

The conceptual shift to an open population perspective introduces many new complexities and challenges to the development of Aboriginal population projections.

An Open Model for the Registered Indian Population

Some additional features of the open population model depicted above can be illustrated within the context of a specific variant of the model configured for the registered Indian population. As in the discussion in section 2, the registered Indian population can be viewed as an open population that is circumscribed or defined by legislation. Individuals can enter or be added to the population over time through the registration and reinstatement provisions of the 1985 *Indian Act* (Bill C-31). This process can be viewed as the equivalent of ethnic in-migration, or the $EIM_{j,i}$ term of the general model. The set of rules contained in Section 6 of the 1985 *Indian Act* determines which descendants are entitled to registration based on the registration attributes of their parents. In concert with the parenting patterns and fertility attributes of males and females, this set of rules constitutes the $\alpha B_{j,i}$ term of the general model. Unlike previous versions of the *Indian Act*, where individuals could lose registration through exogamous marriage or other events, registration under the 1985 *Indian Act* is permanent and cannot be lost. As such, there is no requirement for the ethnic out-migration ($EOM_{j,i}$) term to be included in the registered Indian model.

Table 15.1: Parenting Combinations and Consequences for Indian Registration Entitlement Under Section 6 of the 1985 Indian Act

Parent's Entitlement	Parent's Entitlement	Child's Entitlement
Section 6(1)	Section 6(1)	Section 6(1)
Section 6(1)	Section 6(2)	Section 6(1)
Section 6(1)	Not Entitled	Section 6(2)
Section 6(2)	Section 6(2)	Section 6(1)
Section 6(2)	Not Entitled	Not Entitled
Not Entitled	Not Entitled	Not Entitled

The applicable projection model within the context of the registered Indian population is summarized in equation 3:

$$P_{j,t+i} = P_{j,t} + \alpha B_{j,i} - D_{j,i} + NM_{j,i} + EIM_{j,i} . \quad [3]$$

Several prior projections of the registered Indian population contained procedures developed for estimating and incorporating future additions to the population associated with the registration and reinstatement provisions of the 1985 *Indian Act* (Nault et al. 1993; Loh 1995; Norris et al. 1996; Clatworthy 2001). These projections reveal that new Bill C-31 registrations and reinstatements are declining, and that this component of registered Indian population growth is expected to continue declining in importance over the course of the next two decades. As this aspect of the registered Indian model has been discussed at length elsewhere, the primary focus of this study will now shift to the more complex issue of configuring the registered Indian model to incorporate the interplay of parenting patterns, fertility, and the inheritance rules governing entitlement to Indian registration (i.e., the $\alpha B_{j,i}$ term of the projection model).

Parenting Patterns and Entitlement to Indian Registration

As discussed above, Section 6 of the 1985 *Indian Act* distinguishes between two classes of registered Indians: Section 6(1) and Section 6(2). As noted by Clatworthy and Smith (1992), these two classes differ in their ability to pass an entitlement to Indian registration to their children. The range of parenting combinations, and their consequences for descendants in terms of Section 6 registration entitlement, are summarized in **Table 15.1**. As the table shows, those registered under Section 6(1) have the ability to pass entitlement to Indian registration to all of their offspring, regardless of the registration status of their parenting partner. Those registered under Section 6(2) have the ability to pass entitlement to Indian registration to offspring only if their parenting partner is also entitled to Indian registration. Exogamous parenting by those registered under Section 6(2) results in descendant children who lack entitlement to Indian registration. Children of

this third population group, non-registered descendants, will qualify for registration only if their other parent is registered under Section 6(1).

The differential consequences of exogamous parenting among the population subgroups discussed above implies the need for registered Indian population projection models to distinguish the population not only on the basis of age and gender, but by Section 6 registry entitlement (i.e., Section 6(1), Section 6(2), and not entitled).

Measuring Parenting Patterns and Rates of Exogamous Parenting

The rules governing the transfer of Indian registration entitlement to descendants are gender neutral, meaning that they apply in the same fashion to both male and female parents. This aspect of the rules is important, as it means that the model must also explicitly incorporate the parenting and fertility patterns of both gender groups.

Measures of the parenting patterns of registered Indian males and females can be obtained from data contained on the Indian Register, which links parents and their children. The register, however, does not contain a complete record of all children born to registered Indian parents: specifically, children born to a parent registered under Section 6(2) and whose other parent is not registered do not qualify for Indian registration and are not contained in the register. At the present time, estimates of the parenting patterns of the registered Indian population rely upon data for children who have at least one parent registered under Section 6(1). Apart from any late reporting of births, the Indian Register contains a complete record of these children and the registry status of both of their parents.

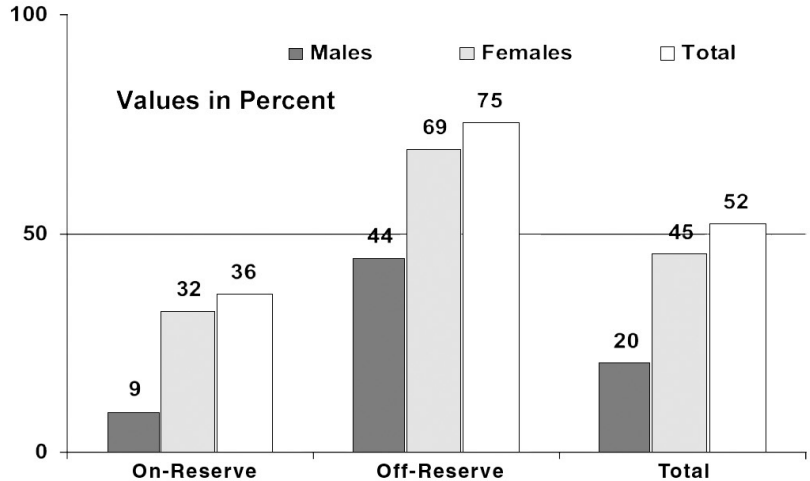
Within the context of developing registered Indian population projections, the critical aspect of parenting patterns relates to exogamous parenting. Clatworthy (2001) has recently estimated gender-specific rates of exogamous parenting in the form of conditional probabilities. For example, in the case of females, the exogamous parenting rate is expressed as the likelihood that a child born to a registered Indian female has a non-registered father. For purposes of calculating the rates, he distinguishes among three groups of births:

- Female exogamous births (***x***), or children born to a registered Indian female and non-registered male
- Male exogamous births (***y***), or children born to a registered Indian male and non-registered female
- Endogamous births (***z***), or children born to two registered Indian parents

Given these groups, exogamous parenting rates are calculated as follows:

- For females $x / (x + z)$
- For males $y / (y + z)$
- For both gender groups combined $(x + y) / (x + y + z)$

Figure 15.1: Estimated Rate of Exogamous Parenting by Gender and Location, Registered Indian Population, Canada, 1985-1999



Source: Computed from data on the Indian Register, Dec. 31, 1999

Using this procedure, Clatworthy estimates the combined rate of exogamous parenting among registered Indians during the 1985 to 1999 time period, at the national level, to be about 52%. As illustrated in **Figure 15.1**, rates of exogamous parenting among registered Indians vary between gender groups and by on-off-reserve residence and are substantially higher among females than males and among both gender groups living off-reserve, as opposed to on-reserve. In light of the inheritance rules contained in the 1985 *Indian Act*, the high rates of exogamous parenting have substantial implications for any future population entitled to Indian registration. Over time, persistent exogamous parenting will result in the loss of registration entitlement for a growing proportion of the descendants of the registered Indian population.

Implications for Measuring Fertility

The *gender neutral* aspect of the inheritance rules also has implications for fertility measurements, and the manner in which this factor is included in the model. The general problem arises in situations involving exogamous parenting. Some aspects of the problem may be highlighted by focusing more closely on the consequences for registration entitlement among descendants of various parenting patterns associated with males and females registered under Section 6(1) and 6(2) of the 1985 *Indian Act*. **Table 15.2** (page 250) isolates the pertinent parenting patterns.

Table 15.2: Parenting Combinations by Gender and Registration Entitlement Group and Consequences for Indian Registration Entitlement Under Section 6 of the 1985 Indian Act

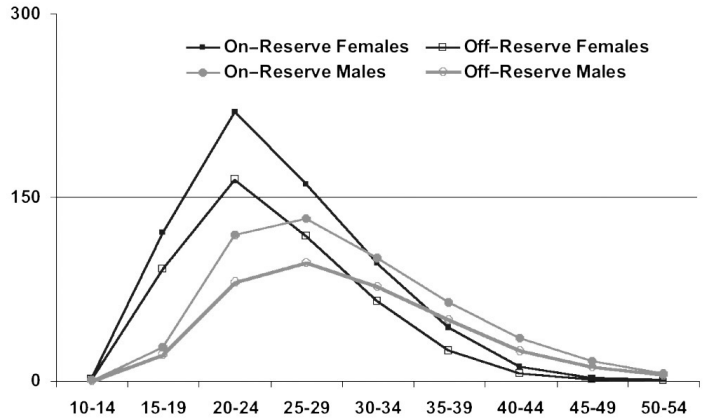
Father's Entitlement	Mother's Entitlement	Child's Entitlement
Section 6(1)	Not registered (A)	Section 6 (2) (1)
Section 6 (2)	Not registered (B)	Not Entitled (2)
Not registered	Section 6 (1) (C)	Section 6 (2) (3)
Not registered	Section 6 (2) (D)	Not Entitled (4)
Section 6 (1) or 6 (2)	Section 6 (1) or 6 (2) (E)	Section 6 (1) (5)

Within the context of the registered Indian population, conventional measures of female fertility, such as the total fertility rate (TFR), are normally derived from data collected by the Canadian census concerning the number of children ever born to registered Indian females, or data in the Indian Register concerning child/woman ratios. Within the content of the parenting patterns displayed in **Table 15.2**, the "children ever born" method captures only the fertility attributes of a portion of the mothers who produce children entitled to Indian registration (i.e., mothers in groups C, D, and E). All children born through the exogamous parenting of Indian males and non-registered females (i.e., children in groups 1 and 2) are excluded in spite of the fact that some of these children (i.e., group 1) are entitled to Indian registration. More detailed research on registered Indian fertility by Clatworthy (1994), and on the fertility of other Aboriginal groups by Robitaille and Guimond (2003), demonstrate that the conventional measures of female-only fertility underestimate the true fertility of the population by failing to capture the male contribution to the group's fertility, which arises through exogamous parenting.

Estimating conventional measures of registered Indian fertility using Indian Register data on child/woman ratios is more problematic. Using this method, three groups of children would be included in the numerator of the ratio (groups 1, 3, and 5). The denominator of the ratio would include all registered women (i.e., mothers in groups C, D, and E, as well as all other registered Indian women who have not had children during the reference period). In light of the information provided in **Table 15.2**, the child/woman ratio based on the register data contains several sources of error, as summarized below:

- The numerator of the ratio includes some children who are not born to registered females (i.e., children in group 1) and excludes some children who are born to registered females (i.e., children in group 4).
- The denominator of the ratio excludes some mothers who have given birth to children who are entitled to registration (i.e., mothers in group A).
- Mothers (group B) and children (group 2) associated with exogamous

Figure 15.2: Estimated Births Per 1,000 Population by Age, Gender, and Location, Registered Indians, 1999



Source: Computed from data on the Indian Register, Dec. 31, 1999

parenting by males registered under Section 6(2) are excluded entirely from the ratio.

These inconsistencies between the numerator (i.e., the population of children) and denominator (i.e., the population of women) of the child/woman ratio imply that this method cannot provide unbiased measures either of the fertility of Indian females or the fertility attributes of the total registered Indian population.

Problems associated with conventional measures of fertility flow largely from the exogamous parenting of registered Indian males and non-registered females, which has the effect of producing an independent male component to the total fertility of the population group. Recent research by Clatworthy (2001) provides some estimates of the scale of the male dimension of registered Indian fertility. Based on data for the time period 1985–1999, Clatworthy estimates that roughly 24,000 (or more than 10%) of the 228,000 children added to the register have resulted from exogamous parenting between Indian males and non-Indian females. Among the population residing off-reserve in some provinces/regions, children with registered Indian fathers and non-registered mothers account for up to 36% of all children registered during the period. Clearly, the scale of the independent contribution of males to total fertility implies the need for registered Indian projections to address this dimension of fertility explicitly.

Estimating Gender-specific Fertility Rates

Estimates of age- and gender-specific fertility rates for registered Indians can be calculated from the data on the Indian Register that links children to parents. As in the case of estimating exogamous parenting rates, the register data support direct fertility estimates only for the population registered under Section 6(1). Lacking

complete data for those registered under Section 6(2), rates for this group are assumed (for purposes of the projections) to be the same as those registered under Section 6(1), who are living in the same location. Estimates of registered Indian fertility by age, gender, and location of residence, prepared by Clatworthy (2001) using data for 1999, are illustrated in **Figure 15.2** (page 251).

As revealed in the figure, the fertility rates of both males and females vary by location of residence. In general, rates among the population living on-reserve are about 30–40% higher than those of the population off-reserve. Pronounced differences in fertility also exist between gender groups, both on- and off-reserve. Female fertility rates are significantly higher compared to those of males for all age cohorts under 30 years. For older cohorts, male fertility rates exceed those of females. The fertility estimates presented in **Figure 15.2** can be employed in projections to estimate the total number of births to males and females annually.

The Indian Register data used in the calculation of fertility rates can also be manipulated to provide estimates of the total fertility rate of females and males. In 1999, the TFR for registered Indian females was estimated to be about 3.2 births per woman on-reserve, and about 2.1 births per woman off-reserve. Comparable rates estimated for registered Indian males were 2.5 births per man on-reserve, and 1.7 births per man off-reserve.

Creating an Operational Projection Model

Having identified and, where applicable, provided measures of the key components of the model's $\alpha \mathbf{B}_{j,i}$ term (i.e., the inheritance rules, male and female rates of exogamous parenting, and male and female rates of fertility), how can these components be made operational in the projection model?

The Three-parameter Approach

A recent model developed for projecting the registered Indian population by Clatworthy (2001) incorporates these three sets of factors into the projection model using a two-stage process. In addition to location of residence, the model distinguishes members of the population by age (five-year age cohorts), gender and Section 6 registration status (i.e., Section 6(1), Section 6(2), and non-entitled descendants). In the initial stage, three sets of parameters—male and female fertility rates and the rate of exogamous parenting by females—are used to generate the total number of births to males and females and the number of exogamous births generated by females. Given these estimates, the number of endogamous births to males and females, and the number of exogamous births to males, can be calculated as a residual. In a second stage, births associated with endogamous and exogamous parenting are assigned to registration subgroups by applying the logic of inheritance rules contained in Section 6 of the 1985 *Indian Act*. The specific steps involved in the process are described in **Figure 15.3** (pages 253–254) using, as an example, actual projection data for the on-reserve population in the province of Ontario for the year 2030.

Figure 15.3: Sequence of Steps Involved in Computing and Allocating Births in the Projection Model

Step 1: Compute Total Births by Gender and Registration Group	
Apply the male and female fertility rates to the child-bearing population of each registration group to yield the number of births to male and female parents. For the on-reserve population of Ontario in the year 2030, this results in:	
	7,384 births to females registered under Section 6(1) 3,082 births to females registered under Section 6(2) 243 births to female descendants who are not entitled to registration 5,915 births to males registered under Section 6(1) 2,414 births to males registered under Section 6(2) 157 births to male descendants who are not entitled to registration
	Total female births = 10,709 Total male births = 8,486
Step 2: Apply Rate of Exogamous Parenting for Females to Calculate Exogamous Female Births by Registration Group and Compute Endogamous Births as Residual	
	Exogamous parenting rate for on-reserve females in Ontario = 25.48
Exogamous births for	Section 6(1) females = 7,384 * .2548 = 1,881 Section 6(2) females = 3,082 * .2548 = 785 Non-entitled females = 243 * .2548 = 62
	Total exogamous female births = 2,728
Endogamous births for	Section 6(1) females = 7,384 - 1,881 = 5,503 Section 6(2) females = 3,082 - 785 = 2,297 Non-entitled females = 243 - 62 = 181
	Total endogamous female births = 7,981
Step 3: Set Male Endogamous Births = Female Endogamous Births and Distribute Across Registration Groups According to Proportional Distribution of Total Male Births	
	Male endogamous births = female endogamous births = 7,981
Registration distribution of male parents:	Section 6(1) = 5,915 / 8,486 = .6970 Section 6(2) = 2,414 / 8,486 = .2845 Non-entitled = 157 / 8,486 = .0185
Endogamous births for	Section 6(1) males = 7,981 * .6970 = 5,563 Section 6(2) males = 7,981 * .2845 = 2,270 Non-entitled males = 7,981 * .0185 = 148
Step 4: Calculate Exogamous Male Births by Residual	
Exogamous births for	Section 6(1) males = 5,915 - 5,563 = 352 Section 6(2) males = 2,414 - 2,270 = 144 Non-entitled males = 157 - 148 = 9
	Total exogamous male births = 352 + 143 + 9 = 505
Total births =	endogamous births (7,981) + exogamous female births (2,728) + exogamous male births (505) = 11,214

Step 5: Apply Proportions of Endogamous Male Births by Registration Group to Distribution of Endogamous Female Births to Estimate Endogamous Parenting Combinations

Proportion of endogamous male births	Section 6(1) = .6970 Section 6(2) = .2845 Non-Entitled = .0185
Distribution of endogamous female births	Section 6(1) = 5,503 Section 6(2) = 2,297 Non-Entitled = 181

Endogamous parenting patterns

Male Registration Group	**Female Registration Group**		
Section 6(1)	Section 6(1)	Section 6(2)	Non-Entitled Descendant
Section 6(2)	5,503 * .6970 = 3,836	2,297 * .6970 = 1,601	181 * .6970 = 126
Non-Entitled Descendant	5,503 * .2845 = 1,566	2,297 * .2845 = 653	181 * .2845 = 51
	5,503 * .0185 = 102	2,297 * .0185 = 42	181 * .0185 = 3

Totals may not sum due to rounding error.

Step 6: Add Endogamous to Exogamous Births to Construct Total Parenting Pattern

Males	**Females**				
	Section 6(1)	Section 6(2)	Non Entitled Descendant	Exogamous	Total
Section 6(1)	3,836	1,601	126	352	5,915
Section 6(2)	1,566	653	51	144	2,414
Non-Entitled Descendant	102	42	3	9	156
Exogamous	1,881	785	62	—	2,728
Total	7,385	3,081	242	505	11,213

Step 6: Add Endogamous to Exogamous Births to Construct Total Parenting Pattern

Section 6(1) = Births involving two registered parents = 3,836 + 1,601 + 1,566 + 653 = 7,656

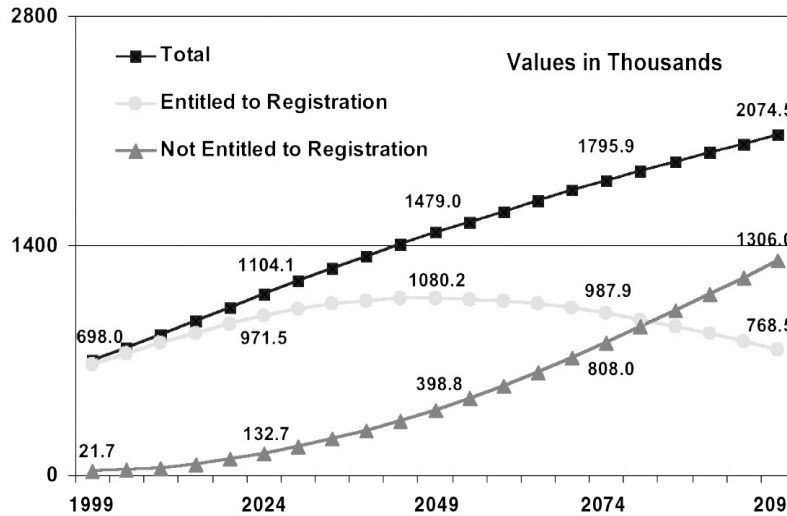
Section 6(2) = Births involving Section 6(1) parent and non-registered descendant or exogamous partner = 102 + 1,881 + 126 + 352 = 2,461

Non-Entitled Descendants = Births involving Section 6(2) and non-registered descendants or exogamous partner = 42 + 785 + 51 + 144 + 3 + 9 + 62 = 1,096

Allocate births (i.e. Pop. 0-4 Years) to gender groups, assuming 105 males per 100 females

Section 6(1)		**Section 6(2)**		**Non-Entitled Descendant**		**Total**	
Male	Female	Male	Female	Male	Female	Male	Female
3,921	3,735	1,261	1,200	561	535	5,743	5,470
						Total	11,213

Figure 15.4: Projected Population of Survivors and Descendants by Indian Registration Entitlement, Canada, 1999-2099



One importantfeature of the projection model relates to the manner in which exogamous parenting is conceptualized. In this regard, the model views exogamous parenting as parenting between registered Indians or their descendants (regardless of registration status) and individuals who are not registered and are not descended from the registered Indian population. This concept is consistent with the measured rate of exogamous parenting that is currently being captured in the Indian Register data.[1] One of the consequences of exogamous parenting is that it will, over time, generate a growing group of individuals that is not registered but is descended from the registered Indian population. The existence of a growing population of non-registered descendants within First Nations communities, especially reserves, will alter the registration mix of potential partners (mates), and serve to increase the likelihood of parenting between a registered and non-registered descendant. The projection model incorporates the compounding effect of exogamous parenting by viewing all parenting between descendants (regardless of their registration attributes) as endogamous. As the registration mix of the descendant population changes over time to include larger numbers of non-registered individuals, endogamous parenting among descendants will also result in a growing number of offspring who are not entitled to Indian registration.

The model's use of the three parameters (male and female fertility rates and the rate of exogamous parenting by females) for the purpose of generating births also allows it to capture the impact on births that is the result of changes in the

assumed rates of exogamous parenting. Clatworthy (1994) and, more recently, Guimond (forthcoming), have examined the relationship between the rate of exogamous parenting and fertility, and concluded that in situations where fertility is the same, populations with higher rates of exogamous parenting will produce larger numbers of children. This can be most simply explained by considering a population group comprised of 100 males and 100 females. For this population, the maximum number of endogamous unions would be 100. This same population, however, could produce 200 exogamous unions. If these unions have the same fertility characteristics, then twice as many children would be expected to result from the population group under conditions of exogamous, as opposed to endogamous, partnering.

The total number of births generated using the three-parameter model is automatically adjusted if the assumed rate of female exogamous parenting is altered. This can be illustrated by changing the assumed rate of exogamous female parenting in the Ontario example provided in **Figure 15.3**. In this example, the assumed rate of exogamous female parenting of 25.48% resulted in 11,214 total births, including 2,728 exogamous female births, 7,981 endogamous births, and 505 exogamous male births. If one repeats the calculations in **Figure 15.3** using an assumed rate of exogamous female parenting of 40%, the total number of births projected by the model increases to 12,770, including 4,284 exogamous female births, 6,425 endogamous births, and 2,061 exogamous male births.[2]

Selected Results from Recent National Level Projections

Recent projections of the registered Indian population at the provincial/regional and national levels have been undertaken using Clatworthy's three-parameter approach. The projections were designed to explore the longer term implications of the 1985 *Indian Act* amendments for the registered Indian population. The projection time frame spans 100 years, or roughly four generations into the future. The projection scenario highlighted in this section is based on assumptions of declining fertility and mortality, modest net migration to reserves declining to zero after 20 years, and declining inflows of new registrants/reinstatements under Bill C-31, reaching zero after 40 years. The projections also explore four scenarios concerning future rates of exogamous parenting, including a stable rate scenario and three scenarios involving increases of 10, 20, and 30%, respectively, in the rate of exogamous parenting. Results presented here derive from the scenario that assumes a gradual rise in the rate of exogamous parenting of 20% over 40 years, and remaining stable thereafter.

Figure 15.4 (page 255) illustrates the projected population of survivors and descendants by entitlement to Indian registration. The total population is expected to continue to increase at a gradually declining rate throughout the entire period, reaching about 2.07 million after 100 years. The population entitled to Indian registration, however, is projected to grow for only about 50 years, reaching

about 1.08 million. Over the remaining 50 years of the projection period, the population entitled to Indian registration is projected to fall to about 768,500, a level slightly higher than that estimated in 1999. Significant growth in the population of survivors and descendants who do not qualify for Indian registration is expected to occur throughout the projection period. The non-entitled component of the population is expected to grow from the 1999 level of about 21,700 to nearly 399,000 individuals within 50 years. Within 100 years, non-entitled descendants are projected to number about 1.31 million, and will form a sizable majority of the descendant population.

The projection results also reveal that, within 45 years, children who are entitled to Indian registration will form a minority of all children born to the population. While the impact of the interplay between the inheritance rules and exogamous parenting are clearly substantial in the longer term, a significant impact is also expected in the short term. Clatworthy's results suggest that, during the 1999–2004 period, about 1,780 children annually will be born into the population who lack entitlement to Indian registration. Within 25 years, this number is expected to increase fourfold, to about 7,340 children annually. Roughly 111,500 children born to the population over the next 25 years are projected to lack entitlement to Indian registration.

Implications for Projecting Other Aboriginal Populations

In the discussion earlier, it was noted that the 1985 *Indian Act* amendments influenced not only the growth and composition of the registered Indian population but of other Aboriginal populations as well, as many of those who acquired or reacquired Indian registration are believed to have been members of other Aboriginal subgroups (Norris, Kerr, and Nault 1996).

The projection results presented in the previous section imply the possibility that non-registered descendants of the registered Indian population may flow back into the populations of other Aboriginal subgroups. At this point, research has not been undertaken to establish how non-registered descendants of the registered Indian population identify themselves. There is some evidence from census data concerning child-woman ratios to suggest that the non-registered (i.e., non-status) Indian population may have experienced a significant inflow of non-registered descendants of the registered Indian population since the 1985 *Indian Act* revisions. Estimates of total fertility rates and children ever born (constructed from the Indian Register and the census) rank the fertility of registered Indians significantly higher than that of non-registered Indians. Child/woman ratios from the census suggest the opposite. For example, registered Indian and non-registered Indian TFR estimates for 1991 are 2.8 and 2.0, respectively, while the corresponding child/woman ratios are 445 and 615 children per 1,000 women (Norris, 1997). The higher child/woman ratios calculated for the non-registered Indian population would appear to result from the outflow of non-entitled descendants of registered Indians into the non-registered Indian population. If it is the case that the majority

of the non-entitled descendants of the registered Indian population maintain their North American Indian identity, then the non-registered Indian population can be expected to experience a substantial increase in growth—growth that originates within the registered Indian population. It remains uncertain as to what the future identity patterns of non-entitled descendants will be, since flows to other groups including Métis, Inuit, and non-Aboriginal groups, are also possible.

The possibility of flows of descendants from the registered Indian population to other Aboriginal population groups raises a number of difficult questions. If non-entitled descendants identify as non-registered Indians, how can one project the non-registered Indian population without also projecting the registered Indian population at the same time? If some of the non-entitled descendants have a non-registered parent who is Métis or Inuit, are they more likely to identify as Métis or Inuit? If so, is there not also a need to project these population subgroups at the same time? Although specific answers to these questions remain unclear at his point, what is becoming clear is the need to consider the development of concurrent projection approaches.

Summary and Implications for Policy and Further Research

This study has examined a number of issues and challenges related to the projection of future numbers for Canada's Aboriginal populations. The projection model illustrated for the registered Indian population addresses many of these issues and, in doing so, may provide a useful framework for future development. Evidence presented in the study suggests a need for Aboriginal projections to be conducted concurrently and to be constructed in a fashion that recognizes and incorporates population flows among Aboriginal subgroups. A major constraint in this regard relates to our limited knowledge about several key factors affecting Aboriginal population growth. These factors include exogamous parenting, the contribution of males to group fertility and births, parenting patterns between members of different Aboriginal groups, and the consequences of both exogamous and endogamous parenting for the transfer of identity to descendants.

Although a considerable body of research concerning Aboriginal demography has been developed over the past two decades, little of this research has focused on the topics of Aboriginal family composition, marriage, and parenting patterns. Analysis of census data on families may provide some useful information concerning Aboriginal marriage and parenting patterns, the fertility of various marriage arrangements, and on the links between parent and child identity. In the short term, this type of research may provide valuable contributions to the development of more appropriate and accurate Aboriginal population projections. In the longer term, such research may support the construction of a concurrent projection model, which appears to be required.

The research issues raised above, however, relate to only part of the gap in our understanding and knowledge of factors influencing Aboriginal population growth and change. The construction of accurate Aboriginal projections is also

dependent upon our ability to gain a better understanding of intra-generational ethnic mobility. While Guimond's (1999, forthcoming) pioneering work has provided some insights into the nature and scale of Aboriginal ethnic mobility, current knowledge of this issue falls far short of that required to support its inclusion in projection models. Clearly, a more concerted research effort is also called for on this important dimension of Aboriginal demographic change.

This is not simply a matter of science or technique. There are serious policy implications. Population projections are used in most planning processes, whether it is forecasting health care needs, educational requirements, housing, community infra-structure, or the many other supports needed by populations. It is safe to say that accurate projections allow for more accurate forecasts of these requirements. This means better utilization of scarce resources, and fewer situations of inadequate provision for social and economic needs.

Governments and non-governmental agencies request population projections more than any other single piece of demographic information (Kerr, Guimond, and Norris 2003). This is particularly true for populations, such as Aboriginal Peoples, where government has expanded responsibilities. Aboriginal population projections have been assessed as being quite limited for sometime (Kerr, Guimond, and Norris 2003), owing to knowledge gaps that this paper has identified concerning several key factors affecting Aboriginal population growth and ethnic mobility. The work presented in this paper goes some way towards improving our ability to develop more appropriate and accurate project populations and, consequently, is more conducive to policy making that is evidence based, relevant, and effective.

Endnotes

1 As the rules contained in Section 6 apply to children born after April 16, 1985, the population of non-entitled descendants that has reached child-bearing age is currently quite small. As such, exogamous parenting rates calculated from the register are capturing parenting between registered Indians and non-registered individuals who have not descended from the registered Indian population.

2 Assumptions concerning lower rates of female exogamous parenting will yield lower numbers of total births. The model illustrated in Figure 15.3, however, is limited in this regard, as it is possible to lower the female exogamous parenting rate to a level that results in a number of endogamous births greater than the total number of births to males. As such, the fertility and exogamous parenting parameters included in the model displayed must satisfy the condition that the total number of births to males is equal to or greater than the number of endogamous births. This condition would not be required if the male exogamous parenting rate (which is lower than the female rate) were used instead of the female rate. In projection situations where the rate of exogamous parenting is assumed to decline over time, the model should be configured using the exogamous parenting rate for whichever gender group has lower rates. Based on Clatworthy's (2001) estimates for 1999, rates of exogamous parenting are lower for males than females both on- and off-reserve in all provinces/regions.

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