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# Inuit Population Dynamics: A Demographic Analysis of North Greenland

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***Abstract***

The purpose of the study was to analyse population dynamics among the Inuit in Thule, North Greenland, over the period 1850-1972. A published genealogical register was used to establish a computerised integrated person register. Analysis of fertility and survival trends was conducted on a non-parametric basis in order to estimate individual intensities of transition from life to death and family formation through parity-conditioned fertility. A multivariate analysis of the birth interval structure was also carried out. Mortality risks were differentiated according to sex, age, and birth cohort. A considerable decrease in adult mortality can be ascertained since the beginning of this century. Moreover the estimated functions of intensity indicate a substantial loss of observations for short lifetimes, probably caused by the retrospective observational scheme applied in the data collection process. The results also suggest male preference in the reporting of short lifetimes. The analysis of fertility failed to uncover substantial differences concerning birth intervals when controlling for birth cohort of the mother and child's parity. Thus it is unlikely that conscious family planning was being practised, as was known to have been the case among married women in West Greenland since the late 1950s.

***Résumé***

La présente étude se proposait d'analyser la dynamique des populations Inuit de Thule (Nord du Groenland) de 1850 à 1972. Un registre généalogique publié a servi à établir un registre intégré informatisé. Une analyse non paramétrique des tendances de fécondité et de survie a permis d'estimer les intensités individuelles de transition de la vie à la mort et la formation familiale d'après la fécondité par parité. Une analyse multidimensionnelle de la structure des intervalles génésiques a également été effectuée. Les risques de mortalité ont été différenciés selon le sexe, l'âge et la cohorte de naissance. Une réduction considérable des risques de mortalité adulte est survenue depuis le début du siècle. De plus, les fonctions estimées d'intensité indiquent un déclin notable des cas de brèves durées de vie – probablement attribuable au mode d'observation rétrospective ayant servi à recueillir les données. Les résultats suggèrent également une prédominance masculine dans les rapports de courtes durées de vie. L'analyse de la fécondité tenant compte de la cohorte de naissance de la mère et de la parité n'a pas permis de découvrir de différences appréciables. Contrairement à la pratique parmi les femmes du Groenland de l'Ouest depuis la fin des années 1950, il semble peu probable qu'une planification familiale consciente ait été exercée.

***Keywords:*** Inuit, Greenland, fertility, mortality.

## Introduction

The Inuit population that had originally settled in the region of Thule, Avanersuup Kommunia, in North Greenland, today consists of some 800 individuals. Once termed Polar Eskimos, they prefer to call themselves Inughuit ("real people").

Despite being the northernmost resident people in the world, the Inughuit have over the years been strongly susceptible to outside influences. These influences have left a profound impact on survival rates and patterns in family formation, i.e. marriage, divorce, and fertility. In addition, the increased foreign contact has been associated with considerable migration.

The primary purpose of this project has been to establish a computerised integrated person register of the Inughuit in order to empirically study demographic dynamics in terms of fertility and mortality over the period 1850-1972. Evaluation of data quality of the applied material also formed an important part of the study.

Only a couple of hundred individuals lived in the old self-sufficient Inughuit society in Thule around 1850 (Ulloriaq 1985). One would imagine that the

Inughuit should have been quite conservative and sceptical to new material innovations. They first acquired knowledge of the kayak in the 1860s through an immigration of Inuit Canadians. The Canadians later out-migrated after six years. However during that period the Inughuit learned many useful skills from the Canadians, for example building Igloos with a special windscreen, shooting with a bow and arrow, hunting reindeer and spearing salmon. Such new knowledge and abilities undoubtedly increased the prospect of survival of the population. The Canadian visit had also genetic consequences for the Inughuit in terms of new kinship.

Any examination of the evolution of demographic processes over time among the autochthonous population is far from unproblematic. For example, in the official statistics we note that in Greenland censuses since 1955 the personnel at Thule Air Base (USA) are separated as an independent population subgroup. There is also a distinction drawn between individuals born in and outside of Greenland. However the latter division is not relevant to the study of population dynamics in Inughuit society.

Over the years frequent epidemics, especially tuberculosis, as well as physical injuries have been great causes of death among the Inughuit. Several epidemics have been recorded: 1880, 1895-96, 1901-02, 1909-10, 1920-21, 1928-29, 1932, 1945, 1948-49, and 1955. Most were caused by influenza (Gilberg 1976), except the 1948-49 epidemic of whooping cough, which also affected the rest of Greenland.

In addition to the lack of distinction of the Inughuit as an independent population group, the official statistics are characterised by high levels of aggregation: cross-sectional observations of birth cohorts at a particular point in time or over a limited period, typically a calendar year. The disadvantage of such a historically inconsistent method of enumeration is that considerable heterogeneity is introduced at the observational level. This causes serious problems when it comes to distinguishing factors that may have affected individuals and (homogenous) sub-populations regarding survival and other conditions of life.

In order to fulfil our original purpose of studying the Inuit population of Thule, we were thus forced to seek other sources of information. A published genealogical register of the Inughuit population by Gilberg et al. (1978) provided an excellent opportunity to achieve our goal. The primary data sources in Gilberg's Thule register are not totally independent, due to the shared basic foundation (i.e. census lists and parish registers). However, also included is a detailed list of supplementary individual information collected from more peripheral sources, such as reports from expeditions and interviews from local doctors and stationed ethnographers. We can thus assume that the Thule register represents the most adequate population delineation for the given observation period in the region of Thule, and the best basis for establishing a computerised integrated person register and conducting the ensuing data analysis.

## Data and Methods

The data on the Inughuit population was compiled over a long period drawing on a number of different sources: censuses of a more or less formal character, parish registers, retrospective personal interviews, etc. The material has the character of a genealogical individual and family register and was published in an encrypted form by Gilberg et al. (1978). It covers the period from 1850 through the end of 1972.

The register covers 2643 persons within 610 families and contains information on time of birth and death, on parent/child relationships and on spousal relationships. Some data on place of birth outside North Greenland is also presented, for example, the immigration of Inuit from the Canadian Arctic in the 1860's. The individual-level information is utilised in the reconstruction of biological core families, i.e. heterosexual couples and their reproduction in terms of full siblings and the relationships between families. However dates of marriage are not systematically reported in the register.

Computerised versions of the published Inughuit register were established under selected data models by Date (1986), in connection with the present study for the purpose of demographic-statistical analysis (Lund 1989, 1990).

Given the highly limited numbers of observed cases, and since the nature of the data is individual-related life events, it was elected here to use non-parametric estimations of intensity, primarily within the framework of the simple survival model.

Aspects of survival and fertility in the broader class of life event models will, within a given life course, take place in a space S with n transient (life-) states and one or more absorbing states, e.g. dead or emigrated. From a demographic statistical point of view, the main analytical focus is measuring the transitions between related life states.

Our analysis concentrated on the transition from life to death (mortality) and family formation through live birth, i.e. transition from i children per mother to i+1 children, where i=0,1,2,...,k-1 (parity conditioned fertility), in the presence of risk of death or censoring (loss of observation due to causes other than registered death).

The demographic-statistical analysis takes as point of departure a categorisation of 25-year birth cohorts. We then apply the negative logarithm to the Kaplan-Meier estimator and the Nelson-Aalen estimator in non-parametrical estimations of intensity of individual life events differentiated by sex and cumulated over age (4).

The idea of the intensities, also called risks or hazards, is following a person who is in a state of risk (for example risk of death), because of the omnipresent positive probability of going from one state to another (unless the person is in an absorbing state). Intensities are measured at a given point of time, unlike probabilities which are measured in intervals, and may be expressed as the number of events having occurred at time t in relation to the number of persons at risk at the same moment. By drawing on individual-level data we can ascertain the actual time of exposure. Intensities can be estimated using parametric, semi-parametric, or non-parametric methods, depending on the form of the theoretical intensity function within a given age interval. Non-parametric estimation is employed in this study, being free of assumptions regarding the shape of the theoretical intensity function. Analysis of the distribution of the cumulated intensity (or cumulated hazard function) against age and calendar time will unveil possible gross errors and lacuna in the reported survival and family formation among the Inughuit.

A special problem concerns the delimitation of birth intervals. In this study a serial monogamous family structure and a closing/truncation of birth interval was accepted at:

1. Birth of the next child;
2. Death of the biological father;
3. Death of the biological mother;
4. Divorce between parents;
5. Commencement of menopause for the mother; or
6. End of observation period.

In order to be able to fully exploit the available unique person register, a multivariate analysis of the birth interval structure was conducted. The analysis was based on a multiplicative model of intensity of time-independent covariates (Kalbfleisch and Prentice 1978) assuming proportionality between the involved hazards. The model can be described as:

$$\mu t, Z(i)) = \mu o(t) \exp[a(o) + \sum \beta j) Z(j,i)]$$

where

$\mu(t, Z(i))$ = intensity of transition from parity k to parity k+1

$t$ = sojourn (waiting time) in parity k

$Z(i)$ = binary covariate vector of person i

$\beta((j)$ = regression coefficient of covariate j

$\mu o(t)$ = baseline hazard, expressing time independence, which in the model is asumed equal for all individuals

*exp* = factor for population heterogeneity

Covariates for sex, birth cohort of the mother, parity and mother's age at childbirth were included. Estimations for the multiplicative model were calculated using the SAS-procedure PROC PHGLM, and non-parametrical estimations with the computer package DemoPack (Hansen 1993).

# Results

## Mortality

The estimated cumulated intensities of death for 25-year cohorts born between 1850 and 1949 initially emerge as somewhat surprising. At face value, these cohorts would appear to have experienced a systematic increase in mortality for the age group 0-11 years. Risk of death in this age interval is highest for the cohort born in the period 1925-1949. Conversely, mortality is higher in the young and middle-aged adult years for those born before 1925 compared to those born between 1925 and 1949. Figure 1 shows an example of a hazard plot for males born between 1850 and 1924.

## Infant mortality

A detailed analysis of the risk of death before the exact age one among infants born between 1850 and 1949 was carried out for boys and girls.

Firstly, all observed lifetimes for girls born between 1850 and 1899 are found to be greater than one year. Moreover among male birth cohorts, there are only three records with duration of life less than one year. This indicates serious problems of loss to follow up - even complete loss with respect to girls - regarding short lifetimes among persons born in this period. Similar problems are also found for those born between 1900 and 1924.

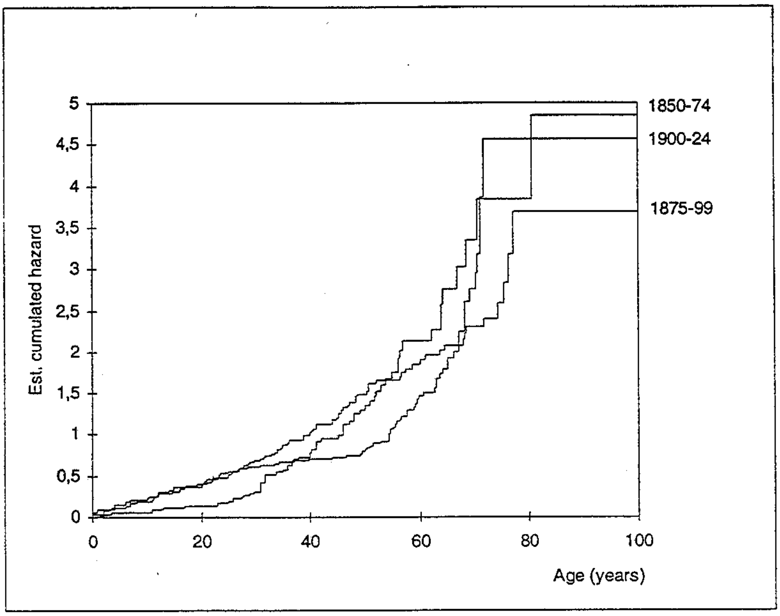
Among those born between 1925 and 1949, although the registration of short lifetimes is much improved, it still cannot be recognised as complete, for neither boys nor girls. Intensity of death during the first 2-3 months following birth appears to be strongly underrepresented for this cohort compared to boys born in 1950-59 and 1960-72.

Estimated infant mortality for girls born after 1950 is also likely strongly biased. While the infant mortality rate among boys seems to have decreased over cohorts born between 1950 and 1960-72, it apparently increased for their female counterparts. It should be pointed out that for girls born in 1950-59 there are only three registered lifetimes of less than one year, compared to sixteen for the 1925-49 cohort and eight for the 1960-72 cohort. For some unknown reason the registration of short lifetimes, at least for girls, is very poor for those born in 1950-59. Despite certain improvements in data quality for girls born in 1960-72, registration must still be considered incomplete. Consequently, there seems to have existed a pronounced male preference in terms of the registration of short lifetimes.

Moreover, assuming the estimation results to be more or less realistic, it is interesting to note that the 1925-49 birth cohort, compared with its two succeeding cohorts, demonstrates a higher estimated mortality after the age of approximately 3 months. Overall the results seem to indicate a decreasing mortality from cohorts born 1925-49 to those born after 1950.

Figure 1

**Estimated Cumulated Intensity of Death by Age for Inughuit Male Cohorts Born between 1850 and 1924, Thule, Greenland**



## Adult mortality

Based on the hypothesis that the previously ascertained loss of observations primarily concerns children and adolescents, it was natural to attempt estimation of the cumulated intensity of adult mortality within the respective birth cohorts.

Estimated mortality over the age interval 20-50 years for men and 20-68 years for women was lower for the 1830-1849 cohort compared to persons born in 1850-74 and 1875-99. There was strong accordance between the estimated cumulated intensities of death, both by sex and by cohort, for those born between 1850 and 1899 (most pronounced in the age interval 20-50 years for men and 20-66 years for women). For older age groups mortality for both sexes appeared lower for the first of the two 25-year cohorts. However this result is subject to considerable uncertainty due to the low number of observed persons at risk.

Overall the estimates of adult mortality seem much more convincing than those regarding infant mortality. An important and systematic decrease in mortality can be detected for both sexes when comparing estimated cumulated intensities of death across cohorts born in 1875-99, 1900-24 and 1925-49. The decline is especially pronounced for the two oldest cohorts. This applies for men from c. 28 years of age and for women from c. 34 years of age.

If cohorts born before 1925 are compared to those born in 1925-49, lower mortality for the latter is obvious from c. 20 years of age.

In Table 1 estimated lifetimes among Inughuit adults are shown for the age interval [20, y], where y is the truncated life expectancy at either 50 and 60 years. Life expectancies are found to be more or less the same for men and women born in the latter half of the 19th century. Men born in the period 1900-24 have higher life expectancies than women, as should be expected based on the estimated cumulated intensities of death. This differential is reduced for the cohort born in 1925-49. Males in Thule of productive age, that is the hunters, thus seem to experience similar mortality as their female contemporaries. The increase in lifetimes for both sexes, calculated from age 20 to 50 years, [20, 50] measures approximately 8 years for cohorts born between 1875 and 1949. It is obviously of great interest to compare these results to experiences of survival in other parts of Greenland. Table 2 presents lifetimes estimated on the basis of age-dependent death rates for North and South Greenland in the period 1831-1930, as published by Bertelsen (1935). We can assume that the Inughuit of Thule were unlikely to have been included in Bertelsen's data. Life expectancies seem to be higher for Thule (Table 1) than the rest of Greenland (Table 2). It appears from Table 2 that, with but one exception, expected lifetimes for the observed periods and regions are highest for women.

## Fertility

There is a great deal of variation in the number of births recorded in 1830-1874, and a slightly smaller variation in 1875-1925. From 1930 to 1969 there is a systematic increase, especially from 1945 onwards. The highest birth orders are very sparsely represented, at least until around 1930. Births at parity 5 and above are far more commonly represented among children born after 1945 than in the preceding cohorts of newborns.

Observed number of births among women born before 1915 shows relatively significant variation. Only 6 births are observed among the 6 women born in 1895-99 (1.0 child per woman) against 55 births among 25 women for 1890-94 (2.2 children per woman). Twenty-nine women born in 1905-09 gave birth to no less than 82 children (2.8 children per woman), while 12 women born in 1910-14 only gave birth to 17 children (1.4 children per woman).

**Table 1**

**Estimated expected adult lifetime *e[20,y]* among the Inughuit.**
**Male and female cohorts born after 1830, Thule, Greenland.**
y = truncated lifetime at 50 and 60 years of age.

| Year of Birth | Males | Females |
|---|---|---|
| *y = 60 years* | | |
| **1830-49** | 30.3 | 26.9 |
| **1850-74** | 22.2 | 23.6 |
| **1875-99** | 21.5 | 20.5 |
| **1900-24** | 30.5 | 27.9 |
| *y = 50 years* | | |
| **1830-49** | 26.4 | 23.0 |
| **1850-74** | 20.5 | 20.6 |
| **1875-99** | 18.8 | 18.7 |
| **1900-24** | 23.6 | 22.3 |

**Table 2**

**Estimated Expected Adult Lifetime from 20 to 50 Years of Age e/20,50/ by Selected Cohorts and by Sex, North, South and All Greenland**

| Year of Birth | North Greenland | | South Greenland | | All Greenland | |
|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females |
| *y = 50 years* | | | | | | |
| 1861-1900 | 16.9 | 21.2 | 17.2 | 16.5 | * | * |
| 1901-1930 | 17.6 | 20.2 | 16.7 | 21.8 | * | * |
| 1946-1951 | * | * | * | * | 16.7 | 19.3 |

Source: Estimated on basis of cross-sectional data for the period 1861-1930 Published by Betelsen (1935) and official statistics.
Note: The figures for North Greenland do not include the Inughuits in the region of Thule.

Comparing the above results, the variation in the number of births over successive cohorts of mothers does not seem to be readily explainable, except by the relatively great differences in the sample sizes in question. Cohorts of mothers born after around 1930 are censored at the end of the observation period in 1972. They have therefore not traversed their whole fertile age segment. When censoring is taken into account fertility does not seem to have decreased appreciably over the period studied.

In order to explore the problems of data quality, the observed mothers were analysed according to reported age at first and last childbirth respectively. For cohorts born after 1938 it is the latest observed birth of a child that is counted.

Women born before 1950 were relatively often both unexpectedly old at birth of their first child and young at birth of their last child. These tendencies would have been considered fairly reasonable in a context of rapidly decreasing fertility, i.e. postponement of childbirth combined with termination of childbearing when the desired family size has been reached. However such an explanation strongly contradicts the observed increases in the number of births in the period 1945-69.

In the early period (1830-1924) most women gave birth to their first child at age 19-23 years. In 1925-37 most first births took place at the maternal age of around 23 years. Hereafter (1938-50) there was no greater scattering and the principal occurrence was in the age interval 20-24 years. After 1950 most women were 20 years of age when they gave birth to their first child. The tendency suggests that the Inughuit women are becoming first-time mothers at a younger age.

Mean birth intervals differentiated according to mother's birth cohort and birth order of the child are presented in Table 3. It appears that the expected time interval between marriage and first childbirth (parity 0) is lower than the estimated duration between subsequent births. This may be explained in part by the fact that many brides already are pregnant when they get married. The mean intervals for higher birth orders vary between 20 and 35 months for both cohorts of mothers. Moreover these intervals seem to be uncorrelated with birth order, though the values are remarkably lower among the youngest cohort of mothers.

Figure 2 shows an example of the estimated cumulated intensity of birth for child k, where k = 2, 3, ..., 8 for birth cohorts between 1932 and 1972. The intensities seem to be negatively associated with parity. It appears from the number and height of the 'steps' in the plots that the statistical uncertainty is considerably more important among the highest birth orders. This is caused by the decreasing number of persons at risk at higher birth orders.

No convincing correlation across trends in birth interval and mother's birth cohort is noted.

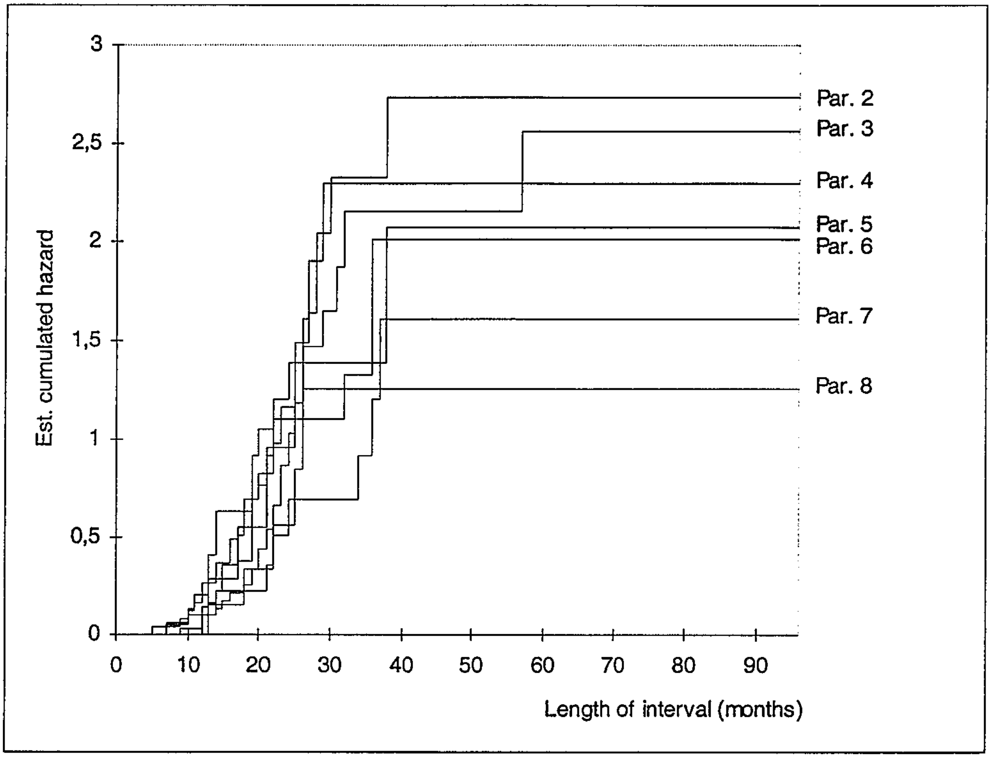
The multivariate analysis of birth intervals was based on omission of parities 0, 1 and over 8, allowing for 439 remaining observations, of which 375 were uncensored. The covariates selected for inclusion in the model were sex of the child, birth cohort of the mother (1908-31, 1932-), parity (2, 3, ..., 8), and maternal age at childbirth (under 25 years, above 25 years), which resulted in the value of -2 log L being reduced by Q = 29.89 (3970.89 - 3941.00), which is chi-square distributed with 10 degrees of freedom. The test result was strongly significant (p= 0.0009).

The initial estimates of ß(j), where j = 1, ..,10, with p-values greater than 5%, could be removed as explanatory variables since their contribution to the likelihood was small and statistically insignificant. Those to be excluded concerned the mother's birth cohort, child's sex, and parity covariates (with the possible exception of parities 4, 5 and 6). The age of the mother, on the other hand, was strongly significant.

Non-significant covariates were step-wise eliminated, starting with the least significant variable being excluded and ending with only maternal age remaining in the model. The final estimate of ß for age of mother equalled 0.49, implying that Inughuit women under 25 years of age had a birth intensity which was (exp 0.49) 1.6 times higher than that of their older counterparts.

## Figure 2

## Estimated Cumulated Intensity of Parity Conditioned Fertility (Parities 2-8) for Birth Cohorts between 1932 and 1973 among the Inughuit, Thule, Greenland



## Discussion

Despite the modest number of observed cases, the person register has previously been employed as data source for research into the Inughuit population (Gilberg 1976), mainly based on application of conventional statistics bureau methodology and calendar time observations.

The present study furthers our understanding of demographic trends among the Inughuit drawing on the same data, but now established as a computerised integrated register under a relational model. The applied non-parametric estimators, that required the availability of individual-level event data, turned out to be especially powerful in situations where the observed number of cases at risk was small.

Our advanced statistical analysis revealed that the completeness and data quality of the Thule register are more questionable than previously presumed. Regardless of method of data collection, a high frequency of incomplete registration should not come as a surprise given the known historical background of the Inughuit population living under extremely harsh physical conditions and across great geographical distances. Furthermore communication systems are often inadequate in North Greenland, compounded by the difficulties in overcoming cultural differences between the data collectors and respondents.

At first glance, the patterns of mortality appear radically different for cohorts born before 1925 compared to succeeding cohorts. Paradoxically, estimated youth and adult mortality seem to have increased. Trends were more or less the same for men and women. The ensuing question becomes whether these results should be taken at face value or if the measurement of mortality is biased due to sampling within the population register.

Explorer Robert Peary was probably the first to consider whether population growth in the old Inughuit society was in balance with food production. He appraised that this must have been the case through many generations (Gilberg 1976). Data from the register concerning the period before Peary's arrival in Thule in 1891 could be interpreted within the scope of a retrospective observational methodology. Information on individual life courses had mainly been obtained through interviews with persons having survived at least until 1891 and/or until the time of the arrival of Holm in 1927. After the development of a parish register following the building of Thule's church in 1912 and the initiation of Holm's registration process, demographic events among the Inughuit presumably were recorded immediately after they occurred, i.e. application of a prospective observational scheme. Furthermore, the historic establishment of the Thule trading station in 1909 improved the registration coverage remarkably. Recording of demographic events immediately following occurrence will normally lead to ameliorated data quality, though of course there is no guarantee of completeness.

Undoubtedly, the establishment of the trading station by Knud Rasmussen and Peter Freuchen indirectly improved survival rates through easier access to food and supplies for a great part of the population in Thule district.

The ascertained lower infant mortality for the cohort born in 1925-49 compared to those born after 1950 was especially distinct for children having survived their first critical days and weeks. Better access to medical treatment, primarily through the permanent presence of medical doctors in the Thule region from 1938, in all likelihood proved beneficial to the treatment of infectious diseases and mortality reduction, not the least among children and delivering women.

Improvements in sanitation and housing conditions as well as in public health expenditures in the 1950s and early 1960s presumably were important factors behind the documented substantial decrease in mortality among persons aged 20 years and older. An a-priori hypothesis regarding elevated infant mortality as was observed in West Greenland (Hansen 1982) could neither be accepted nor rejected due to incompleteness of registrations of short lifetimes, especially regarding the oldest birth cohorts. However it is observed that Inughuit children born between 1960 and 1972 seem to experience considerably higher mortality than children born in 1969-1977 in all of Greenland.

As regards adult mortality, the study demonstrated a decreasing trend for both sexes but with relatively lower age-specific survival risk for women. Maternal death due to delivery complications is one of the most likely explanations. It is also quite conceivable that women, sedentary in the housing and family care duties in the settlements, at times experienced malnutrition during the men's often prolonged hunting trips. The first to enjoy the killed prey were the men, who thus benefited more from the important vitamins, in contrast to the women who consequently were quite possibly susceptible to poorer general health. However at the same time, life expectancies seem to have been slightly better among the Inughuit than in the rest of both North and South Greenland. This could be attributable at least in part to the overlapping time periods across regional estimates (Tables 1 and 2) and in comparing cohorts with cross-sectional estimates. But it could perhaps also be seen as a confirmation of the explanation formulated by Bertelsen (1935) that mortality among men in South Greenland was higher due to greater incidence of accidental drowning given the more extensive kayaking in this area.

Our main conclusion regarding fertility is that, under application of relatively general rules of censoring, it does not seem likely that substantial decreases in fertility had taken place during the observation period. This concords with the lack of any drastic changes in terms of cohabitation behaviour during this period.

The applied multivariate analysis of birth interval structure assumed proportionality between the involved hazards. Given the uncertainty of the estimated cumulated intensities, this assumption could quite likely be accepted as fulfilled for the hazards in question. The results which showed women under the age of 25 years as having a birth intensity 1.6 times higher than that of older women are not particularly surprising. More interestingly, little change is noted for the intensities corresponding to birth orders 2 through 8 over the two cohorts of mothers. Noticeable shorter mean birth intervals among the youngest cohort could perhaps be interpreted as the start of a transition, as observed in West Greenland, from breastfeeding to other forms of infant nutrition.

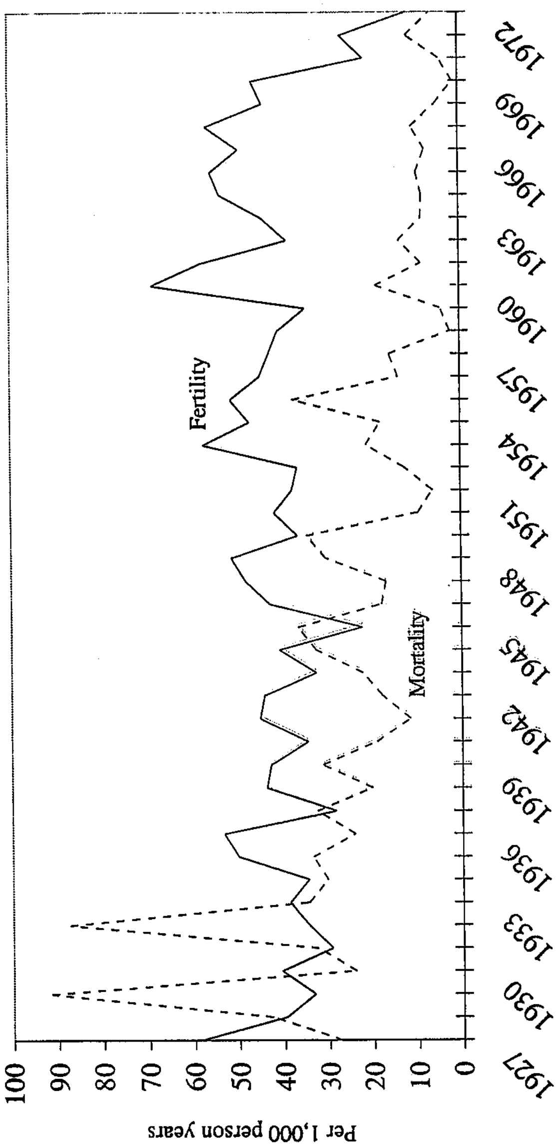
Considering the widespread experiences of birth intervals from other populations, it is most likely that the Inughuit practised natural fertility, i.e. absence of conscious family size limitation. However, considerable variation can be found across natural fertility regimes, dependent in part on the form of infant nutrition. Bertelsen (1935) assessed the average duration of breastfeeding in Greenland at approximately 2-3 years, while a 1945-65 study from North Greenland (Balslev et al 1985) showed an average of 4.5 months. Recent results from the 1993/94 Greenland Health Interview Survey suggest a long-term decreasing mean duration of breastfeeding over the period 1938-93 (Iburg 1997; Curtis et al 1997). According to Romaniuc's (1981) study of North American Indians in Canada, a reduction in birth intervals, and consequent rise in fertility rates, was caused by a massive shift from breastfeeding to bottle-feeding. Evidence of shorter periods of breastfeeding, especially among young mothers, has also been noted among the Inuit in Nunavik, Québec (Jetté 1994). Lower proportions of mothers breastfeeding, influenced by changes in lifestyle, education and type of work, could lie at the root of the cause.

Beyond problems of data quality, relatively high ages for first time mothers could be attributable to late menarche among Inuit women. This is seen in Robert-Lamblin's (1987) study of East Greenland. Decreasing marital fertility, which according to official statistics was experienced among married women in West Greenland during the last half of the 1950s (Hansen 1979), could not be ascertained among the Inughuit due to very incomplete information about formal marital status in the applied person register. However, it can be noted that fertility aggregated over marital status has not been subject to any considerable decrease during the observation period, until the year 1972. It is around this time that family planning practises, particularly the use of intra-uterine device (IUD), are known to have become widespread among the Inughuit.

Crude death and birth rates are the components of natural population growth. With caution they could be used as crude indicators for fertility and mortality. It appears from Figure 3 that the demographic transition for the Inughuit population reflects that experienced in West Greenland (Hansen 1979) and in East Greenland (Robert-Lamblin 1987). Mortality has fluctuated dramatically but eventually declined over time from a very high level. The number of births remained relatively high until the end of the 1960s. In this context it seems fair to conclude that until then the fertility regime among the Inughuit would have been natural.

**Figure 3**

**Crude Birth and Death Rates among the Inughuit by Calendar Year for Thule, Greenland: 1927-1972**




Source: Calculations made on basis of Gilberg (1976).

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