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Mortality in a Northern Ontario Fur-Trade Community: Moose Factory, 1851-1964

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Abstract

Parish records represent a relatively under-exploited source for historic Aboriginal demography, for a variety of reasons associated with the historical context in which many communities have developed. This paper summarizes the results of a historical demographic study of a Northern Ontario Aboriginal community. Data on 19th and 20th century mortality for the community of Moose Factory are examined from Anglican parish records. Since a direct evaluation of the parish records is not possible, their validity is assessed indirectly by the relative accuracy and consistency with which they have been recorded. Overall, the parish burial records for Moose Factory seem an appropriate and valid source of data regarding mortality in this Cree community. Changing patterns of mortality over time and differential mortality are assessed. Cumulative survivorship curves were estimated using the Kaplan-Meier method for each of three temporal periods reflecting the late 19th century, early 20th century and post WWII periods. The results demonstrated that the second period (1914-45) had survivorship values significantly lower than both the post WWII period and the late 19th century. The implications of these results are discussed in relation to changes in the frequency and intensity of European contact and the changing socio-economic factors related to the decline of the fur trade from the late 19th to early 20th centuries.

Résumé

Les registres paroissiaux sont une source quelque peu sous-exploitée en ce qui concerne la démographie historique des autochtones; et cela pour différentes raisons relatives au contexte historique dans lequel beaucoup de communautés ont évolué. Cet article résume les résultats d'une étude en démographie historique sur une communauté d'autochtones de l'Ontario septentrional. Des données sur la mortalité au 19^{e} et 20^{e} siècle sont analysées pour la communauté de Moose Factory en utilisant les registres de la paroisse anglicane. Comme l'évaluation directe de ces registres n'est pas possible, leur validité est établit indirectement par le biais de l'exactitude et de la cohérence avec lesquelles ils ont été dressés. En général, les actes concernant les sépultures de la paroisse de Moose Factory semblent être une source adéquate et valide en ce qui concerne les données sur la mortalité de cette communauté de Cree. Des changements structurels de la tendance de la mortalité avec le temps, ainsi que de la mortalité différentielle, sont observés. Des fonctions de survie ont été calculées en utilisant la méthode de Kaplan et Maier pour chacune de trois périodes renvoyant à la fin du 19^{e} siècle, au début du 20^{e} siècle et à la période après la deuxième guerre mondiale. Les résultats montrent que les valeurs de la fonction de survie pour la deuxième période, allant de 1914 à 1945, sont de manière significative inférieures aux valeurs relatives aux deux autres périodes, celles de l'après-guerre et de la fin du 19^{e} siècle. Les implications des résultats sont abordées en fonction des changements de la fréquence et de l'intensité de leurs contacts avec des Européens, ainsi que les changements des facteurs socio-économiques liés au déclin du commerce de fourrure, entre la fin du 19^{e} et le début du 20^{e} siècle.

Key Words: Aboriginal health, historical demography, survivorship, subarctic, Cree

Introduction

Studies of Aboriginal communities have been a relatively rare component of historical demographic research. Much that is classed in this category for North America tends to deal more broadly with the issue of population size estimates and de-population of native Americans in the New World following contact with European settlers (e.g. Dickinson and Grabowshi, 1993; Dobyns, 1993; Denevan, 1992; Henige, 1992; ; Ubelaker, 1992; Verano and Ubelaker, 1992; Reff, 1991; Zubrow, 1990; Thornton, 1987).

Historical demographic studies of aboriginal communities have been less frequent because of the scarcity of records available, and their often unreliable

quality. While currently under-exploited, parish records represent a potentially powerful source of information regarding issues of historic Aboriginal demography (Herring 1992,1994a). Parish records are well suited for studies of this nature, as they lend themselves to both aggregate analysis (time trend in a single series of vital records) and family reconstitution methods (genealogical reconstruction from baptism, marriage, and burial records). Nevertheless, several issues must be considered when reconstructing mortality profiles based on parish records – in particular, the reliability of the individual series of records is crucial. A variety of factors, including but not limited to the loss of records, periods of under-recording, failures to register, a long period of time between birth and baptism or rapid changes in the social or economic structure of the community, all act to potentially bias historical records of vital events (Willigan and Lynch, 1982; Lee, 1977; Wrigley, 1977 Drake, 1974; Levine, 1976). Willigan and Lynch (1982) identify 3 factors that traditionally have tended to affect the overall reliability of church records: 1) the concern of the church to communicate and enforce rules regarding record keeping, 2) the skills of the recorder, and perhaps the most important 3) a variety of historical circumstances which have differentially affected the recorder's ability to accurately enumerate vital events at the approximate time of their occurrence within the community. These authors note that the most obvious influence on growing 'frontier' communities was the potential for changing parish boundaries associated with the growth and migration of populations, the result of which may be temporary increases or declines in the frequency of vital events. Further, problems of transportation and communication would have affected the ability to accurately record events.

The survival to the present of more than 150 years of Anglican Church of Canada parish records for the *Moose Factory First Nation* gives us the opportunity to explore the changing patterns of mortality in this central subarctic Cree community. While the general outline of the epidemiologic transition is known for the Subarctic, there are few locations where the full, detailed sequence of changes in mortality from the 19th- to the 20th- century has been observed in a single Aboriginal community (e.g. Ewart, 1983). Studies to date have focused on other issues, such as specific epidemics (Herring, 1994a,b), seasonal patterns in the incidence of disease (Herring and Hoppa, 1997; Ray, 1976), infant mortality (Moffat, 1992), the movement of epidemics through the region (Sattenspiel and Herring, 1998; Decker and Freeman, 1993; Hackett, 1991; Decker, 1988, 1989; Ray, 1976), or more general patterns of mortality (Waldram, Herring and Young, 1994; Hurlich, 1983).

Materials and Methods

The Community

Moose Factory was established in 1673 as one of three Hudson's Bay Company (HBC) fur trade posts built on the south-western shore of James Bay (Figure 1). In 1686 the James Bay posts were captured by the French as the struggle between the British and French fur-trade companies grew. Seven years later, Fort Albany to the north was recaptured by the British, but the other two posts were burned to the ground (Rich, 1960). In 1713, territory around Moose Factory was regained by the British, but it was not until 1730 that the post was rebuilt at the request of the Moose River Cree who wanted to trade closer to their hunting grounds rather than make the journey north to Albany (Stephenson, 1991). Once re-built, the company town at Moose Factory quickly became a trade centre for the Hudson's Bay Company, and after 1821 Moose Factory served as the HBC's headquarters for present day northern Ontario (Ray, 1996; Rich, 1960). By this time, a strong trade relationship existed between HBC factors who operated the post and the seasonally mobile Cree who lived on the western shores of James Bay and along the Moose River. Although Cree had settled in and around the post at Moose Factory by the 19th century, the diversity of the land and its resources prevented the development of permanent villages around the post and necessitated that the people move into the boreal forest interior in winter to support themselves on its animal resources (Rogers and Rogers, 1959).

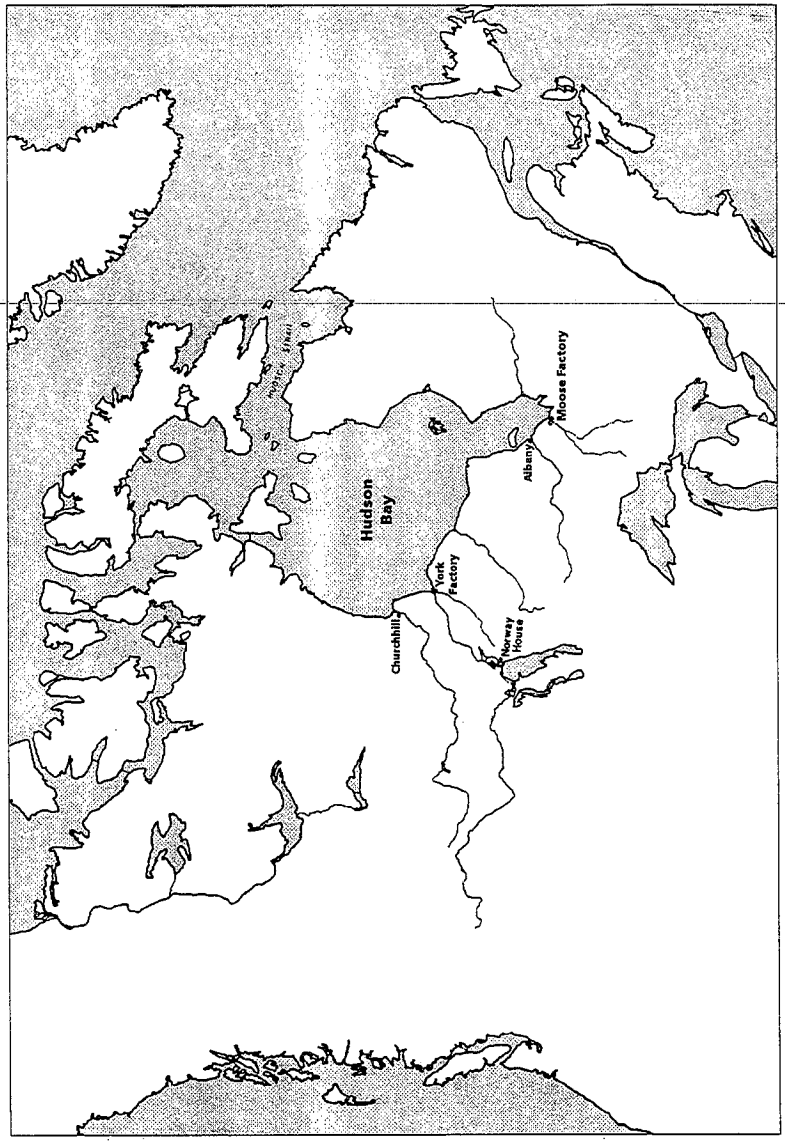
The Parish Records

This study is based on Anglican Church of Canada Parish burial records that were transcribed from microfilm (ACCA 1811-1964), verified, then analysed statistically using SPSS 7.5. The parish of Moose Factory became part of the Anglican Diocese of Moosonnee when formed in 1872. The parish records, which are available on microfilm, were transcribed from printed hardcopies to a database for analysis. Verification of the transcription was made after a period of several weeks had elapsed from the time of the original data entry task.

Problems associated with using parish records as a source of historical demography are particularly relevant to the current study. Assessment of historical records can be made through a number of tests (e.g. Wrigley and Schofield, 1981; Herlihy, 1977; Drake, 1974; Eversley, 1966; Gutman, 1956).

> The extensiveness of information on individuals, however, is only one determinant of the value of parish records for historical demographers. Information they contain, no matter

Figure 1. Moose Factory, Canada



> how extensive, may be relatively valueless for the study of historical communities if it is not accurate, or if it refers only to small or unrepresentative segments of the parish population...(Willigan and Lynch 1982: 61).

The question that must be addressed then, is how reliable are the parish burial records as a source for understanding patterns of mortality within a 19th century Canadian Aboriginal community? This necessarily includes an overall evaluation of the quality of the parish burial record based on the observed levels of precision and consistency in recording of the events themselves, as well as the details of those events. In general, parish records used to develop an aggregate model from individual records should be of better quality than those used in aggregate studies to compare separate series of vital events over time (Willigan and Lynch 1982: 58). However, the problem of record quality is further compounded for studies, like the present one, which are examining *missionary* records for the indigenous population living at Moose Factory in the late 19th century.

Evaluating the Parish Records

The Moose Factory data represent a rich source of information regarding Canadian Aboriginal mortality. However, because they are derived from a missionary parish in a northern colonial fur-trade context, it presents a number of unique challenges for understanding what can be said from it. Methods such as those proposed by Drake (1974) for evaluating Anglican parish records are not entirely appropriate for Moose Factory or other similar collections of vital events. A number of factors contribute to the uniqueness of such documentary sources. First, Moose Factory would have encompassed only a few hundred individuals. As a result, the suggested minimum figure of 100 recorded events per year and other standard numerical guidelines for evaluating parish records are inappropriate, although Eversley's (1966) minimum figure of 15-20 annual events is appropriate. Next, 19th century Moose Factory represents a fur-trade outpost and missionary church. Since more traditional approaches to evaluating these data cannot be used exclusively, two primary issues were explored for the records: precision and consistency of recorded events. The burial records were examined for: consistency in recording exact ages at death, disproportionate recording of deaths of either sex, number of recorders, potential for under-recording deaths that occurred at a distance from the community, and for consistency in the quality of the records over time.

For the late 19th century, the Moose Factory data does afford the opportunity for some cross comparison between two sets of recorded vital events: 1) Anglican missionary records (1811-1894) and 2) those recorded in the St. Thomas' Anglican Church parish registers (1851-1906, 1914-1964). Comparison of entries duplicated in both sets of records imply some level of independence in

the recording of events and there are only a small number of records that occur in only one or the other sources. The style of recording was also distinct in the two sources — the missionary records maintained a free-style diary method of recording events while the church parish records entered details in a columnar, format with pre-defined headings. The two sets of records were compared manually, cross-referencing events listed in both sets of records and verifying the consistency of recorded variables, such as age at death and date of death or burial, between the two sources. Sekar-Deming (c.f. Crimmins 1980; Sekar and Deming 1949) indices were calculated to estimate the percentage completeness in the two sources. The results presented in Table 1 also test for common bias by calculating estimates separately by sex, deaths of infants and persons over 65 years of age and comparing group estimates to those obtained for the total sample (Emery and McQuillan 1988). The results suggest no substantial bias in completeness although the missionary records do appear consistently more complete than the parish registers. However, without truly independent comparative data with which to evaluate the records, accuracy per se cannot be examined. Nevertheless, one may be able to make some inferences about representativeness through an examination of the levels of *precision* and *consistency* with which the records are kept. As such, the relative accuracy of the parish records is assessed somewhat circumstantially.

Table 1
Sekar-Deming Estimates of Completeness for Moose Factory Burials, Ontario, Canada: 1851-1894

Population Category	Estimated Number of Deaths	Missionary Records (% complete)	Church Parish Records (% complete)
I. Total	441	98.0	83.9
II. Sex			
Male	220	97.2	82.2
Female	208	98.9	85.9
III. Age			
Infants(<1 year)	57	95.8	83.6
Aged (65 +)	50	97.9	93.9

Assessing Mortality

Survivorship and hazards curves were estimated from the Moose Factory burial data using the Kaplan-Meier (1958) product-limit method and compared by various factors. This method estimates the probability of an event occurring during a time interval, given its observation of occurrence previous to that interval. The purpose of survival analysis is to examine the relationship between various factors and the survival time of individuals as defined by the occurrence of some event of interest (e.g. death, marriage, divorce, first birth etc). Initial applications of this technique were developed for examining age-specific probabilities of death (hence the term survivorship), however, its use is widely applicable to questions of time-related change in many areas of study.

Basically, survivorship is the proportion of the population surviving to a given age. To calculate cumulative survivorship for age x one multiplies the probability of surviving to age x by the probability of surviving age x (Norusis 1993). It is intended for use with interval times of small duration, although can be used for intervals of longer duration provided that the proportion dying in any one interval is less than 10 percent (Kahn and Sempos 1989: 188). In order to examine *all* individual cases of death, age intervals can be made arbitrarily small with only those persons having the exact same age-at-death in each interval. From this data, a product-limit or Kaplan-Meier method for estimating survivorship can be used (Kahn and Sempos 1989). While this method can be used for samples of any size, it is particularly useful when the sample size is too small to be grouped into age intervals (Kahn and Sempos 1989). There are several assumptions that are made in order to calculate survival functions including identifiable starting and ending points (here birth and death), censorship can not be related to the outcome, and there is no secular trend (Norman and Streiner 1994). With regards to censored data, the present analysis examines only mortality data, therefore there are no censored subjects (people who have not yet encountered the event of death at the end of the study period). In order to minimize violations of the last assumption, the data are partitioned into three periods of study for which survivorship functions are then compared.

Survival analysis provides a robust statistical technique for not only describing the relative risk of death for individuals in mortality samples, but for examining differences between subgroups within a sample (Whittington 1991). Three test statistics (Mantel-Cox log-rank, Breslow, and Tarone-Ware) are available for comparing survivorship functions between groups or strata. This is of particular use for quickly assessing differences in observed risks of death between the sexes, and economically, culturally or temporally distinct groups. Further, survival analysis can be used reliably on samples that are unlikely to represent a stable population "since measurable sources of heterogeneity in a non-random sample are likely to characterize a random sample as well" (Whittington 1991: 172).

Tests of significance between groups is most commonly made using the Mantel-Cox log-rank test, which is a modification of the Mantel Haenzel chi-squared test (Norman and Streiner,1994). This is a nonparametric test, but it is more powerful than a z-test because it makes use of more of the data (Norman and Streiner, 1994). Like the chi-squared test, the log-rank test compares the observed number of events (here deaths) with the expected number of events, assuming no group differences. The log-rank test weights all ages equally, while the Breslow or generalized Wilcoxon test weights age by the number of cases at risk in the sample. Finally the Tarone-Ware test weights ages by the square root of the number of cases at risk (Norusis, 1993). Thus the Breslow test weights younger deaths more than older deaths because the number at risk decreases with age (Norusis, 1993), making it more sensitive to early childhood mortality differences.

Results

Quality of the Burial Records

Of the 1459 total burial records for the period 1811 to 1964, some 1345 (92.2%) have an age at death recorded for the individual. The distribution of sex by decade in the burials records shows no significant differences in the recording of male versus female deaths (χ^2= 15.696, df = 14, p = 0.332) although this cannot be taken strictly to mean there was not consistent under-registration of one group over the other. Recorded ages were partitioned into two categories: 1) rounded: stated to the year or 2) precise: having months and days included in the age. Over the whole data set, there are no differences in the precision of age notations by sex (χ^2= 0.294, df = 1, p = 0.588) or season (χ^2= 1.184, df = 3, p = 0.757). There is, however, evidence of 'heaping' in the recording of ages[1], serving to reinforce the problems associated with recording accurate age among the Cree.

Of further concern for the quality of the records is whether the Cree population is being accurately enumerated given the seasonal nature of mobility associated with subsistence and economic pursuits. Several of the entries in the parish records are for individuals who died 'at a distance' or 'in the bush' and are therefore assumed to represent a record of death after the fact. While it might be expected that more winter deaths would be missing, the inclusion in the records of deaths occurring in the bush demonstrates a concerted effort on the part of recorders to enumerate deaths occurring away from the post on trap lines during winter.

As recommended by Drake (1974) gaps between successive entries in the burial records were examined. Up until 1851 there were only sporadic entries in the mission records every few months to several years apart. For instance, while the

1459 burials records available span the period 1811 to 1964, only ten are recorded before 1851. It is not until the establishment of St. Thomas' Anglican parish in the early 1850's at Moose Factory, that regular recording of vital events occurs. Mean time elapsed between successive records is greater in the winter, with an average of 33 days between recorded deaths, versus 24 days in the fall. A one-way analysis of variance demonstrated seasonal differences in the time elapsed between successive records with the mean number of days the least in fall as compared to the other seasons ($F = 2.669$, $df = 3$, $p = 0.046$).

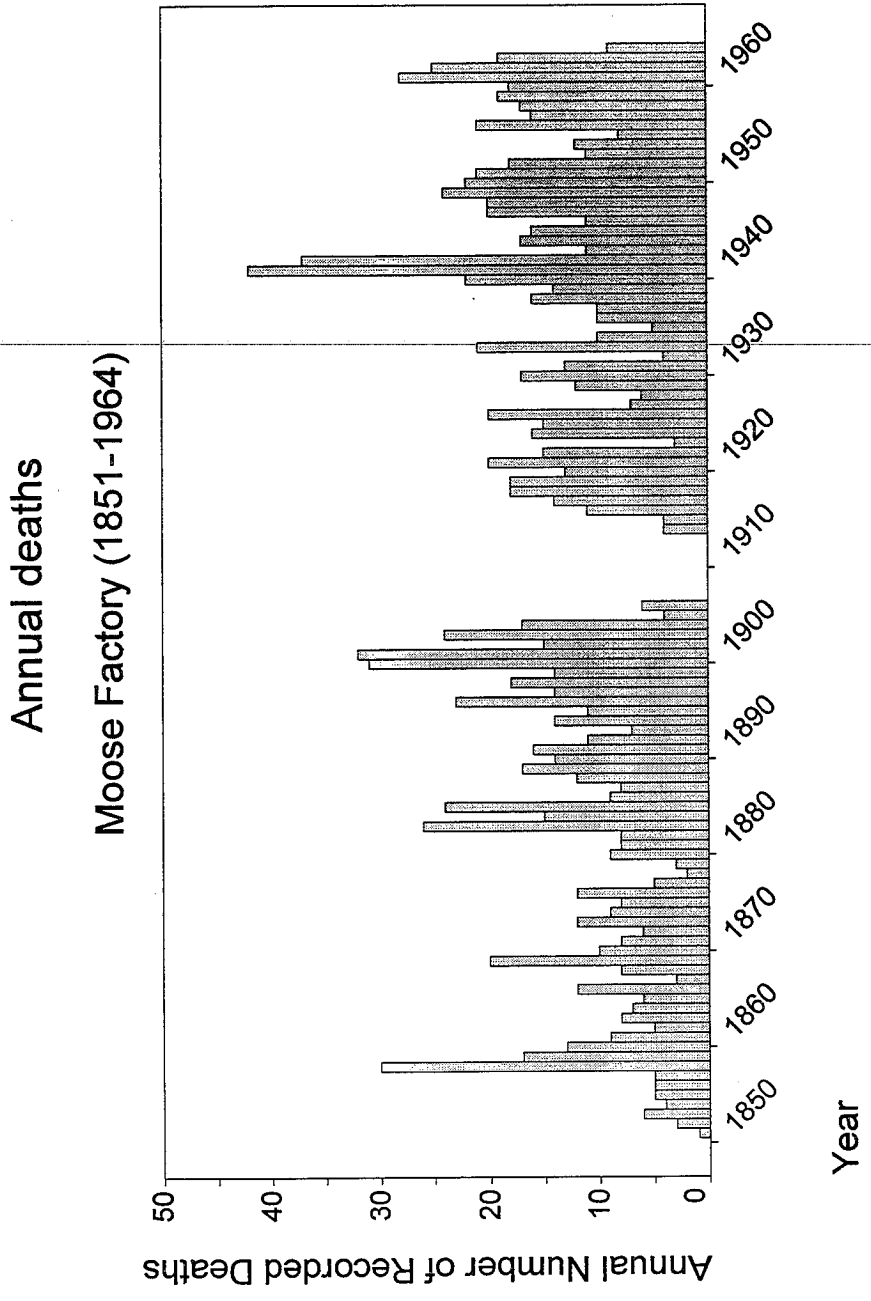
The results of this evaluation were gratifying with no serious or systematic biases being detected in the 1459 burials contained in the Moose Factory parish registers between 1811 and 1964. However, because of the sporadic nature of the early missionary accounts (pre-1851), these records are not included in the analysis as they do not include all annual deaths.

Mortality at Moose Factory

This study examines changes in survivorship from the Moose Factory burial data. Figure 2 presents the annual number of deaths recorded in the parish records for Moose Factory. Analysis of the burial records has shown that mortality was unevenly distributed throughout the year. While there is no direct correlation between climate and frequency of deaths at Moose Factory, mortality is affected by seasonal resource shifts, population movements and size during the annual cycle. In the late 19th century, a statistically significant pattern of mortality seasonality, showing a peak in summer deaths and a weaker secondary peak in winter, has been identified (Herring and Hoppa, 1997). The summer peak in mortality appears to reflect a higher frequency of infectious disease outbreaks because of increased population density and the introduction of pathogens through long-distance freighting of goods to the coast in summer. The secondary winter peak primarily reflects a significant excess of tuberculosis-related deaths clustered in the winter months relative to all other causes (Herring and Hoppa, 1998). By the early 20th century, however, the seasonal patterning of death disappears (Herring and Hoppa, 1997).

In light of the shift over time in the seasonal patterning of mortality, the Moose Factory burial data are partitioned into three periods: 1851-1906, 1914-45 and 1946-64 to broadly reflect the late 19th century, early 20th century, and the post-WWII periods, respectively. Period 1 (1851-1906) represents the beginning of reliably recorded Anglican Church parish records associated with the establishment of St. Thomas' parish in 1851, and ends in 1906[2]. This period is marked by a strong missionary presence and a viable fur trade economy in the area. Period 2 begins in 1914 and continues through to 1945, encompassing the implementation of the federal government's system of reserves for Aboriginal people. The final decline and disappearance of the fur-based economy

Figure 2


Annual deaths
Moose Factory (1851-1964)
Annual Number of Recorded Deaths
0
10
20
30
40
50
1850
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
Year

also occurred during this period. Lastly, Period 3 (1946-1964) represents deaths during the post-WWII interval, a period of increasing government intervention, including the extension of social assistance programs, and more intensive health care delivery and the building of the hospital in 1949.

The results of the survivorship analysis revealed no significant differences in the age-specific hazards of death by sex, season, or cohort. As can be seen in Figure 3, women do consistently have greater survivorship than men, but the differences are not significant until very old age (i.e. 80+), where there is a relative propensity of old-aged females. Cross-tabulation of deaths by sex and period similarly revealed no significant differences in the proportion of deaths for either sex.

Survivorship does, however, change significantly when analyzed by period (Figure 4). The lowest cumulative survivorship values were observed in period 2 (1914-45) and were significantly lower than in both the 19th and last half of the 20th centuries (log rank = 12.44, df = 2, p = 0.002). This seems to be reflective of the cumulative economic impact on health of the dissolution of a viable fur trade. Changes in the frequency of deaths over the three periods could not be evaluated because of the differing duration of each period and poorly documented census information. It is observed however, that the mean annual frequency of deaths increases from Period 1 (11.6 per annum) to Period 3 (17.8 per annum), although not significantly so, and is likely reflective of a growing population base at Moose Factory and nearby Moosonnee. Population growth since the signing of Treaty 9 in 1905 is estimated at about 5.5 percent per year (Stephenson 1991), although ethnohistoric estimates of population size demonstrate the most rapid growth in mid 20th century (Figure 5).

Discussion

While burials are generally expected to be the least useful of the three sets of vital records (Williган and Lynch, 1982), the records for Moose Factory suggest the opposite. To determine whether the quality of the Moose Factory burial information was sufficiently good to warrant analysis, the burial records were examined for consistency in recording precise ages at death, disproportionate recording of deaths by sex, under-recording deaths that occurred at a distance and consistency in the quality over time. The results of this evaluation revealed no serious or systematic biases in the 1449 burials contained in the Moose Factory parish registers from 1851 to 1964. Evidence of age heaping to the nearest five-year interval does however, suggest that recorded ages may often have been estimated.

Figure 3

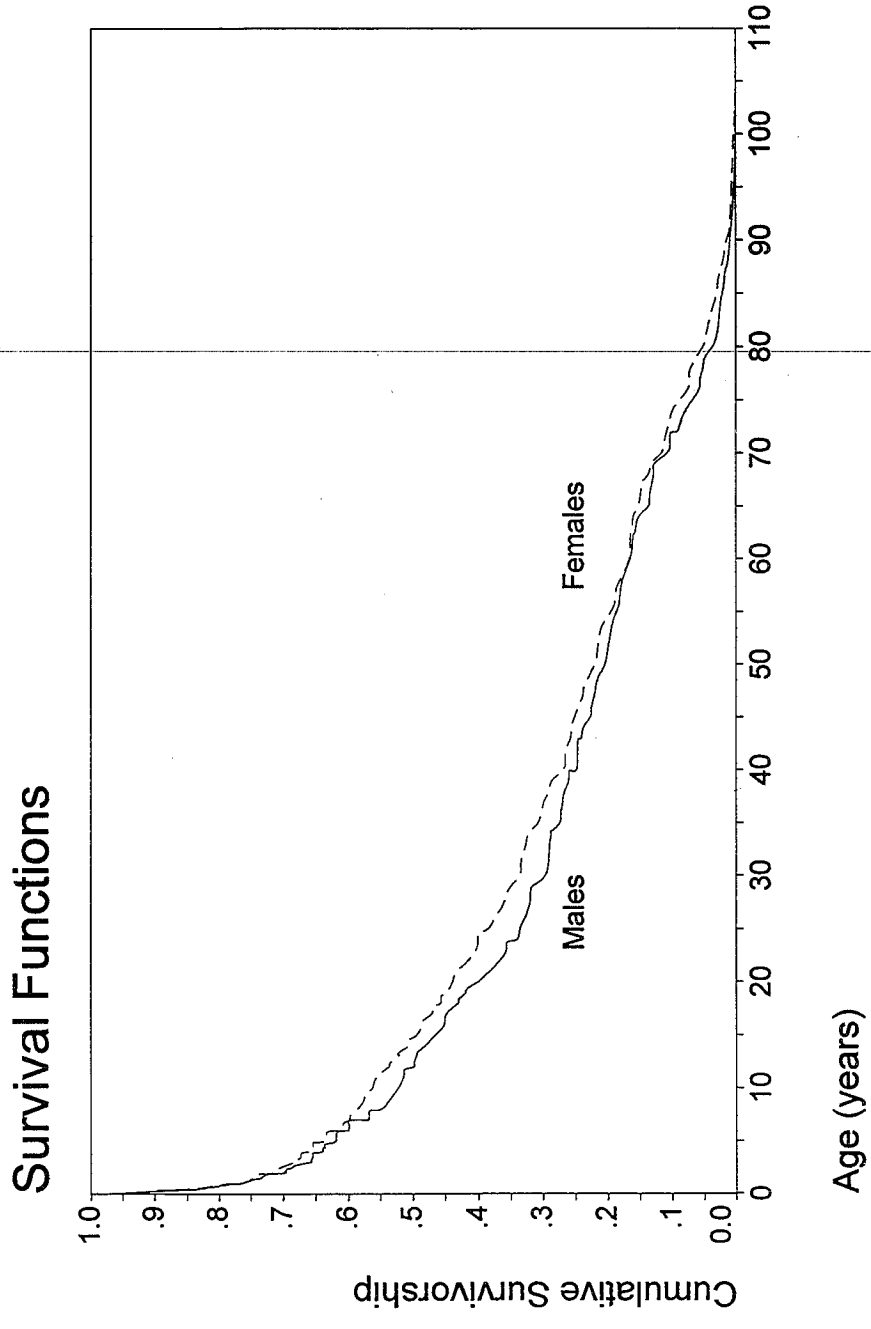

Survival Functions
Cumulative Survivorship
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
0.0
0
10
20
30
40
50
60
70
80
90
100
110
Age (years)
Females
Males

Figure 4

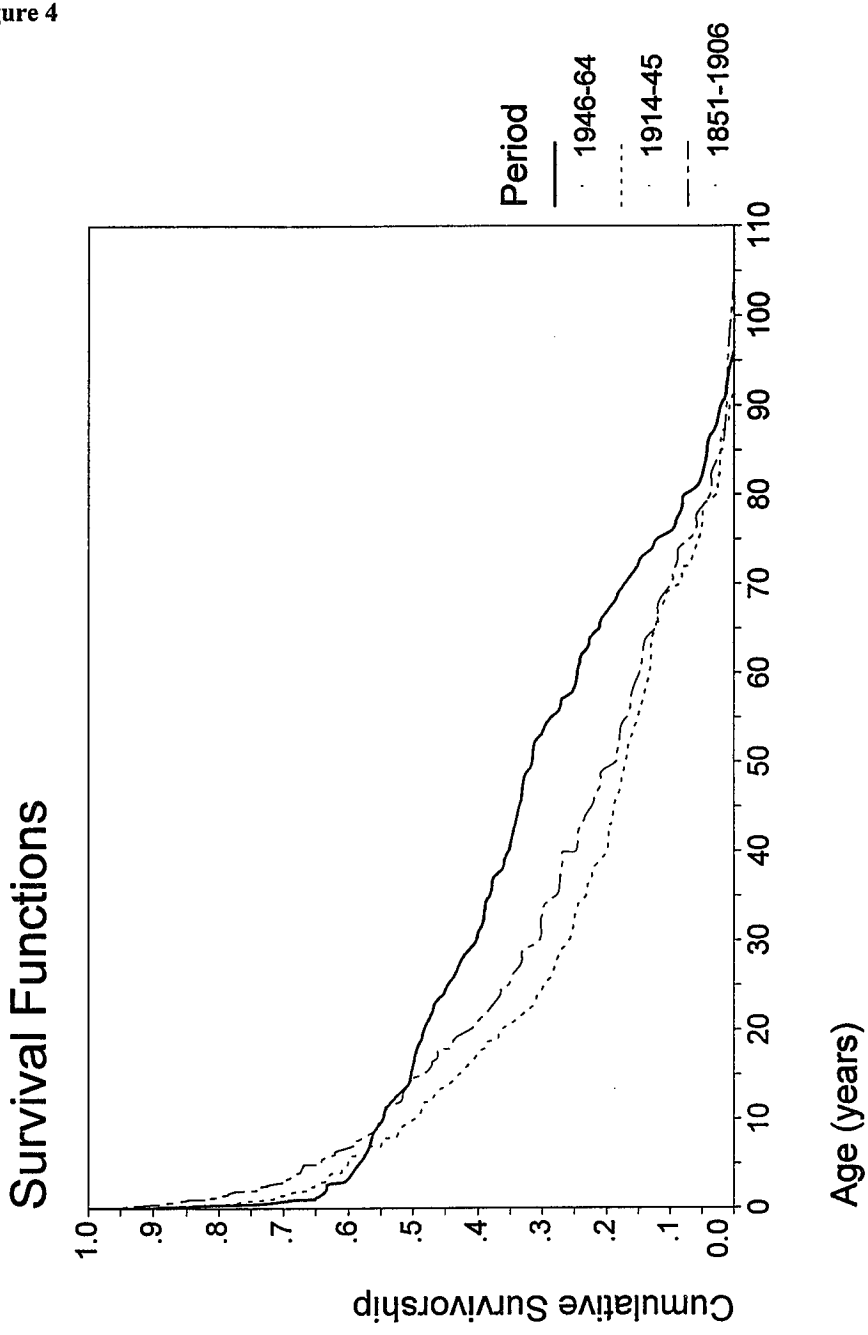
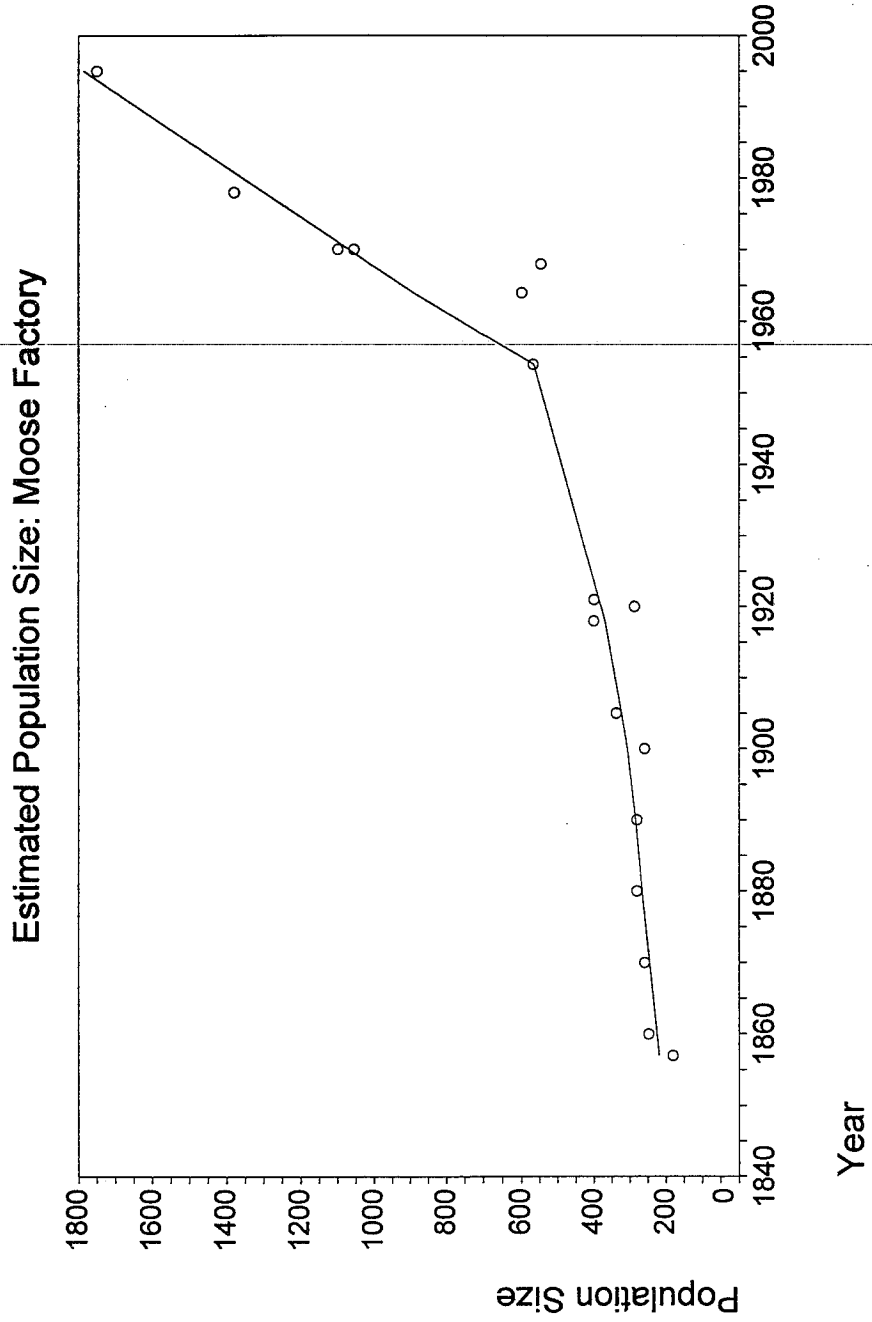

Survival Functions
Cumulative Survivorship
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
0.0
0
10
20
30
40
50
60
70
80
90
100
110
Age (years)
Period
1946-64
1914-45
1851-1906

Figure 5


Estimated Population Size: Moose Factory
Population Size
0
200
400
600
800
1000
1200
1400
1600
1800
Year
1840
1860
1880
1900
1920
1940
1960
1980
2000

For many populations it is expected that female life expectancy will be greater than male life expectancy. While this pattern remains true for the Moose Factory population, the lack of significant differences between male and female survivorship is of interest. The general expectation is of higher female survivorship in industrialized populations and lower female survivorship in populations with low life expectancy. Madrigal (1992) has already demonstrated that such generalizations do not consistently apply, when she observed no differential mortality by sex in her historical examination of a 19th century rural community from Costa Rica. While there are obvious sex-specific risks of mortality, such as maternal mortality for females or the often cited preponderance of violent/accidental deaths among males from drowning and related hunting accidents, the incidence of these among the Moose Factory population clearly seem to have a minimal influence on overall sex differences. This may be explained, in part, by cultural factors among northern Aboriginal populations that promoted equally important roles for men and women with respect to procuring food and resources for survival. As early as the 1930's, ethnographic work with the James Bay Cree noted the egalitarian nature of Cree society (Flannery, 1935). This notion has been further support from others who have observed that male-female activities are viewed by the Cree as complimentary (Honigmann, 1949). Women usually learned domestic tasks such as cooking, drawing water, chopping wood and skinning animals from the mother and other older women. Their mothers also taught them to preserve meat, catch fish and techniques for snaring animals (Blythe, et al. 1985).

However, in addition women often learned hunting and trapping from their fathers as the ability to carry out such subsistence tasks was necessary for women who might be left for considerable time at a winter camp without a man, and was essential in case of widowhood (Blythe, et al., 1985). "Boys did not often learn sewing or beadwork but women needed the survival skills, even those tasks usually done by men" (Blythe, et al., 1985: 49). However, it is not sufficient to simply examine survivorship, as similar age-specific risks of death can be associated with relatively different numbers of deaths of males and females. Cross-tabulation of deaths by sex and period (Table 2) however, also revealed no significant differences in the proportion of deaths for either sex. Further, while a pattern of slightly greater frequency of female deaths in Periods 1 and 2 is replaced by an increase in male deaths during Period 3, the changes are not significant (χ^2 =4.648, df=2, p=0.098).

While there is an apparent lack of differential survivorship by sex, overall differences in survivorship are noted between each of the three periods. Of particular interest is the observation of reduced survivorship during the early to mid 20th century (Period 2). That the results were significantly lower than the later 20th century is not surprising. It is surprising however, that they appear significantly lower than the late 19th century which is assumed to be a time with poorer living conditions and medical services. Medical treatments were provided

Table 2
Cross Tabulation of Deaths at Moose Factory Showing Sex by Period, Ontario, Canada: 1851-1964

Period		Males	Females	Both Sexes
1851-1906	Count	315	317	632
	Std. Residual	-.5	.5	
1914-1945	Count	223	229	452
	Std. Residual	-.5	.6	
1946-1964	Count	171	131	302
	Std. Residual	1.3	-1.4	
Total	Count	709	677	1386

to Aboriginal communities by the HBC posts who employed physicians and provided supplies until the late 19th century. During the 19th century however, uncertainty over who was responsible for providing medical treatment ensued between the company and the federal government. As a result, medical treatment for many northern communities suffered during the first half of the 20th century until the end of WWII when government medical care finally began to prevail (Waldram, et al., 1995).

As the fur trade dwindled during the 20th century and the economic bases of many Aboriginal communities became increasingly precarious, poor nutrition and high infectious disease loads were common, especially among children in the 1930s and 1940s. There is a period of substantial mortality in the early 1940's associated with malnourishment and starvation. In the parish burial records these are observed as epidemic-like peaks in mortality in both 1941 and 1942 (c.f. Figure 2), and as such it is important to ensure that the reduced survivorship observed in Period 2 in not simply the product of these two years. Removing these years and re-analyzing the data, a slight increase in Period 2 survivorship is observed, although it remains significantly lower than the post WWII period. This suggests that while those two years do impact on the data, the period nevertheless, is characterized by a mortality pattern that is, at least, no different than the 19th century.

Analysis of the burial records suggests that important changes in health were occurring at Moose Factory during this period. The 19th century represents a period of transition for the Moose Factory Cree and it is the changing socio-economic environment during this period that is most prominent in understanding these changing patterns of mortality. The dwindling fur-trade and increased reliance on European commodities are clearly associated with a shift from seasonal hunting and trapping to a more sedentary lifestyle. The mid-19th century saw the depletion of land food resources as a result of over-trapping, forcing northern populations such as the Moose Factory Cree to modify their subsistence strategies (Rogers 1994). Increased reliance on fish and small game necessitated a reduction in mobility to remain near favourable fishing or hare-trapping locales (Rogers 1994; Taylor 1994). Toward the end of the fur-trade era with declining prices for fur and over-exploited game resources, occasional starvation was a real threat (Steegmann et al., 1983). Steegmann and colleagues (1983) have suggested that prior to the availability of food through the trading post, a series of adaptive strategies existed to maintain small population sizes, lightly encumbered by the young children and the infirm. However, with food available from HBC sources, many of these strategies, including both food management and population control measures were modified. The years following WWI were particularly trying with food resources scarce. "Overtrapping had depleted fur resources, and the small settlements contained no income-producing alternatives to trapping" (Honigmann, 1981: 218). The loss of employment opportunities within the fur-trade industry may be been less detrimental on Aboriginal populations had there been viable alternatives available, but after the turn of the century these too began to disappear (Ray, 1996: 290). Ray in fact notes that by the mid 20th century, many northern Aboriginal groups were likely *more* dependent on hunting and trapping for subsistence than they had been in the two centuries prior.

Conclusions

Although a pattern of declining health from the 19th to 20th centuries is frequently cited for Aboriginal peoples of the subarctic, there are only a few studies that have empirically examined the historical development of this pattern. There can be no question that changing socio-political and economic conditions associated with the decline of the fur-trade had dramatic effects on northern Aboriginal peoples like those who lived at Moose Factory. From the analysis of parish burial data for a single community, the current study builds on an established literature regarding Aboriginal health in the Canadian Subarctic (Young, 1979, 1988; Waldram et al., 1995).

This analysis has revealed several important features of the pattern of mortality in the Cree community at Moose Factory. First, the age-specific hazards of mortality appears to have been relatively homogeneous within the population. In particular, men and woman showed patterns of mortality risk that were not

substantially different. This may be reflective of the equal importance of both men and women in the procurement of food and shelter, particularly during the winter seasons. Next, the early 20th century appears as a period of reduced survivorship for the Moose Factory population. This observation reinforces the notion of poor conditions of health among northern populations after the turn of the century even when improvements in medical treatments and services are occurring in the south. Finally, this study demonstrates the potential that historical demographic data has for contributing to questions regarding Aboriginal health in the central Canadian subarctic. To this end, parish records represent an untapped wealth of information. This study, however, represents only a fragment of the total picture. In order to understand the issues and relationships regarding mortality, morbidity and social change, further analyses of the surrounding communities are required. In doing so, questions regarding disease and mortality experience within and between communities can be more thoroughly addressed.

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Endnotes:

1. Values close to 100 suggest no bias toward recording of ages to the nearest five-year interval. Whipple's index (Shryock and Siegel 1973) calculated for the parish burial records was 204 and 210 for males and females respectively. These values are quite large, suggesting substantial rounding of ages to the nearest five-year interval within the records.

2. Records for the period 1907-1913 were lost in a Church fire.

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