SKELETAL EVIDENCE OF HEALTH AND DISEASE IN PRE- AND POST-CONTACT
ALASKAN ESKIMOS AND ALEUTS

By

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ABSTRACT

A palaeopathological analysis of skeletal samples representing pre- and post-contact Alaskan Eskimos and Aleuts was conducted in order to 1) assess the pre-contact health of these groups; 2) investigate possible differences between the Eskimos and Aleuts in patterns of health and disease; 3) examine temporal changes in health; and 4) assess the biological effects of European contact on these populations.

The results obtained in the present study reveal that the Alaskan Eskimos and Aleuts suffered from a variety of health problems prior to contact, including iron deficiency anemia, fractures, non-specific infections, dental pathology, and congenital malformations. The data also suggest that the Eskimos and Aleuts had different patterns of health and disease prior to contact. Most notably, the Aleuts has significantly more cranial and overall trauma, and infracranial and overall infection than the Eskimos, while the Eskimos had significantly more enamel hypoplasia of the canines and lateral incisors than the Aleuts. Differences between these groups in their environment, warfare practices, housing, and subsistence pursuits may underlie this variability.

The skeletal data provide some evidence of declining health following contact, at least among the Aleuts. The introduction of new pathogens, particularly treponemal infection, likely contributed to the significantly higher frequencies of cranial infection and cribra orbitalia in the post-contact Aleut sample compared to the pre-contact sample. The post-contact Eskimo sample showed little evidence of declining health over time; however, historical accounts of epidemics and population decline clearly attest to the deleterious effects of contact on this population.

The present study illustrates the value of palaeopathology in providing insight into the health of the Alaskan Eskimos and Aleuts both prior to, and following contact. The

valuable contributions of other sources of information, such as ethnohistory and epidemiology, are also recognized.

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CHAPTER 1

INTRODUCTION

In 1960, Stewart (1973) advanced the hypothesis that the harsh arctic environment of Beringia acted as a "cold filter", screening out diseases from the earliest migrants to the New World. In his words, the arctic environment was "unfavorable to the spread and perpetuation of disease germs", and people moving into North America "passed through a germ filter, leaving behind whatever disease germs there were in the Old World" (Stewart 1973: 19-20). Black (1975) echoed Stewart's hypothesis, commenting that "the filtering effect of the Bering and Panamanian land bridges may have protected the people we studied from a number of diseases, including tuberculosis and malaria" (F. Black 1975: 518).

One of the implications of Stewart's hypothesis is that native American populations enjoyed a virtually disease-free existence prior to contact with Europeans. As Fortuine (1986/87: 39) notes, however, "such an antiseptic life is a myth." Utilizing data from palaeopathology, historical narratives, native traditional medicine, and modern medical research, Fortuine (1989) has recently demonstrated that the Alaskan Eskimos and Aleuts were by no means disease-free in prehistoric times. Rather, they suffered from a variety of health problems, some of them related to their unique environment and cultural practices, and others common to human populations everywhere (Fortuine 1986/87: 51). This finding is consistent with skeletal studies of native populations from elsewhere in the New World, which indicate a substantial pathogen load prior to contact (Aufderheide 1992: 166; Ubelaker and Verano 1992: 279).

As Fortuine (1989: 4) points out, there have been relatively few studies of health and disease in pre-contact native Alaskan skeletal samples. In his opinion, this is

unfortunate since "only by more clearly understanding the status of Native health prior to the arrival of whites can we fully appreciate the changes that followed" (Fortuine 1986/87: 52). Previous studies, for example, have indicated that pathogens introduced by Europeans may have had a more detrimental impact on groups whose health was already compromised (Milner 1992: 112).

Analyses of well-documented and dated skeletal samples from various regions within North and South America have revealed that native Americans experienced a significant decline in health following contact (Verano and Ubelaker 1992). Unfortunately, systematic studies of arctic skeletal remains with the purpose of assessing temporal changes in the health of arctic populations, particularly as they relate to European contact, are conspicuously absent. One exception is Meer's (1985) analysis of two early contact period skeletal samples from Chirikof Island in southern Alaska, which revealed little evidence of physiological stress despite contact with Russians.

Previous studies of skeletal samples from North and South America have also demonstrated considerable variability in disease patterns within and between different geographic regions in response to differing cultural factors (Ubelaker and Verano 1992: 280). Again, however, comparable studies of arctic populations are lacking despite the existence of skeletal collections which provide an excellent opportunity to investigate differences in disease patterns between distinctly different groups.

The present study was undertaken in an attempt to fill in these gaps in our knowledge of health and disease in arctic populations. Skeletal samples representing pre- and post-contact Eskimo populations from Point Hope and Point Barrow on the northern Alaskan coast, and Aleut populations from Umnak, Shiprock, and Kagamil Islands in the eastern Aleutians were selected for analysis. Collected between 1918 and 1938 by W. B. Van Valin (Mason 1930), Henry Collins (1929), James Ford (1959),

and Ales Hrdlicka (1941b, 1943, 1945), these samples are currently housed in the National Museum of Natural History, Smithsonian Institute.

The goals of the analysis were as follows: 1) to assess the pre-contact health of the Alaskan Eskimos and Aleuts, as indicated by their skeletal remains, in order to establish their "base-line health" (Fortuine 1986/87: 39) to which post-contact health could be compared; 2) to compare the skeletal evidence for Eskimo and Aleut health prior to contact in order to determine if any differences exist that might be related to the different environments, subsistence patterns and cultural practices of these groups; 3) to examine temporal changes in the health of these populations; and 4) to assess the effects of European contact on the health of the Alaskan Eskimos and Aleuts, as reflected in their skeletal remains.

CHAPTER 2

PALAEOPATHOLOGY OF ALASKAN ESKIMOS AND ALEUTS

Compared to other regions of North America, there have been relatively few palaeopathological studies of arctic populations to date. Those that have been conducted have focused on small samples of mummies from the Aleutian Islands (Zimmerman et al. 1971; Zimmerman et al. 1981), frozen cadavers from Point Barrow (Zimmerman and Aufderheide 1984) and St. Lawrence Island (Zimmerman and Smith 1975), and skeletal remains from various regions of Alaska, the majority of these specimens dating to the pre-contact period. Because of the paucity of palaeopathological data and the problem of making broad inferences from such limited data (Fortuine 1989: 4), much of what is known about the health of the Alaskan natives prior to, and after European contact has been derived from other sources of information, notably historical accounts, traditional healing practices, and inferences from modern scientific knowledge (Fortuine 1990: 5). This chapter will review what is currently known about the health of the Alaskan Eskimos and Aleuts before and after European contact based on the palaeopathological evidence. Specific topics to be covered include metabolic diseases, trauma, infectious and parasitic diseases, chronic and degenerative conditions, skeletal malformations, and dental pathology. This data will later be compared with the results obtained in the present study and with information derived from other sources in order to obtain a more complete picture of health and disease in Alaskan natives before and after contact.

Palaeopathological studies have yielded little evidence of either general malnutrition or specific vitamin or mineral deficiencies among Alaskan native populations. Multiple Harris lines[1], markers of nutritional or disease stress, have been noted in the pre-contact remains of four individuals from Utqiagvik, Point Barrow, and have been interpreted as indicating an annual period of malnutrition, most likely occurring in late winter when food shortages are reported to have been most severe (Lobdell 1984). Similarly, the occurrence of multiple Harris lines in a small series of pre-contact Eskimo skeletal remains from Kachemak Bay in southern Alaska have been interpreted as reflecting seasonal nutritional stress (Lobdell 1980: 83).

A number of studies have indicated that Eskimos show an earlier and more rapid rate of age-related bone loss than U. S. Whites (Mazess and Mather 1974; Harper et al. 1984). This observation has been attributed to genetic differences (Thompson and Gunness-Hey 1981: 7), and to the high protein diet of the Eskimos, a diet known to cause metabolic acidosis, a condition resulting in bone loss and increased calcium excretion (Mazess and Mather 1974; Richman et al. 1979; Harper et al. 1984). Differences in bone mineral content have also been noted between Eskimos and Aleuts (Laughlin et al. 1979), and between Yupik and Inupiaq-speaking Eskimos (Thompson and Gunness-Hey 1981), suggesting that factors other than diet, such as length of daylight and activity patterns (Thompson and Gunness-Hey 1981: 6; Martin et al. 1985: 379), may account for these differences (Laughlin et al. 1979: 584). With respect to temporal changes in bone remodeling, comparisons of pre-contact Eskimos from Kodiak Island and post-contact Eskimos from St. Lawrence Island have revealed no significant differences between the two groups (Thompson and Gunness-Hey 1981: 6).

According to Ortner (1984: 81), evidence of scurvy, reflecting a dietary deficiency of vitamin C, is absent in the Alaskan Eskimo skeletal collections from the

[1] For those readers not familiar with the medical terminology used in this chapter, see the glossary provided in Appendix A.

National Museum of Natural History with one exception, the cranium of an 8 year-old child (USNM #342,512) dating from the contact period. Originating from Metlatavik on the northwestern coast of the Seward Peninsula, the cranium of this individual exhibited sieve-like lesions of the orbital roof, as well as porous lesions of the maxilla and mandible. The infracranial skeleton was absent. Given the adequate vitamin C content of foods traditionally consumed by Alaskan Eskimos, the presence of probable scurvy in this individual is interpreted as possibly reflecting a reliance on a non-traditional, vitamin C-deficient diet following European contact (Ortner 1984: 81).

No evidence of rickets, a bone disease caused by a deficiency of vitamin D, has been recorded in any Alaskan skeletal remains with the possible exception of a left ulna recovered from a pre-contact site in Kachemak Bay. The shaft exhibited an abnormal curvature suggestive of the disease, however the absence of the rest of the skeleton prevented a conclusive diagnosis (Lobdell 1980: 65).

Evidence of iron deficiency anemia, indicated by the presence of cribra orbitalia and porotic hyperostosis in the cranium, is more abundant, however reported frequencies of these lesions vary considerably. An analysis of 90 Alaskan Eskimo crania, 50 from Point Hope and 40 from Point Barrow (temporal position unknown), revealed that 20% had cribra orbitalia (Nathan and Haas 1966). In contrast, only three cases of the condition were observed in a series of skeletal remains from Kodiak Island, two of them subadults (total sample size unknown) (Hrdlicka 1944a: 369), while a frequency of 6.1% (porotic hyperostosis and cribra orbitalia combined) was derived from an analysis of 792 Eskimo crania, most of them Alaskan (El-Najjar 1976). Scott et al. (1984: 70) note that porotic hyperostosis is not uncommon in pre-contact and early contact period Alaskan Eskimo skulls, while Stewart (1979a: 271) suspects that the condition may, in fact, be rare in Eskimo and Aleut populations, the discrepancy in reported frequencies reflecting, in part, methodological differences (1979a: 265).

The rugged terrain and cold climate of their environment posed a number of health hazards to the Alaskan Eskimos and Aleuts. While drowning was likely the most common fatal accident, especially among the Aleuts and Koniag Eskimos, who spent a great deal of time on the water (Fortuine 1989: 45), skeletal evidence attests to the frequent occurrence, in the past, of other types of injuries among these groups. Some of these injuries were accidentally sustained during subsistence pursuits or the performance of other day-to-day activities, while others were intentionally inflicted during skirmishes between groups, for example between the Koniag Eskimos and Aleuts (Laughlin 1980: 54), as a result of altercations within groups, as occurred among the northern Eskimos (Burch 1974) and among the Aleuts (Levashov, cited in Masterson and Brower 1948: 59), or as punishment of slaves and prisoners of war, a practice recorded for the Aleuts (Veniaminov 1984: 243). Self-inflicted injuries have also been documented among Alaskan natives (Fortuine 1989: 48).

Of the four types of trauma that can be detected in skeletal remains, fractures, dislocations, disruptions in nerve and/or blood supply, and artificial deformation (Ortner and Putschar 1985: 55), fractures have been most frequently reported in the palaeopathological literature from Alaska. A healed Colles' fracture was recorded in the distal left radius of an adult female Eskimo from the lower Yukon River region of Alaska (Ortner and Putschar 1985: 74). This type of injury would have resulted from a fall in which the arm was extended to break the impact (Ortner and Putschar 1985: 58). Other fractured elements that have been documented in Alaskan skeletal collections to date include an isolated left humerus of uncertain archaeological age from St. Lawrence Island, in the process of healing at the time of the individual's death (Ortner and Putschar 1985: 80), an isolated left radius from Jones Point, Kodiak Island (Ortner and Putschar 1985: 82), and the left femur of a young adult male of uncertain archaeological age from Golovin Bay (Ortner and Putschar 1985: 82). In the latter two

cases, failure of the broken ends to unite had resulted in the formation of a pseudarthrosis, or false joint, and reduced mobility of the limb.

Four additional fractures have been reported in contact period remains from St. Lawrence Island. These include a healed fracture of a right rib, two possible healed fractures in a left rib, a healed fracture and pseudarthrosis of a left ulna, and a healed oblique fracture of a left tibia (Tyson and Alcauskas 1980: 172, 200, 288). Few fractures were found in the pre-contact Eskimo skeletal remains recovered from Kachemak Bay (Lobdell 1980: 65). One ulna exhibited multiple fractures representing either parry fractures or an injury sustained as the result of a fall, while most of the remaining fractures in the sample were found in phalanges.

Perimortem fractures have been documented in the frozen bodies of two adult females from Utqiagvik, both of whom showed multiple rib fractures sustained when the roof of their dwelling collapsed due to a sudden, inland movement of sea ice (Zimmerman and Aufderheide 1984). Finally, multiple perimortem fractures in at least one skeleton from Kodiak Island have been attributed to possible bear attacks (Hrdlicka 1941a: 2).

One other type of fracture, spondylolysis, has been the focus of a number of studies of Alaskan skeletal remains. Characterized by a separation of the neural arch from the vertebral body, the condition has received much attention since the 1930s, when Stewart (1931) reported high frequencies in Alaskan Eskimos. In a sample of 187 skeletons originating north of the Yukon River, the frequency of spondylolysis was 37.4% in females and 40.6% in males (Stewart 1931: 56). In contrast, 161 Eskimos south of the Yukon River showed frequencies of 10.7% in females and 16.3% in males (Stewart 1931: 56). Other studies have reported frequencies of 21% for the Ipiutak Eskimos and 45% for the Tigara Eskimos (Lester and Shapiro 1968), 42.3% for the Inupik Eskimos of Alaska (Saunders 1978: 455, 459), 25.7% (Gunness-Hey 1982: 106) and 29.1% for the Koniag Eskimos (Saunders 1978: 455, 459), 23% (Yesner

1981, cited in Merbs 1989: 165) and 21.7% for the Aleuts (Saunders 1978: 455, 459), 21.6% for the southern mainland Alaskan Eskimos (Saunders 1978: 455, 459), and 20% for the St. Lawrence Island Eskimos (Saunders 1978: 455, 459). The defects have been found to occur more often in males than females, and to increase with age (Stewart 1953).

Spondylolysis has been found to show a familial pattern, with certain families having a much higher frequency than the general population. This finding suggests that there is a genetic predisposition to develop the condition (Wiltse 1957). Although its etiology is still not completely understood, sustained stress or acute trauma are believed to be the most likely causes of spondylolysis (Merbs 1989: 167). Among Eskimo and Aleut populations, one source of chronic stress hypothesized to cause separation of the neural arch is posture, specifically the habit of standing or sitting with the legs fully extended and the back and hip joints hyperflexed (Stewart 1953: 949). Alternatively, acute trauma associated with carrying, dragging or lifting heavy objects may have led to the development of the condition in these groups (Merbs 1983: 153).

In addition to fractures, Alaskan natives also experienced dislocations in the past. Two shoulder dislocations, one from Norton Bay and one from Kodiak Island, and a hip dislocation, also from Kodiak Island, have been described by Ortner and Putschar (1985: 88-89). All three specimens are adult males of uncertain archaeological age.

Although well adapted to their environment, the Eskimos and Aleuts are known to have suffered from frostbite and hypothermia on occasion (Fortuine 1989: 50). While death from hypothermia cannot be detected in skeletal remains, severe cases of frostbite resulting in the partial or complete loss of limbs may be evident in bone. At least two cases of frostbite have been reported in the palaeopathological literature (Zimmerman and Kelley 1982: 7); however, neither case is from Alaska. Lobdell (1980: 27) has reported evidence of amputation in two proximal phalanges from Kachemak Bay. In both

cases, the distal ends had been amputated and the shafts had healed.

Although few in number, studies of human remains from Alaska have yielded important information on the types of infectious and parasitic diseases that afflicted the Alaskan natives prior to contact. It is difficult to interpret the evidence of respiratory disease in the early contact period for two reasons. First of all, early written accounts often provide only a description of symptoms, not a diagnosis. Secondly, since respiratory diseases were likely the first diseases to be introduced to the Alaskan natives by Europeans, it is difficult to determine which infections were present prior to contact (Fortuine 1989: 68). Given these problems, the palaeopathological evidence of respiratory infections is particularly noteworthy.

Evidence of pneumonia has been detected in three Alaskan mummies, all of them dating to the pre-contact period. The first case, the mummy of a middle-aged Aleut male, exhibited evidence of lobar pneumonia, with septicemia and multiple visceral abscesses (Zimmerman et al. 1971: 99). A second Aleutian mummy and a frozen body from Utqiagvik, both middle-aged females, showed pleural adhesions also suggestive of the disease (Zimmerman et al. 1981: 640, Zimmerman and Aufderheide 1984: 62).

Healed granulomas identified in the lungs of the frozen cadaver of an elderly female from St. Lawrence Island (Zimmerman and Smith 1975) and in a female from Utqiagvik (Zimmerman and Aufderheide 1984) have been diagnosed as histoplasmosis, an infection of the respiratory tract caused by the fungus *Histoplasma capsulatum*. While the disease is most common in the Mississippi and Ohio valleys (Ortner and Putschar 1985: 225), cases have been documented elsewhere, including Alaska, where the incidence among modern natives is approximately 1% (Comstock 1959, Sexton et al. 1949, cited in Zimmerman and Aufderheide 1984: 62).

Although the granulomas described above are similar to those associated with pulmonary tuberculosis (Fortuine 1989: 255), the diagnosis of histoplasmosis in these

particular cases was based on the fact that no conclusive evidence of pre-contact tuberculosis has yet been found in the Arctic, although a number of cases have been noted elsewhere in the western hemisphere (Buikstra 1981). Ortner and Putschar (1985: 174) describe skeletal remains from the Yukon River in Alaska that exhibit bone changes indicative of the disease; however, the archaeological age of the specimen is uncertain. Hrdlicka (1931: 132) reported two cases from contact period sites on the Kuskokwim River and stated that the disease was brought by Russians. De Laguna (1956: 86) found a case of spinal tuberculosis in a contact period Chugach burial and agreed with Hrdlicka (1931) that the disease was introduced by Europeans. A number of possible cases of tuberculosis have also been documented in contact period skeletal remains from St. Lawrence Island (Tyson and Alcauskas 1980: 116, 164, 168, 172, 294, 300, 312), while one contact period skeleton from Kodiak Island exhibited multiple tuberculous lesions (Hrdlicka 1941a: 2). Schaefer (1959: 250) is of the opinion that the disease became a problem for the Canadian Inuit only after contact with whalemen, traders, and trappers. The early written accounts provide no clues as to whether or not the disease was present at the time of contact, but as Fortuine (1971: 114) states, anyone who was able to witness Eskimos with chronic respiratory disease "was also there long enough to have been a source of infection himself."

Most of the fungal infections that affect bone, including coccidioidomycosis and blastomycosis, tend to have a more southerly geographic distribution (Lobdell 1980: 74; Ortner and Putschar 1985: 224-225). While there have been no published cases from Alaska of bone lesions attributed to fungal infections, several possible cases have been noted in Koniag Eskimo skeletal remains from Kodiak Island (Smithsonian Institution Paleopathology Course 1985, List of Skeletal Specimens at the National Museum of Natural History).

Evidence of treponemal infection has not been found in any pre-contact human

remains from Alaska, nor are venereal diseases mentioned in any of the early written accounts. Stewart (1979a: 258) remarked that none of the syphilitic remains that have been found to date in the Arctic are ancient, while Oswalt (1979: 288) stated that "whalers almost certainly introduced syphilis" into Eskimo populations. At least four possible cases of the disease have been reported in Aleut skeletal remains, all of which are believed to date to the Russian period (Hrdlicka 1945: 371, 531; Steinbock 1976: 133; Laughlin 1980: 101). Two cases from Kagamil Island, an adult female (#377,819) and an adult male (#377,860), exhibited cranial lesions characteristic of the disease (Hrdlicka 1945: 531; Steinbock 1976: 133). A third case, an adolescent Aleut from Kodiak Island (#374,759), showed apposition of bone on the anterior margins of the tibiae and the presence of destructive lesions in the left tibia suggestive of late congenital syphilis (Steinbock 1976: 103). Finally, the post-contact skeleton (#378,606) of an adult female excavated from the Umnak Island burial mound showed signs of the disease (Hrdlicka 1945: 371).

Bone changes indicative of possible treponemal infection have also been noted in a number of Alaskan Eskimo remains. Skeletal changes in an isolated cranium of a young adult female from Mud Bay on the Alaska Peninsula have been interpreted as syphilitic, however the archaeological age of this specimen is uncertain (Ortner and Putschar 1985: 214). Four crania from Kodiak Island, representing either recent intrusive burials or burials from the early Russian period, exhibited evidence of possible treponemal infection, while none of the pre-contact remains exhibited any signs of the disease (Hrdlicka 1944a: 369). Additional cases of possible syphilis have been reported in contact period skeletal remains from St. Lawrence Island (Steinbock 1976: 130; Tyson and Alcauskas 1980: 92, 168, 188, 292, 294, 300), including one case of possible congenital syphilis. Finally, 17 syphilitic specimens from 11 localities within Alaska and Siberia have been described by Holcomb (1940), including some of those mentioned above.

Signs of ear infections, specifically mastoiditis and otitis media, have been found in both mummies and skeletal remains from Alaska. The mummy of a middle-aged Aleut female exhibited bilateral chronic mastoiditis and otitis media of the right ear (Zimmerman et al. 1981: 640). Lobdell (1980: 65) recorded two possible cases of mastoiditis in skeletal remains from Kachemak Bay. Finally, 15 cases of cholesteatoma, a soft-tissue tumor of the external auditory canal, have been documented in Eskimo and Aleuts skulls, a condition that may be related to the cold climatic conditions under which these groups live (Stewart 1979a: 268).

Examination of Alaskan Eskimo and Aleut skeletal remains has yielded little evidence of non-specific infections to date. Two cases of possible osteomyelitis have been described in the literature. The first one is a young adult male from Shishmaref who exhibited destructive lesions involving the lumbar vertebrae and sacrum (Ortner and Putschar 1985: 125, 128). The second case is a late adolescent female from St. Lawrence Island who had destructive lesions of the left tibia and fibulae attributed to either osteomyelitis or tuberculosis (Tyson and Alcauskas 1980: 294, 300 312). Both specimens date to the contact period.

Parasitic diseases are known to have afflicted Alaskan natives prior to European contact although they were likely not a significant health problem, occurring sporadically and only infrequently causing serious disability or death (Fortuine 1989: 60). Examination of the feces of the frozen cadaver from St. Lawrence Island revealed the ova of the fish trematode *Cryptocotyle lingua* (Zimmerman and Smith 1975: 833), while an autopsy performed on the body of a female from Utqiagvik uncovered the presence of cystic structures in the diaphragm suggestive of trichinosis, a disease contracted by eating uncooked polar bear meat containing the parasite *Trichinella spiralis* (Zimmerman and Aufderheide 1984: 62). Three cyst-like structures believed

to represent the mineralized outer shells of hydatid cysts of the tapeworm *Echinococcus* have been found in association with the pre-contact skeleton of an adult female from Jones Point, Kodiak Island (Ortner and Putschar 1985: 232). Commonly occurring in wolves and dogs due to their consumption of raw caribou or moose, the usual hosts of the larvae, *Echinococcus granulosus* is transferred to humans via the accidental ingestion of its eggs from articles contaminated with dog feces (Fortuine 1989: 61). Although the larvae can infect the liver and lungs in humans, they usually do not pose a serious health threat (Fortuine 1989: 61). Finally, the ova of *Pediculus humanus capitis*, or head lice, have been retrieved from the scalp of an Aleut mummy (Zimmerman et al. 1981: 640).

A number of different chronic and degenerative diseases are known to have affected the Alaskan Eskimos and Aleuts prior to European contact. Autopsies performed on the five bodies previously mentioned have revealed several chronic pulmonary conditions. The middle-aged Aleut male exhibited signs of emphysema and bronchiectasis (Zimmerman et al. 1971: 100), a "chronic dilatation of one or more bronchi" (Dorland 1982: 110). Similarly, the frozen body of the middle-aged female from Utqiagvik had bronchiectasis (Zimmerman and Aufderheide 1984: 61). Fibrosis, a condition characterized by chronic inflammation and the formation of fibrous tissue in the lungs (Dorland 1982: 273), was noted in the frozen female cadaver from St. Lawrence Island (Zimmerman and Smith 1975: 830), in the Aleut female mummy (Zimmerman et al. 1981: 639), and in one of the frozen female cadavers from Utqiagvik (Zimmerman and Aufderheide 1984: 61). Finally, anthracosis, a blackening of the lungs, was observed in all five bodies. In arctic populations, this condition has been attributed to the inhalation of smoke from seal oil lamps used for heating and lighting (Zimmerman and Aufderheide 1984: 61).

Several other chronic conditions were revealed through autopsy examination of the

well-preserved bodies. All five individuals had atherosclerosis, a thickening of the arterial walls due to the deposition of fibrofatty plaques (Buja 1987: 286). Commonly considered to be a disease of western civilization, this condition has been linked to high cholesterol intake, hypertension, diabetes mellitus, and cigarette smoking in modern populations (Buja 1987: 287). The fact that it has been observed in pre-contact Eskimos and Aleuts suggests a considerable antiquity for the disease. The middle-aged Aleut female (Zimmerman et al. 1981) and the middle-aged Eskimo female from Utqiagvik had concretions in the kidneys characteristic of the recovery phase of acute tubular necrosis, reflecting acute kidney failure that may have resulted from the more serious illnesses that affected these individuals (Zimmerman and Aufderheide 1984: 62). In addition, the heart of the middle-aged female from Utqiagvik exhibited an area of calcification in the mitral valves, suggestive of bacterial endocarditis (Zimmerman and Aufderheide 1984: 62), a chronic infection of the heart valves (Fortuine 1989: 84).

Analyses of Alaskan Eskimo and Aleut skeletal remains have also revealed evidence of chronic and degenerative diseases, most notably cancer and arthritis. Previously believed to have affected Eskimos only after European contact (Stefansson 1960), cancer has now been diagnosed in the pre-contact remains of three Alaskan Eskimos. One individual, a late middle-aged female from Kachemak Bay, exhibited multiple lesions diagnosed as malignant hemangioendothelioma, a rare form of cancer (Lobdell 1981). The cranium of an adult male from St. Lawrence Island (#280,091), and the cranium, ribs, clavicle, and thoracic vertebrae of an adult female from Hooper Bay, Alaska (#339,122) had lesions suggestive of metastatic carcinoma (Steinbock 1976: 389, 393). A fourth specimen, an adult male cranium from St. Lawrence Island, also showed evidence of probable metastatic carcinoma, however the archaeological age of this specimen is unknown (Lagier et al. 1982).

Osteoarthritis, or degenerative joint disease, has frequently been observed in

Eskimo and Aleut skeletal remains. An analysis of osteoarthritis in the knee, hip, shoulder, and elbow joints of 798 skeletons representing four different populations, modern American Whites and Blacks, Pueblo Indians, and Alaskan Eskimos, revealed that the Eskimo sample showed the most frequent and severe involvement and the earliest age of onset for all four joints examined (Jurmain 1977). This observation has been attributed primarily to the greater amount of functional stress experienced by this population (Jurmain 1977), although other possible contributing factors have been suggested, including the cold, damp climate of the region and a genetic susceptibility (Fortuine 1989: 79).

Hrdlicka (1941a: 2) remarked that osteoarthritis was common in the joints of elderly individuals from Kodiak Island and in the vertebral column of older individuals from the Kuskokwim Valley (1931: 132). Similarly, pre-contact Eskimos from Prince William Sound frequently exhibited degenerative changes (De Laguna 1956: 86). More recently, osteoarthritis has been reported in Eskimo remains from Kachemak Bay (Lobdell 1980: 63-65) and from the Aleutian Islands, where the condition was found to be present in the skeletons of most individuals over 40 years of age, occurring most frequently in the vertebral column and in the elbow (Laughlin 1980: 11). An examination of 144 adult Koniag Eskimo skeletons revealed that 73.6% had vertebral osteoarthritis, while 78.4% had osteophytosis (Gunness-Hey 1982). Both conditions occurred more frequently in males than in females and both were associated with aging. Seven cases of osteoarthritis from Alaska have been described and illustrated by Ortner and Putschar (1985: 423-433).

In addition to degenerative arthritis, one probable case of rheumatoid arthritis and two probable cases of ankylosing spondylitis have been reported in the literature. The first specimen is the infracranial skeleton of an adult male Eskimo of unknown archaeological age from Golovin Bay (Ortner and Putschar 1985: 407-411), while the latter two specimens are adult males from Kuskokwim River (Ortner and Putschar 1985: 413-415) and St. Lawrence Island (Tyson and Alcauskas 1980: 130). A fourth specimen from Kodiak Island, an adult female estimated to have been 30 to 35 years of age at the time of death, displayed lesions of the appendicular skeleton suggestive of polyarticular inflammatory arthritis, specifically juvenile rheumatoid arthritis (Ortner and Utermohle 1981).

Reports in the palaeopathological literature of skeletal malformations from Alaska are few in number. Scoliosis has been noted in the frozen cadaver from St. Lawrence Island (Zimmerman and Smith 1975), spina bifida has been observed in 6.4% of Alaskan Eskimos (Stewart 1932: 131) and 14.3% of Koniag Eskimos (Gunness-Hey 1982: 106), craniosynostosis has been documented in a subadult cranium (sagittal suture) from Utqiagvik (Scott et al. 1984: 70) and in an adult female cranium (coronal suture) from Wales (Ortner and Putschar 1985: 354), and hydrocephaly has been found in a young adult female Eskimo from Prince William Sound (De Laguna 1956: 83). More recently, a congenital malformation of the left foot of a young adult female from Point Hope has been reported (Keenleyside and Mann 1991). Characterized by ectrodactyly of the phalanges, synostosis of the second to fifth metatarsals, and hypoplasia of the calcaneus, the condition has been interpreted as the result of a defect in the embryonic sensory nerves, causing an inappropriate organization of mesenchyme during the fifth week after conception (Keenleyside and Mann 1991: 20).

Some information on the dental health of Alaskan natives prior to European contact has been obtained from the analysis of the five preserved bodies previously mentioned. Zimmerman and Aufderheide's (1984) examination of the two frozen bodies from Utqiagvik revealed severe dental attrition, antemortem tooth loss, and atrophy of the mandible in the older female and moderate attrition in the younger female. Heavy attrition accompanied by calculus deposits and periodontal disease were noted in the

mummy of the middle-aged Aleut male (Zimmerman et al. 1971: 87), while the mummy of a middle-aged Aleut female exhibited alveolar resorption of the mandible (Zimmerman et al. 1981: 638).

A broader picture of dental health in Alaskan natives prior to contact is provided by a number of skeletal studies that have focused exclusively on dental pathology. Leigh's (1925) analysis of 395 Eskimo crania, some of them from Alaska, revealed only 4 crania (1%) with carious lesions, an observation attributed to the high protein and fat diet consumed by this group. Similarly, a study of the molars of 807 mandibles, the majority of them from Alaska, revealed that only 53 of the mandibles (6.6%) contained carious teeth (Goldstein 1932). A more recent examination of 246 Ipiutak and Tigara Eskimo skeletons from Point Hope, and 79 skeletons from Jones Point, Kodiak Island, all pre-contact, revealed low rates of dental caries, ranging from 3.5% (of teeth) in the Kodiak sample and 4.4% in the Tigara sample, to 14.4% in the Ipiutak sample (both sexes combined) (Costa 1980a). Both diet and attrition have been cited as explanations for these low rates (Costa 1980a, Goldstein 1932). The results of these studies are consistent with observations made by other researchers. Hrdlicka (1941a: 2) remarked that a collection of Eskimo skeletons from Kodiak Island showed heavy attrition resulting in abscesses and antemortem tooth loss, but no caries. Stewart (1979a: 270) also commented on the rarity of dental caries in Eskimo and Aleut skeletal remains and noted that cervical caries do not occur in the former group. Finally, three subadult skeletons excavated at Utqiagvik were found to be free of caries (Scott et al. 1984: 70).

Other forms of dental pathology have also been investigated in Alaskan Eskimo skeletal remains. These include abscesses, antemortem tooth loss, periodontal disease, enamel hypoplasia, and tooth trauma. Most noteworthy are the studies by Raymond Costa (1980a, 1980b, 1982), who investigated the incidence of abscesses, antemortem tooth loss, and periodontal disease in three Alaskan skeletal samples. His examination of 246

skeletons from the Ipiutak and Tigara levels at Point Hope, and 79 skeletons from Jones Point, Kodiak Island, revealed few abscesses per tooth and per individual in the Ipiutak sample (0.44/individual for males, 0.79/individual for females), in the Tigara sample (1.05/individual for males, 0.99/individual for females), and in the Kodiak sample (0.14/individual for males, 0.13/individual for females) (Costa 1980a). Similarly, Leigh (1925: 892-893) found only 1.7 abscesses per individual in a sample of 324 Eskimo crania. Both authors attributed the occurrence of abscesses in their samples primarily to dental attrition.

An analysis of antemortem tooth loss in 244 skeletons from Point Hope and 83 skeletons from Kodiak Island revealed varying rates of tooth loss, ranging from 5.8% (of teeth) in the Kodiak sample to 13.0% in the Tigara sample and 15.0% in the Ipiutak sample (both sexes combined) (Costa 1980b). Loss of the anterior teeth was attributed to attrition and trauma in all three samples, while loss of the posterior teeth was attributed to attrition, periodontal disease, and agenesis (Costa 1980b).

Hrdlicka (1940) has argued that the antemortem loss of anterior teeth in arctic populations is the result of ritual ablation, the intentional removal of teeth as part of a ritual practice, possibly a puberty rite. Recognition of this practice, according to Hrdlicka, is based on the following criteria: 1) lack of evidence of disease; 2) symmetry or near symmetry of the tooth loss; 3) repetition of similar patterns of tooth loss in the same group; 4) fracture of the labial alveolar wall; 5) evidence of tooth removal during youth; 6) existence of the practice among related or neighbouring groups; and 7) reference to the practice in folklore (Hrdlicka 1940: 5). Using these criteria, Hrdlicka identified a number of cases of ritual ablation in skeletal collections representing Eskimos from St. Lawrence Island, Kodiak Island, and other regions of Alaska, as well as Aleuts. He noted that the incisors, particularly the maxillary incisors, were the most frequently removed teeth, and that both sexes were involved (Hrdlicka 1940: 30).

Hrdlicka's (1940) assertion that arctic populations practiced ritual ablation has been challenged by Merbs (1968), who argues that the use of the anterior teeth as tools, a practice well-documented among arctic groups, accounts for their high frequency of antemortem loss. As support for his argument, he notes that less than half of the cases identified by Hrdlicka as ritual ablation show symmetrical tooth loss, that the pattern of tooth loss is not highly regular, that the practice of ritual ablation is not mentioned in any of the ethnographic literature, and that it is not possible to distinguish between perimortem fractures of the alveolar wall from postmortem fractures (Merbs 1968: 21-22). More recently, the application of Hrdlicka's (1940) criteria to a sample of subadult skeletons from Kodiak Island revealed evidence of ablation of the deciduous incisors and/or canines in 12 individuals aged 2 to 9 years (D. Cook 1981), suggesting that Hrdlicka's (1940) argument may, in fact, have some validity, at least for the Koniag Eskimos.

An examination of 324 Eskimo crania revealed that 61% of crania showed evidence of periodontal disease (Leigh 1925: 896). The molar teeth were most frequently involved, and the condition was rare in individuals less than 40 years of age (Leigh 1925: 896). In a more recent study, 83% (88/106) of Eskimo crania, a small number of them from Alaska (temporal position unknown), were reported to exhibit some evidence of the disease, including some of the youngest individuals examined (10-20 years of age) (Curzon 1978: 87). In a sample of 202 pre-contact Ipiutak and Tigara skeletons from Point Hope, periodontal disease was found to be less severe than in modern Americans and not the major cause of tooth loss at any age (Costa 1982: 109). A more recent examination of 40 Alaskan Eskimo crania (temporal position unknown) revealed low frequencies of the condition, with only 8.9% (of teeth) showing proximal alveolar bone loss and 11.2% showing buccal alveolar bone loss (Clarke et al. 1986: 178). In most of the affected individuals, the degree of bone loss of periodontal origin was mild and, like Costa's (1982) findings, would not have resulted in tooth loss. Both generalized mild and localized severe periodontal disease in Eskimo populations have been attributed to their high protein and fat diet (Costa 1982: 109).

No evidence of enamel hypoplasia was detected in the subadult skeletons excavated at Utqiagvik (Scott et al. 1984: 70), while the remains of at least four individuals recovered from Kachemak Bay had hypoplastic defects, possibly reflecting seasonal nutritional stress (Lobdell 1980: 83). A more recent study of a pre-contact skeletal sample from St. Lawrence Island revealed that 63.4% (175/276) of the anterior teeth had hypoplasias (Scott and Gillispie n.d., cited in Scott et al. 1984: 70).

Finally, a particular form of dental trauma, termed "pressure-chipping" has been found to occur in significantly higher frequencies in Eskimo populations of Canada, Greenland, and Alaska, than in Aleut and Indian populations (Turner and Cadien 1969). Characterized by crushing and/or flaking of the crown surface, the condition, analyzed in a sample of 324 crania, was found to range in frequency from 8.0% to 29.3% among Aleuts, from 9.1% to 31.2% among northern Indians, and from 37.9% (Kodiak Eskimos) and 67.5% (coastal Alaskan Eskimos) to 87.5% in the Sadlermiut Eskimos of Hudson Bay (Turner and Cadien 1969: 305). More severe tooth use due to mastication of hard dietary substances such as frozen meat and bones, and to the use of the teeth as tools are believed to account for the higher frequencies seen in the Eskimo samples (Turner and Cadien 1969).

In conclusion, the palaeopathological data that has been collected from Alaska reveals that the Alaskan Eskimos and Aleuts were by no means disease-free prior to European contact. Rather, they suffered from a variety of disorders, some of them related to the unique environmental conditions under which they lived, and others common to human populations everywhere (Fortuine 1989: 86). Unfortunately, this data has provided little insight into changing patterns of health and disease following

contact, since most of the remains that have been analyzed to date are pre-contact. Before the results of the present study and their significance can be addressed, it is necessary to review the history of contact among the northern coastal Eskimos and the Aleuts, and to outline the way of life of these groups in order that the impact of culture change on the health of these individuals can be more clearly understood.

CHAPTER 3
HISTORICAL BACKGROUND

Previous research has demonstrated "considerable geographic variability" in the biological impact of contact (Ubelaker and Verano 1992: 280). This variability has been attributed, in part, to "differences in the timing and intensity of European contact and colonization" (Verano 1992: 21). That historical and biological processes are closely linked has been recognized by Fortuine (1989: 87), who states that "the very events of history in significant ways determined what the patterns of health and disease would be among the people of Alaska". The purpose of this chapter is to highlight those aspects of Eskimo and Aleut history that pertain, either directly or indirectly, to the health status of these populations. Particular attention will be paid to those factors underlying the depopulation of these groups. Readers wishing a more detailed historical account of the northern coastal Eskimos and Aleuts are urged to consult Coxe (1780), F. Beechey (1831), Bancroft (1959), VanStone (1962), T. Simpson (1970), Berkh (1974), L. Black (1980, 1984), and Bockstoce (1986).

Aleuts

The first contact between Aleuts and Russians occurred in 1741, when Vitus Bering and Alexei Chirikov landed their ships in the Aleutian Islands (see Figure 1). Although their expedition did not achieve its original goal of establishing Russian sovereignty in northwestern North America (VanStone 1984: 149), the valuable cargo of sea otter pelts obtained during the voyage stimulated the organization of commercial fur-hunting expeditions to the Aleutians in the years that followed (L. Black 1980: 92). The first

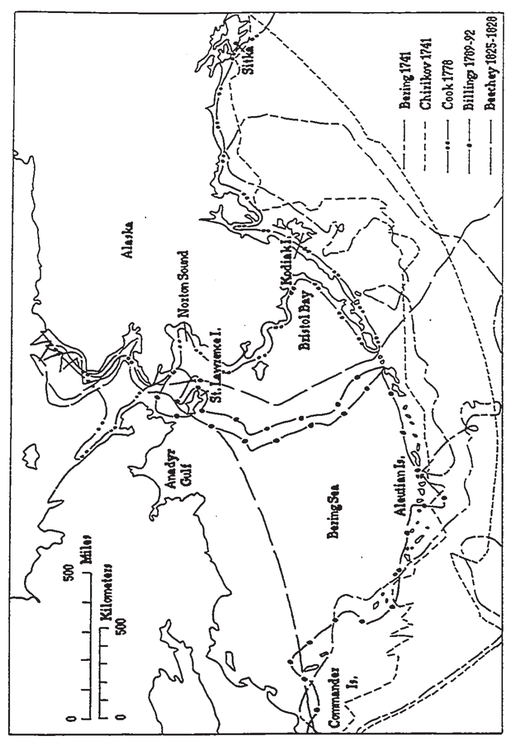

Figure 1. Routes of early Alaskan exploration (after VanStone 1984)

Russian fur hunters, or *promyshlenniki* as they were known, landed in the islands in 1745 to hunt sea otters and other fur-bearing animals (L. Black 1984: 72). Initially engaged in the hunt themselves (Liapunova 1987: 114), the Russians became increasingly reliant on the Aleuts to provide them with pelts, either through trade or coercion (footnote in Bancroft 1959: 121; Liapunova 1987: 115). To ensure the safety of their own hunting parties, the Russians took by force or persuasion Aleut hostages, usually the children of chiefs (Levashov, cited in Masterson and Brower 1948: 60).

In the early years of the fur trade, the Russian government made little effort to protect the welfare of the Aleuts (Hulley 1953: 57). Consequently, relations between the Russians and Aleuts were not always amicable, and on a number of occasions, hostile encounters resulted in injury and death to both groups (Coxe 1780: 34; Bancroft 1959: 103, 105, 122; Jochelson 1968: 3; Berkh 1974: 5, 19; L. Black 1984: 82, 85, 87). As Black (1980: 93) has noted, the outcome of these encounters, which were local and sporadic, depended to a great extent on the character of the individuals involved, and some early traders did succeed in establishing good relations with the Aleuts (Berkh 1974: 17, 18, 30; Makarova 1975: 52; L. Black 1984: 75).

Moving eastward along the island chain as sea otters became increasingly scarce and the western islands became overcrowded with hunting parties (L. Black 1984: 76), the Russians reached Umnak Island in 1759 and the Alaskan mainland in 1762 (L. Black 1980: 93). By this time, the number of vessels visiting the chain annually for the purpose of hunting had increased from one to as many as ten vessels (L. Black 1984: 75), and over 44,000 sea otters had been taken in the Andreanof and Commander Islands (Khlebnikov 1976: 136). As the fur trade increased, so too did the violence against the Aleuts (L. Black 1980: 94), many of whom opposed Russian demands to assist in the fur hunts. Among the most notable abuses committed during this time period were those of the merchant Bechevin and his crew, who were responsible for a number of native

deaths (Bancroft 1959: 124, 125; Berkh 1974: 25). Compounding the loss of Aleuts at the hands of the Russians was a severe famine which struck the Unalaska region in 1762, resulting in a dramatic reduction in the population (Coxe 1780: 259; Levashov, cited in Masterson and Brower 1948: 58).

The behaviour of Bechevin and his crew likely precipitated the organized uprising of the eastern Aleuts during the winter of 1763 to 1764 (L. Black 1984: 86). In surprise raids against several Russian fur-hunting parties, the Aleuts destroyed four vessels wintering on Umnak, Unimak and Unalaska Islands, and reportedly killed an estimated 200 Russian crewmen (L. Black 1980: 94). In retaliation for the death of their comrades, the Russian survivors of the uprising destroyed entire villages from Umnak Island to Akutan Pass, including 18 villages on Unalaska Island, all of the villages on Umnak and the Four Mountains Islands, and numerous villages on Unimak Island (Hulley 1953: 60). One Russian, Ivan Soloviev, and his crew are reported to have killed 200 to 300 Aleut warriors (Bancroft 1959: 151; Berkh 1974: 41; L. Black, footnote in Veniaminov 1984: 251). In one widely reported incident, Soloviev is said to have bound 12 Aleut males together, front to back, in order to determine how many men could be killed with one shot. The bullet reportedly lodged in the ninth individual (Veniaminov 1984: 252).

Russian estimates place the total number of Aleut deaths at the hands of Soloviev and his men at 3000 (Davydov 1977: 188) to 5000 (Sarychev, cited in Veniaminov 1984: 256), figures with which Veniaminov (1984: 256) and Laughlin (1980: 128) concur. However, several sources, including a number of eyewitness accounts, suggest that these figures may be greatly exaggerated (L. Black, footnote in Veniaminov 1984: 256), and that the death toll may have been closer to 200 (Berkh 1974: 41-42).

In 1768, a government expedition under the command of Captain-Lieutenant Petr Krenitsyn and Lieutenant Mikhail Levashov, was undertaken in order to explore and map

the islands, to secure the territory for the Russian Empire, to bring the Aleuts under Russian citizenship, and to regulate the collection of tribute (Glushankov 1973: 205). The expedition eventually succeeded in charting the eastern end of the island chain, despite several skirmishes with the Aleuts and the loss of over 30 crewmen from scurvy. Levashov, who took an interest in the customs of the local inhabitants, left valuable ethnographic observations and sketches of the Unalaska Aleuts (Levashov, cited in Masterson and Brower 1948: 57-61; Glushankov 1973). He also enforced the government policy of "fair and equitable treatment" of the Aleuts, even though he reportedly disliked them personally (L. Black 1980: 95).

From 1778 to 1779, Captain James Cook, on an expedition in search of a northern passage to the Atlantic, passed through the Aleutians, stopping briefly at Unalaska Island (Figure 1). By this time, most of the natives had been subjugated by the Russians (Bancroft 1959: 169), and the population, estimated to have numbered 12,000 to 15,000 prior to Russian contact (Veniaminov 1984: 246), had been reduced by at least one third (Laughlin 1980: 129). Cook's crew ascertained that approximately 500 Russians and Kamchadals occupied the island chain in 1778 (Fedorova 1973: 113), 60 to 70 of them on Unalaska Island, and approximately 400 on the other islands (Clerke in Cook 1967, 3(2): 1338).

By 1780, most of the Aleutian Islands had been discovered and mapped (Fedorova 1973: 105), 48 fur-hunting expeditions had been sent to the archipelago, and the fur trade had reached its peak (Makarova 1975: 77). By this time, the number of fur-trading companies operating in the islands had been reduced to five (Fedorova 1973: 106). Although the number of vessels making annual voyages to the Aleutians still remained relatively small, overcrowding of the Andreanof Islands by fur hunters resulted in increased conflicts between rival fur-trading companies as they attempted to lay claims to specific hunting grounds (L. Black 1984: 92). As competition for greater

catches and profits increased, so too did the Russians' reliance on Aleut hunters (L. Black 1981a: 118; L. Black 1984: 81). Consequently, the Russian practice of forcing the Aleuts to hunt for them became increasingly common.

The year 1786 marked the discovery of the Pribilof Islands, St. Paul and St. George, and in the years that followed, many Aleuts were transported from the central Aleutians to the Pribilofs to hunt, some never returning home (L. Black 1984: 96). By this time, reports of the mistreatment of Aleuts by the Russians had reached the Imperial Government, and an expedition under the command of Captain Joseph Billings was dispatched to investigate allegations of Aleut brutalities at the hands of the Russian fur hunters, as well as explore the coasts of northwestern North America and eastern Siberia (Figure 1), and assert Russian sovereignty over these regions (Pierce, in Merck 1980: v).

When the expedition arrived in the islands in 1790, only one third of the original Aleut population remained, according to Lieutenant Gavriil Sarychev (Sarychev 1807: 72). In addition, the sea otter population had become greatly reduced (Sarychev 1807: 71). Wintering at Unalaska from 1791 to 1792, the crew confirmed earlier reports of Aleut abuses and were, themselves, witnesses to these abuses. Dr. Carl Heinrich Merck, the expedition's naturalist, commented that

> now the Aleuts have to live in constant anxiety only to serve the laziness and clumsiness of the promyshlenniki. That life of forced labor, for which they are used, causes not a few to succumb to sickness; and that in addition to starvation, which they do not yet know how to prevent, and dangers to which they are often untimely exposed. (Merck 1980: 80)

Although the expedition succeeded in putting an end to the murder of natives (Veniaminov 1984: 256), the practice of forced labour continued (L. Milan 1974: 19), particularly in the more densely populated eastern Aleutians, where native resistance was stronger

(L. Black 1984: 81).

In addition to suffering from the effects of forced labour, the Aleuts were also experiencing a number of health problems as a result of their contact with Russians. During the winter of 1791 to 1792, many Unalaska Islanders are reported to have died of a respiratory disease characterized by coughing and the spitting of blood, a disease which Merck (1980: 177) attributed to their lack of adequate food and clothing. In 1794, two Aleuts were afflicted with smallpox, believed to have originated from Spanish vessels near Cape Edgecombe (Portlock 1789, cited in L. Milan 1974: 20; Bancroft 1959: 350).

The last private trading vessel was dispatched to the island chain in 1792 (Makarova 1975: 119), and in 1799, the consolidation of several fur-trading companies resulted in the formation of the Russian-American Company. Granting a monopoly to the Company, the government hoped to prevent destructive competition between rival companies, "and to protect its claim to Russian America" (Jones 1976: 18). By this time, no more than 225 Russians were living in Alaska (Gibson 1976: 7).

Although the Company's first charter contained no guidelines regarding the treatment of Aleuts (Okun 1951: 197), its second charter, issued in 1821, outlined its policy regarding this matter in a section entitled "On the Islanders" (Liapunova 1987: 139). According to this document,

> Islanders and others are to work for the Company by trapping marine animals. It is established that one half of all men between the ages of 18 and 50 may be called upon to serve the Company....to insure that as many selectees as possible are taken from families with more than one male, so that women and children will not be left without assistance or food...Islanders appointed to Company service shall be supplied with proper clothing, food and canoes by the Company, and above all they shall be paid a wage for the animals they catch amounting to no less than one-fifth that formerly received by Russians. The appointees need not remain in Company service for more than three years, after which they will be replaced by others. (quoted in Liapunova 1987: 139).

Unfortunately, however, the exploitation of Aleuts continued as the lack of government officials in the colony prevented the enforcement of the charter (Okun 1951: 195).

By 1810, the practices of forced labour and resettlement had reached their peak. Approximately 150 Aleuts were transported to Kodiak Island during this time period (L. Black 1980: 100), while an additional 200 were relocated from Unalaska Island to the Pribilofs to hunt fur seals (Gibson 1987: 80). By 1814, this number had increased to 300, and by 1820, to 380 (Gibson 1987: 80). In addition, three boat-loads of Atkan Aleuts were transferred to Attu Island between 1809 and 1811 (L. Black 1984: 98), while approximately 85 adult Aleuts were transferred from Amchitka Island to Atka and Adak Islands sometime after the turn of the century (L. Black 1984: 96, 158). The need to travel further distances to hunt the rapidly diminishing sea otter population placed the Aleuts at greater risk of accidents at sea. Approximately twenty Aleuts were lost in the Four Mountains Strait in 1804, 40 drowned while crossing from Amak Island to the mainland in 1809, an additional 30 individuals lost their lives in 1811, and 15 men were lost while crossing Akutan Strait in 1828 (Veniaminov 1984: 256).

Compounding the loss of population due to forced resettlement was the decline caused by the numerous epidemic diseases that were introduced to the Aleuts by Russians. In the first decade of the nineteenth century, both respiratory and intestinal infections are reported to have struck the native population. In the fall of 1802, an unidentified epidemic was carried from Siberia to Atka, causing numerous deaths there (Davydov 1977: 105). From 1806 to 1807, an epidemic characterized by chest congestion and high fever struck Unalaska, killing over 350 people (L. Black 1984: 97). The same infection was likely carried by ship the following year to Atka (Vasiliev 1823, cited in L. Black 1981a: 141), where a large number of Aleuts from the surrounding islands had gathered. The deaths at that time were reportedly so numerous that not enough survivors were left to bury the dead (L. Black 1984: 98). A severe outbreak of

dysentery was also reported to have occurred at Unalaska from 1807 to 1808, resulting in many deaths, particularly among young adults (Veniaminov 1984: 257).

The relocation of Aleuts continued in the 1820s and 1830s. From 1823 to 1826, the Russians transferred a number of Aleut hunters to the Pribilof Islands, where they established permanent settlements (L. Black 1981a: 125). In 1826, the inhabitants of Amlia Island were relocated to Atka, while around 1837, a number of Aleuts were transported from Attu and Atka to the Commander Islands (Hrdlicka 1945: 22; Jochelson 1968: 42; Laughlin 1980: 126).

Epidemics continued to pose a serious health threat to the Aleuts during this time period. From 1830 to 1831, a respiratory infection struck a number of the eastern settlements, killing more than 30 individuals, most of them young men (Veniaminov 1984: 258). Similarly, during the month of January, 1831, five Aleut males and three Aleut females from Amlia Island are reported to have died from a disease described as a "coughing sickness" (Netsvetov 1980: 55). The disease struck both the Amlia and Atka settlements and continued to rage the following year, killing a number of Rat Islanders who had been transported to the Near Islands to hunt (Netsvetov 1980: 74). In the same year, an intestinal infection broke out in the western Aleutians, resulting in high mortality (Netsvetov, cited in L. Black 1981a: 141).

In 1838, the great smallpox epidemic, which had broken out on the mainland two years earlier, struck the eastern Aleutians, killing approximately 85 Aleuts on Unalaska (Veniaminov 1984: 245), and more than 4000 Alaskan natives in total (Tikhmenev, footnote in Bancroft 1959: 561). The western Aleuts were reportedly unaffected due to the "sheer distance, lack of regular communication between settlements, and the introduction of vaccination" (L. Black 1981a: 115), first introduced into Russian America in 1822 (L. Black 1980: 103).

Other epidemics soon followed, including an epidemic of mumps, which appeared in

southeastern Alaska in 1843 and spread northwest, affecting nearly every Aleut (Pierce 1974: 3-9). A measles epidemic broke out in Sitka in 1848 and spread to the Unalaska district, resulting in the deaths of several hundred Aleuts, apparently due primarily to their refusal of medical aid (Tikhmenev 1978: 371-72). An influenza epidemic, which struck the Atka/Amlia area in the fall of 1863, resulted in 55 deaths (L. Black 1984: 105). By 1867, when the U. S. government purchased Alaska, the Aleut population numbered only 2,500 (Hulley 1953: 16).

Northern Coastal Eskimos

The first Europeans to establish contact with the Eskimos of northern coastal Alaska were Sir John Franklin and Captain Frederick W. Beechey, both of whom had been dispatched by the British Admiralty to map the Alaskan coastline (Chance 1966: 12). On August 3rd, 1826, the H.M.S. Blossom, under the command of Captain Beechey, landed at Cape Golovnin, which Beechey renamed Point Hope (VanStone 1962: 19) (see Figure 1). Although most of the Eskimos were away on a hunting trip, a number of elderly women and children appeared and engaged in trade with the crew (F. Beechey 1831, I: 365; Peard 1973: 153). The same year marked the European discovery of Point Barrow, when Thomas Elson, Master of the Blossom, and nine other crewmen, were dispatched in a barge to search for John Franklin's party. Reaching Point Barrow, the barge was visited by a number of natives. However, poor ice conditions and hostility on the part of the Eskimos forced Elson to depart after only a short time (Peard 1973: 38-39). While the encounters between Beechey's crew and the northern coastal Eskimos were generally friendly, a skirmish that broke out between the crew and the Eskimos near Chamisso Island following the wreck of the barge in 1827 resulted in the death of one Eskimo, the first reported to have been killed by Europeans in northwestern Alaska (Foote 1965: 85, cited in Bockstoce 1977: 14).

The next European visit to Point Barrow occurred in 1837, when the Hudson's Bay Company dispatched Thomas Simpson to survey the northern Alaskan coast. Reaching Point Barrow on August 4th, Simpson noted the presence of a large cemetery there, and speculated that it may have been the result of a recent epidemic among the local Eskimos (T. Simpson 1970: 153-154). In contrast to Elson's experience with the Point Barrow Eskimos, Simpson's encounter with them, although limited to just over a day (Oswalt 1979: 205), was a friendly one, and natives contacted in 1852 still recalled his visit (Murdoch 1988: 52).

During the first few decades of the nineteenth century, the Americans became aware of the existence of a large whaling ground in the Bering Sea, and in 1843, began hunting whales off the coast of Kamchatka (Foote 1964: 16). In 1848, at least three whalers passed through the Bering Strait into the Chukchi Sea, where they found large numbers of whales (Foote 1964: 16). In the years that followed, increasing numbers of whalers, most of them American, sailed through the Strait to take advantage of the rich whaling grounds to the north. In 1849 alone, 50 whaling vessels reached the Bering Strait (Bockstoce 1986: 93). In addition to whaling ships, the British Navy dispatched a number of vessels to search for the crew of the lost Franklin expedition. From 1848 to 1854, nine Franklin search ships are reported to have visited or wintered in the Bering Strait and northern coastal regions of Alaska (Bockstoce 1977: 9), visiting most of the villages between Port Clarence and Point Barrow (VanStone 1962: 20). One such ship, the H.M.S. Plover, under the command of Captain Rochfort Maguire, became the first vessel to overwinter at Point Barrow from 1852 to 1854, when it was stationed there as a supply ship (Stefansson 1960: 116). Several accounts of this voyage have been published, including the first ethnography of the Point Barrow Eskimos (D. Ray 1975: 142), written by the ship's surgeon Dr. John Simpson (1855, 1875). By this time, the Eskimos were already experiencing health problems as a result of their contact with Europeans. During the early winter of 1851 to 1852, an epidemic of influenza, likely carried by a Franklin search ship, struck the settlement of Utkiavik at Point Barrow, killing about 40 individuals (J. Simpson 1855: 920).

By 1854, five whalers had reached Point Barrow, ushering in a period of regular contact between the northern coastal Eskimos and Europeans (Foote 1964: 17). In the years that followed, few seasons passed in which whalers did not visit the region (Murdoch 1988: 53). In addition, trading schooners of American, British, German, and French origin also plied the northern Alaskan waters, trading with the Eskimos for

baleen, furs, and ivory (Foote 1964: 19). During the early whaling period (1848 to1885), contacts between Eskimos and whalemen were limited to about two months (Murdoch 1988: 53), the average length of the whaling season. These contacts occurred most frequently as the result of onboard visits by Eskimos, since whaling captains were reluctant to send their crewmen ashore for fear of desertion or Eskimo attack (Foote 1964: 17). Occurring less often were contacts resulting from onshore visits by crewmen, shipwrecks, desertion by crew members, and the overwintering of whaling vessels (Foote 1964: 17-18). As Fortuine (1989: 163) notes, any one of these types of contact could have resulted in the transmission of disease from the whalemen to the Eskimos.

According to the Point Hope Eskimos, whales were already becoming scarce along the coast by the time the H.M.S. Plover arrived in northern Alaska (Maguire 1969: 351). In 1852 alone, more than 220 whalers plied the waters near Bering Strait (Bockstoce 1986: 97), and by the end of the season, one third of all bowheads to be caught by whalers between 1848 and 1914 had been killed (Bockstoce 1986: 131). By 1869, two thirds of the total catch had been taken (Bockstoce 1986: 131), and the whalers began turning their attention to other sources of oil, most notably, walruses. In the 1870s, almost every whaling vessel was hunting the animal, killing as many as 1,600 in one month (Bockstoce 1986: 136). By 1880, the walrus population, estimated to have numbered over 200,000 in 1848 (Bockstoce 1986: 129), had been reduced by an estimated 150,000 (Bockstoce 1986: 135). Such a reduction had a profound impact on the coastal Eskimos, particularly those of the Bering Strait region, who relied on the walrus as their primary source of food (Bockstoce 1986: 136). The loss of walrus herds is believed to have contributed to the mass starvation which occurred on St. Lawrence Island during the winter of 1878 to 1879, resulting in the deaths of an estimated 1000 Eskimos, two thirds of the original population (Muir 1917:

107-108).

In addition to suffering from depleted whale and walrus stocks during this time period, the northern coastal Eskimos were also suffering from new diseases introduced by the whalemen. Around 1865, an epidemic of measles struck the Point Hope settlement, resulting in high mortality due, in part, to the Eskimo custom of placing seriously ill individuals outside their homes in order to avoid having to abandon the dwellings in the event of a death (Burch 1981: 16). Considered by natives to be "the first major epidemic to strike Point Hope", the measles epidemic may, in fact, have followed an earlier epidemic of influenza which struck Point Barrow in 1851 and which may have affected the Point Hope Eskimos as well (Burch 1981: 79).

By 1870, firearms and alcohol had become popular trade items among the northern coastal Eskimos. In 1873, the U. S. government passed an act prohibiting the sale of both alcohol and firearms to the Eskimos (Bockstoce 1986: 191); however, no efforts were made to enforce these laws until 1879, when routine patrols in northern Alaskan waters by the U. S. Revenue Marine Service, forerunner of the U. S. Coast Guard (Burch 1981: 17), were introduced.

In 1881, the United States International Polar Expedition, under the command of Lieutenant Patrick Henry Ray, journeyed to Point Barrow for a three-year study of weather patterns, currents, tides, and ice (Murdoch 1988: xiii). John Murdoch, a naturalist on the expedition, is credited with writing a detailed ethnology of the Point Barrow Eskimos (Murdoch 1988). Around the same time period, an influenza-like disease is reported by the Eskimos to have struck the northern coast near Cape Thompson, resulting in widespread death and the abandonment of at least one village in the area (Brower 1942: 32).

The following decades marked the beginning of significant changes among the northern coastal Eskimos (Gubser 1965: 10). Between 1848 and 1885, an estimated

10,000 whales had been killed between Anadyr Gulf and Point Barrow (Foote 1964: 18). As a result, the Eskimos, who formerly relied on whales to supply up to 50% of their winter food (Bockstoce 1986: 232), were now forced to place a greater reliance on other species for their subsistence. In addition to this shift in subsistence, the decline in the whale and walrus populations resulted in periodic starvation among some coastal groups (Foote 1964: 19). During the winter of 1885 to 1886, a severe famine struck the settlement of Point Hope, resulting in dozens of deaths (Aldrich 1889: 170).

Of equal significance, according to Foote (1964: 19), was the introduction by whalemen of new diseases. Given that 3,000 American whalers carrying an estimated 90,000 crewmen passed through the Bering Strait between 1848 and 1885, contacts likely occurring with half of these vessels (Foote 1964: 18), the opportunity for the transmission of new infectious organisms was undoubtedly high. These diseases exacted a tremendous toll on the Eskimo population, contributing to a decline in the coastal population by as much as 50% by 1885 (Foote 1964: 19). Compounding the problems of dwindling food resources and alien diseases were the deleterious effects of alcohol, which included starvation due to the failure to hunt (Foote 1964: 18; C. Hooper 1881: 62-63).

In 1884, the first shore whaling station was constructed at Point Barrow in order to allow whalers to take advantage of spring whaling, thereby increasing both their catches and their profits. Three years later, a shore station was constructed at Point Hope, and in the years that followed, a number of other locations along the coast were chosen as sites for shore-whaling operations, marking the beginning of intensive whaling and increased contacts between the northern coastal Eskimos and the whalemen. An estimated two dozen shore stations were constructed along the Alaskan coast between 1884 and 1906 (Foote 1964: 20). From 1889 to 1890, 20 whites were operating stations at Point Barrow (Bockstoce 1986: 236), while the number of stations at Point

Hope increased from two in 1892 to 13 in 1898 (Bockstoce 1986: 241). The construction of shore stations and the increased need for labour resulted in the recruitment of large numbers of Eskimos. Many of the Point Hope Eskimos, suffering from the decline of caribou herds in the area (Burch 1981: 19), moved to Point Barrow, where they were joined by Eskimos from the interior (Bockstoce 1986: 241). In return for their labour, the Eskimos received flour, tea, canned meats and fruits, cloth, rifles and ammunition (Bockstoce 1986: 242).

The year 1888 marked the discovery of new whaling grounds in the eastern Beaufort Sea (Bockstoce 1986: 256), and from 1889 to 1914, nearly 170 ships overwintered from Point Hope to the Mackenzie River delta and beyond (Foote 1964: 20). In addition to carrying crews of more than 40 whalemen, many of these ships carried with them entire Eskimo families, signed on at Point Hope, Point Barrow, and at other villages along the coast, to act as hunters and seamstresses (Bockstoce 1986: 270). By the mid 1890s, most ships were wintering in the vicinity of Point Barrow and the Mackenzie River, and at Herschel Island (VanStone 1962: 21).

That the Eskimos were continuing to suffer from the deleterious effects of contact with the whalemen was clearly evident. The issue of Eskimo welfare was brought to the attention of Dr. Sheldon Jackson, the General Agent for Education in Alaska, and to the Episcopal Church Board of Missions (VanStone 1962: 24). Following negotiations with a number of Protestant missionary societies, Episcopalian and Presbyterian missions and schools were established in 1890 at Point Hope and Point Barrow respectively (VanStone 1962: 24-25). Leander Stevenson, the first missionary teacher at Point Barrow, began his appointment in 1890 (Bockstoce 1986: 311), and was joined in 1893 by Dr. T. E. Beaupré, who remained at the mission for only a year (Jackson 1896: 1451). In 1896, Stevenson was replaced by Dr. H. Richmond Marsh, who remained at the mission until the turn of the century (Jackson 1897: 1446). In charge of the St.

Thomas mission at Point Hope was Dr. John B. Driggs, who was also the "first physician resident in northern Alaska" (Fortuine 1989: 184). In 1895, Driggs was joined by a second missionary, Reverend A. R. Hoare, who remained at Point Hope for 12 years (VanStone 1962: 25).

Jackson's concern for the welfare of the Alaskan Eskimos deepened following a report submitted by Leander Stevenson in 1892 on the deleterious effects of the whalers on the Point Barrow natives, most notably, sexual intercourse between the whalemen and the Eskimo women, mistreatment of the native children, and alcohol abuse (Lazell 1960: 105-106). In the same year, the Bureau of Education, under Jackson's direction, instituted a reindeer-herding program in an attempt to provide the northern coastal Eskimos with a new food resource (VanStone 1984: 156). However, a lack of interest among the Eskimos in the nomadic settlement pattern required of herding, coupled with overgrazing and thinning of the herds by wolves resulted in the eventual failure of the program (VanStone 1962: 27).

Despite efforts by the U.S. government during this time period to limit contact between the whalers and Eskimos (Phebus 1972: 20), the latter continued to endure hardships as a result of the introduction of new diseases and the rapid depletion of the whale and walrus populations. In the summer of 1894, an epidemic of "capillary bronchitis", or bronchopneumonia, struck the settlement at Point Hope, affecting three quarters of the population and killing one sixth. John Driggs, the teacher in charge when the epidemic began, reported that at times there were not enough healthy people to bury the dead (Jackson 1896: 1467; Lazell 1960: 126).

In 1896, Point Barrow received its first public school (Phebus 1972: 15). A missionary school was in operation at Point Hope at this time, although plans to expand it were temporarily halted by an epidemic of influenza that year (Driggs 1897: 608). The mid 1890s also saw the establishment of small hospitals at Point Hope and Point

Barrow, and the beginning of regular medical services by physicians, services previously rendered, to a large extent, by the missionaries. However, as Fortuine (1989: 195) notes, the introduction of medical services did not necessarily result in better health among the Eskimo population since drug treatments were limited and were of little use in combatting the epidemics that struck the population.

No more apparent were the devastating effects of European-introduced diseases on the northern coastal Eskimos than in 1900, when the Point Barrow Eskimos invited the inland Eskimos, the Nunamiut, to join them in celebrating a particularly successful whaling season. Unknown to the Eskimos, ships arriving at Point Barrow during this time carried influenza, and the disease was soon passed to the Eskimos, resulting in the deaths of some 200 Nunamiut (Brower 1942: 187-188; Gubser 1965: 8). Two years later, a measles epidemic, carried by a small whaling schooner from the Mackenzie River area, struck the northern Alaskan coast, claiming the lives of over 120 Point Barrow Eskimos (Brower 1942: 190-192) and an estimated 12% of the Point Hope population (Driggs 1903, cited in VanStone 1962: 24). Contributing to the high mortality rate was the refusal of some of the affected individuals to stay indoors, their exposure to the cold air outside resulting in pneumonia and death (Brower 1942: 191).

Whaling continued to be profitable for a brief period after the turn of the century, and a number of Eskimos went into business for themselves, operating five or six whaling crews at Point Barrow in 1908 (Chance 1966: 14). However, the introduction of new replacements for whale oil and baleen, the serious decline of the whale population, and the collapse of the baleen market in 1907 (Bockstoce 1986: 345) soon made large-scale whaling impossible (VanStone 1962: 24). Consequently, some whaling vessels turned their attention to the fur trade to supplement their dwindling income (VanStone 1984: 155). By the end of the first decade, much of the native population at Point Barrow, which numbered 300 to 400 in 1906 (Gubser 1965: 14), were inland Eskimos who had replaced the coastal Eskimos decimated by disease the previous century (Jenness 1927: 168, cited in Oswalt 1967: 235; Ford, personal communication 1957, cited in Stewart 1959: 246). While 51 registered American whalers sailed north from California between 1895 and 1905 (Chance 1966: 14), by 1914 this number had been reduced to two (Gubser 1965: 9), and in 1915, commercial whaling in the Arctic came to an end.

As the preceding discussion has illustrated, the nature and timing of contact were quite different in each of the two regions under investigation. In the Aleutian Islands, contact between Aleuts and Russians first occurred in 1741. In the 50 years that followed, encounters between these groups were characterized largely by hostility, exploitation, and abuse of the Aleuts by Russian fur hunters. In contrast, the first contact between the northern coastal Eskimos and Europeans did not occur until nearly one hundred years later, and encounters between these groups became frequent only after 1885, when the establishment of shore whaling stations and the overwintering of whaling crews brought the Eskimos and American whalemen in close contact with one another. Both regions shared one important similarity, however, namely a significant decline in the native population following contact. In the Aleutian Islands, murders committed by Russian fur hunters, famine and drownings resulting from the practice of forced labour, and newly introduced diseases all contributed to the drastic reduction of the Aleut population. In northern coastal Alaska, disease and famine resulting from the overhunting of game were the primary factors underlying Eskimo depopulation.

CHAPTER 4

ENVIRONMENTAL AND CULTURAL DETERMINANTS OF DISEASE AMONG THE NORTHERN COASTAL ESKIMOS AND ALEUTS

Epidemiologists have recognized the link between human disease and the environment (Dubos 1965; MacMahon and Pugh 1970). As Dubos (1965: 194-195) has noted, the transition from "latent infection into overt disease" occurs when environmental factors upset "the biological equilibrium normally existing between the host and the microbial agents". The purpose of this chapter is to highlight those aspects of the physical and cultural environment that may have created conditions favourable for pathogenic microorganisms to thrive and flourish among the northern coastal Eskimos and Aleuts prior to, and following European contact. Topics covered include geography and climate, subsistence, settlement patterns, housing, transportation, technology, clothing, trade, and warfare. Since the emphasis is placed on those aspects of the environment that had a potential impact on health and disease, the chapter should not be considered a complete ethnography of the northern coastal Eskimos and Aleuts, and readers are urged to consult the following sources for further details.

Sources

Reconstructing Aleut culture at the time of contact poses several problems. First of all, many early travelers to the region left only brief and sometimes unreliable accounts of the Aleuts due to their lack of interest in Aleut culture, their inability to converse with the natives, and their short period of contact with them (Veniaminov 1984: xviii). Secondly, few primary sources dating to the eighteenth century have been published (L. Black 1984: 2), and those that are available are not always accurate, having been

compiled from memory by illiterate or semi-literate Russian fur hunters after their return home (Makarova 1975: 78). Finally, Aleut culture changed dramatically in the first 30 or 40 years following contact (Lantis 1970: 144).

For the early contact period, the reports of Lieutenant Mikhail Levashov (Glushankov 1973; Masterson and Brower 1948: 57-61) and Captain James Cook (1967, 3) provide useful information on the eastern Aleuts. As noted in the previous chapter, Levashov, who commanded a government expedition to the Aleutian Islands in 1768 with the purpose of exploring and mapping the Islands and securing the territory for the Russian Empire (Glushankov 1973: 205), made detailed ethnographic observations of the Unalaska Aleuts (Masterson and Brower 1948: 57-61). Captain Cook, who passed through the Aleutians from 1778 to 1779, commented briefly on the Unalaska Aleuts (Cook 1967, 3(1): 457-468) as did a number of his crewmen, including the ship's surgeon David Samwell (in Cook 1967, 3(2): 1121-1149), the assistant surgeon William Ellis (Ellis 1969), Captain Charles Clerke (in Cook 1967, 3(2): 1333-1338), Officer Thomas Edgar (in Cook 1967, 3(2): 1351-1359), and Lieutenant King (in Cook 1967, 3(2): 1426-1452).

The best ethnographic data for the latter part of the eighteenth century is provided by members of the Billings Expedition, which wintered at Unalaska from 1791 to 1792. Commander Joseph Billings, considered a "competent observer" (Pierce, in Merck 1980: xiii), made brief notes on the Unalaska Aleuts (in Merck 1980: 199-210), while his fellow commander, Lieutenant Gavriil Sarychev, provided the most complete description of the natives (1807). Billings' secretary and interpreter, Martin Sauer, also recorded his observations of Aleut culture (Sauer 1802), although his work has been criticized for its anti-Russian sentiment (Pierce, in Merck 1980: vi; L. Black 1984: 12). Finally, the expedition's naturalist, Dr. Carl Heinrich Merck (1980), left a valuable account of medical and ethnographic observations, including an account of

traditional Aleut medical practices.

The most comprehensive ethnographic account of the Aleuts is that of Father Ivan Veniaminov (1984), who served as an Orthodox missionary at Unalaska from 1825 to 1834. By this time, the Aleut culture had been partly destroyed as a result of contact with Russians, although much of it could still be recorded as a "memory culture" (Lantis 1970: 157). Veniaminov's detailed account, most of which is based on his own observations rather than on secondary sources (Pierce, in Veniaminov 1984: vi), includes descriptions of the geography, climate, flora, and fauna of the Aleutian Islands, as well as the history, language, and culture of the Aleuts of the Unalaska district, including a discussion of diseases and methods of treatment. Veniaminov also included in his description ethnographic information on the Aleuts of the Atka district (Veniaminov 1984: 365-379), derived from an account by the Orthodox priest Father Iakov Netsvetov, who served in the western Aleutian Islands from 1829 to 1844 (Netsvetov 1980: xv).

For the early contact period, ethnographic information on the northern coastal Eskimos is derived from three primary sources. The first of these is the narrative of Frederick Beechey (1831), who surveyed the northern Alaskan coast in 1826. Recognized as the first European to identify the northwestern Alaskan natives as Eskimos (Bockstoce 1977: 16), Beechey recorded his observations of various coastal groups and acquired a collection of artifacts, described in detail by Bockstoce (1977) . A second source of information on the northern coastal Eskimos is the narrative of Thomas Simpson (1970), who, in 1837, explored the northern coast from Point Barrow to Return Island. Both Beechey and Simpson provide an account of Eskimo culture that had changed only slightly from the pre-contact period (Spencer 1984b: 337). Finally, the best description of the Eskimos in the early contact period is that of Dr. John Simpson (1855, 1875), surgeon of the H.M.S Plover, which wintered at Point Barrow from

1852 to 1854.

The whalemen who journeyed to the northern Alaskan coast in the latter half of the nineteenth century showed little interest in the Eskimos or their way of life (Oswalt 1979: 206). Consequently, their journals contain little ethnographic information. The best sources for this time period are the accounts of Patrick Henry Ray (1885, 1988a-c) and John Murdoch (1988), members of the U.S. International Polar Expedition, stationed at Point Barrow from 1881 to 1883. Both provide detailed information on the Point Barrow Eskimos, whom Murdoch (1988: 52-53) maintained had changed little as a result of contact with Europeans. However, both men have been criticized for their overemphasis on material culture and their limited coverage of nonmaterial aspects of Eskimo society (Spencer 1959: 3, Oswalt 1967: 234), an imbalance attributed to their inability to converse with the Eskimos (Spencer 1959: 3).

Additional ethnographic data for the late nineteenth century is derived from census reports (U.S. Census Bureau 1884; U.S. Census Bureau 1893, cited in VanStone 1962: 3), and from the work of Froelich Rainey (1947), who reconstructed the culture of the Point Hope Eskimos prior to 1900, based on interviews conducted in 1940 with elders of the community. Focusing primarily on the annual subsistence cycle of this group, Rainey's sketch is considered to be "limited in scope" (Oswalt 1967: 234).

Finally, Robert Spencer's (1959) ethnography of the Point Barrow Eskimos provided useful information, despite criticisms that the data, obtained from informant interviews conducted from 1952 to 1953, pertains not to the Point Barrow Eskimos of Murdoch's time, but to the inland Eskimos. The latter are reported to have moved to the coast after the turn of the century, replacing the northern coastal Eskimos who had been decimated by disease as a result of contact with Europeans (Jenness 1927: 168, cited in Oswalt 1967: 235; Ford, personal communication 1957, cited in Stewart 1959: 246).

Environment

The Aleuts occupy a volcanic island chain consisting of approximately 100 islands extending in an east-west direction for a distance of 1,450 kilometers. The archipelago is characterized by complex coastlines, reefs, tidal pools and lagoons, lakes, beaches, cliffs, and deep waters with turbulent currents (Laughlin 1980: 23). Trees, permafrost, and sea ice are absent (Lantis 1984: 161). Common climatic conditions include moderate temperatures, frequent storms, high winds, fog, and rain (Lantis 1984: 161).

The northern coastal Eskimos inhabit an almost flat, coastal plain ranging from 30 to 90 miles in width (Spencer 1984a: 278). Covering the tundra are numerous species of flowering plants, moss, grass, and lichens. Unlike the Aleutian Islands, the northern coast has both permafrost and sea ice (Spencer 1959: 10-12). The climate is characterized by long, cold winters and relatively short, cool summers, with little annual precipitation (Spencer 1959: 11).

Subsistence

The Aleuts traditionally relied almost exclusively on marine resources for their subsistence. Their diet included sea otters, fur seals, hair seals, sea lions, and whales, as well as numerous species of fish, shellfish, and birds (Laughlin and Aigner 1975: 182-183; L. Black 1981a: 115; Veniaminov 1984: 276). The few terrestrial resources available, including bears, caribou, and wolves, were restricted to the Alaskan Peninsula and Unimak Island (Lantis 1984: 175). The eastern Aleuts are reported to have had dogs prior to contact (Merck 1980: 179), but by 1778, these animals had apparently disappeared (Cook 1967, 3(1): 465). Plant foods supplied only 10% of the Aleuts' total caloric intake (Laughlin and Aigner 1975: 183).

Most foods were consumed raw (Masterson and Brower 1948: 45; Cook 1967,

3(1): 460; Shelikhov 1981: 78; Veniaminov 1984: 278) and were therefore a potential source of parasitic infections (Fortuine 1989: 60, 315). Some foods, however, were cooked using heated rocks (Makarova 1975: 79; Shelikhov 1981: 78), or roasted on a spit (Andreyev 1948, cited in L. Black 1984: 61). Depending on climatic conditions, fish were sometimes air-dried (Veniaminov 1984: 276).

Despite the fact that the food resources available to the Aleuts were abundant and varied (Moorrees 1957: 12; L. Milan 1974: 16), the restricted distribution and seasonal availability of these resources (McCartney 1975; Yesner 1977), as well as the difficulty of storing such food in a damp environment, often resulted in annual food shortages in late winter and early spring (Veniaminov 1984: 179, 257). Tectonic and volcanic activity also contributed to food shortages on occasion by causing local disruptions in the availability of food resources (L. Black 1981b). While it is impossible to determine how many deaths resulted from these annual food shortages (McCartney 1975: 302), according to native oral tradition, more Aleuts died from hunger than from warfare prior to contact (Veniaminov 1984: 257).

The arrival of Russians brought about a number of important changes in Aleut subsistence, most notably the practice of hunting for commercial purposes and the introduction of new food items. Fox trapping was introduced by the Russians in the mid-eighteenth century, while sea otters and fur seals became important commercial crops in the latter part of the century. Among the new foods introduced to the Aleuts were sugar, tea, butter, and flour (Heller and Scott 1967, cited in L. Milan 1974: 21). However, nutritional changes resulting from contact appear to have been minimal (L. Milan 1974: 21). The new food items supplemented rather than replaced their traditional diet, and were often given to Creoles (individuals of mixed Russian and Aleut ancestry) rather than Aleuts (L. Milan 1974: 21). More significant than the introduction of new foods were starvation and malnutrition, which continued to plague

the Aleuts in the later contact period. Famine often occurred when the labour demands of the Russians prevented the Aleuts from obtaining enough food for their families (L. Milan 1974: 19-20), and deaths from starvation, particularly among children, were reportedly frequent (Levashov, cited in Masterson and Brower 1948: 58).

The Aleuts were unfamiliar with alcoholic beverages until 1741, when a crew member of Bering's expedition offered one of them a cup of brandy (Steller 1988: 100). Russian fur hunters carried on board their ships a beverage known as *kvass*, a type of home-brewed beer made from roots or other natural products (Merck 1980: 87, 99) and used to prevent scurvy (Chevigny 1965: 37). The method of manufacturing kvass was later passed on to the natives (Andreyev 1952: 169), although alcohol abuse appears to have been more of a problem among the Russians than among the native population (Fortuine 1989: 280).

Tobacco was also unknown to the Aleuts prior to European contact. Their first introduction to the substance occurred in 1741, when members of Bering's crew presented the Aleuts with pipes of tobacco (Steller 1988: 100). In the years that followed, the Russian fur hunters gave tobacco to the natives as gifts (Bancroft 1959: 103), as payment for their labour (Sauer 1802: 275), and as a means of obtaining sexual favours (Samwell in Cook 1967, 3(2): 1121). By the late eighteenth century, the use of tobacco, which was always chewed or taken as snuff rather than smoked (King in Cook 1967, 3(2): 1426; Ellis 1969, 1: 285; Ellis 1969, 2: 56; Veniaminov 1984: 279), had become extremely popular among the Aleuts, who were willing to exchange their entire supply of fish for the substance (Merck 1980: 170). Health consequences of their use of tobacco included the development of asthma (Dall 1870: 81) and respiratory infections (Fortuine 1989: 276).

Unlike the Aleuts, who relied almost exclusively on marine resources for their subsistence, the northern coastal Eskimos traditionally subsisted on both marine and terrestrial fauna, including whales, seals, walrus, polar bears, caribou, birds, and fish (Murdoch 1988: 61). Vegetable foods made up only a small part of their total diet (Burch 1981: 33; Murdoch 1988: 62). Although sometimes eaten raw or frozen, meat was usually boiled in water over a fire (Murdoch 1988: 63). In contrast to the Aleuts, the Eskimos were able to preserve and store food by freezing it in large caches dug into the ground (Burch 1981: 53).

Despite the general abundance of food resources (Burch 1981: 9), the northern coastal Eskimos also suffered annual food shortages, especially during the winter months (Burch 1981: 51). Lieutenant Joseph Powell, a member of the U.S. International Polar Expedition, remarked that food was often scarce in the winter, and that a failure to obtain an adequate supply of seal or caribou meat would inevitably lead to starvation (J. Powell 1988: lxii). In 1853, for example, a lack of food resources resulted in the deaths of over 20 Point Barrow Eskimos from starvation (J. Simpson 1855: 935; J. Simpson 1875: 237-249).

Contact with American whalers and traders resulted in a number of significant changes in Eskimo subsistence. Of primary importance were the commercial hunting of whales and walruses, and the reduction of traditional food resources due to overhunting. By 1885, an estimated 10,000 whales (Foote 1964: 18) and 150,000 walruses (Bockstoce 1986: 135) had been harvested for their oil or baleen. Also reduced were the seal and caribou populations (Gubser 1965: 7), a reduction attributed to the introduction of firearms and to a natural cyclical decline of these resources. An attempt by the U.S. government to provide the Eskimos with a more stable subsistence base through the introduction of domestic reindeer was ultimately unsuccessful (VanStone 1962: 27).

Of lesser significance was the introduction of new foods, including flour, bread, molasses, sugar, salt, and tea (Oswalt 1967: 132; Murdoch 1988: 62). While such

foods may have been beneficial to the Eskimos (Murdoch 1988: 54), they were only available for two months of the year (Murdoch 1988: 54). Therefore, they provided little security when traditional food resources were scarce, as was the case during the winter of 1881 to 1882, when the Point Barrow Eskimos suffered from starvation even though Murdoch and his crew were living nearby (P. Ray 1988c: c). As Murdoch (1988: 53) maintains, however, the Eskimos were less susceptible to famine during this time period than in earlier years due to the fact that firearms now made food easier to obtain.

Alcohol, unknown to the northern coastal Eskimos prior to European contact, was introduced to the natives by whalers and trading vessels, and by 1870, had become a popular trade item (Foote 1964: 18). The natives likely initially obtained alcohol only in small quantities (Foote 1964: 18) until 1888, when they learned how to manufacture the beverage themselves using flour, molasses or sugar, and water (Bertholf 1899: 20; Brower 1942: 113). In some cases, alcohol abuse led to violence (Brower 1942: 132), drownings (Fortuine 1989: 298), and starvation due to the failure to hunt (C. Hooper 1881: 62-63).

Tobacco was already in use among the Point Barrow Eskimos by 1826 (Murdoch 1988: 65). Having originally obtained it from Siberia through trade (Oswalt 1979: 205), the Eskimos encountered by Beechey and Simpson were quite anxious to procure the substance (F. Beechey 1831, 1: 423), and would trade their most valuable possessions for a single inch of it (T. Simpson 1970: 157). Snuff appears to have been unknown to the northern coastal Eskimos, and the tobacco they obtained was either chewed or smoked by both men and women. The juice was swallowed with no apparent ill-effects (Murdoch 1988: 66), while smoke, which was always inhaled, produced a violent reaction (F. Beechey 1831, 2: 304; Murdoch 1988: 70; P. Ray 1988c: cii), and probably aggravated existing respiratory infections (Murdoch 1988: 39).

Settlement Pattern

At the time of Russian contact, Aleut villages were widely scattered (L. Black 1981b: 314). Most settlements were located along the northern side of the island chain, where an abundant supply of food and driftwood could be found (Veniaminov 1984: 258). Some islands were uninhabited, while others were occupied only seasonally (L. Black 1981b: 314). Settlement size varied, depending on function and the time of year. Traditionally, there were four types: "base camps, all-year villages, and satellite villages and camps" (Laughlin 1972: 382). Like some Eskimo groups, the Aleut population dispersed during the summer months to take advantage of resources such as fish or birds (Laughlin 1972: 382). In general, the more favourable environment of the eastern Aleutians supported larger and more numerous settlements than that of the western islands (Laughlin 1980: 23; L. Black 1981b: 314). Consequently, the eastern Aleuts were more susceptible to newly-introduced, density-dependent diseases such as smallpox, measles, and influenza.

Following contact, islands traditionally unoccupied became settled as the Russians transferred the Aleuts to new hunting grounds. As well, former villages were abandoned as natives were relocated, and the Russians established their own settlements in the island chain (Fedorova 1973). During this period, native settlements commonly numbered about 50 individuals, although some of the larger villages contained as many as 200 to 300 individuals (Shelikhov 1981: 76).

The northern coastal Eskimos maintained large, permanent coastal villages as well as smaller settlements, some temporary and some of longer duration (Spencer 1959: 18; Stanford 1976: 89). Settlement size varied, depending on factors such as food supply, disease, and mobility (Spencer 1984b: 326). Summer camps were small, consisting of four to five tents, each one housing a single family (Murdoch 1988: 83, 85). In contrast, settlements formed during the spring whaling season, such as Tigara

and Utkiavik, were large. Archaeological evidence suggests that the Point Hope settlement may have numbered at least 1000 individuals in the early nineteenth century (Rainey 1947: 236).

Housing

At the time of contact, the Aleuts lived in large, semi-subterranean dwellings called *barabaras*. They consisted of a frame of driftwood logs or whale bones, covered with grass, sod, and skins. One or more doorways were built into the roof, and entry into the dwelling was facilitated by the use of a ladder. These openings also provided ventilation and light. The interior usually lacked hearths, and oil lamps were used to provide heat. Most dwellings lacked any type of flooring, and woven grass mats were used for sleeping. Wooden posts running along the inside walls acted as dividers for the compartments occupied by each family (Sarychev 1807: 72; Merck 1980: 68-69; Billings 1980: 202; Veniaminov 1984: 262-263). While this type of dwelling was used by the Aleuts for much of the year, temporary structures made of skins and matting were also utilized during the summer months or on hunting expeditions (Hulley 1953: 16). Ellis (1969, 2: 47) commented that the Aleuts resided in the same dwelling in both the summer and winter months, while Merck (1980: 169) remarked on the use of both summer and winter dwellings, the latter being slightly warmer with small storage huts attached to them.

All dwellings were rectangular, however their size varied considerably (Laughlin 1980: 50), depending on the number of occupants. In the contact period, most sources indicate that Aleut houses were occupied by many individuals, numbering 30 or 40 (Levashov, cited in Masterson and Brower 1948: 58) to as many as 300 or 400 (Makarova 1975: 81), and possibly 500 individuals (Shmalev, cited in Makarova 1975: 81). Representing anywhere from 10 to 40 families, most of these individuals were related (Veniaminov 1984: 262).

Commenting on the lack of cleanliness in the Aleut dwellings, Cook (1967, 3(1): 461) wrote

> Round the sides and ends of the hut each family have their separate appartments, where they sleep and sit at work, not on benches but in a kind of a Concave trench, which is dug all round inside of the house and covered with Mats, so that these places are tolerable decent. But the middle of the house, which is common to all, is just the reverse for altho it is covered with dry grass it is a receptacle for all the dirt in the house and the place for the Urine trough...

Similarly, Sarychev (1807: 72) noted that the Aleuts "empty their dirty slops and every filth, into the middle of this common dwelling, which becomes by that means excessively wet and muddy". Such unhygienic conditions undoubtedly contributed to the spread of disease (Fortuine 1989: 35).

Following the arrival of Russians, Aleut dwellings underwent a number of changes, the most significant being a reduction in size. Considering the large, communal dwellings to be detrimental to the health of the natives (Jones 1976: 20; Veniaminov 1984: 264), one Russian by the name of Rezanov ordered the Aleuts to build smaller, single-family structures, although larger communal dwellings continued to exist in some villages in the nineteenth century (L. Black 1984: 64, Veniaminov 1984: 265). This trend towards single-family dwellings also reflected attempts by the missionaries to enforce the practice of monogamy among the Aleuts, who commonly practised polygamy (Jones 1976: 20). Rezanov also ordered the dwellings to be built above ground (Veniaminov 1984: 264), believing the semi-subterranean type to be unhealthy. Other changes included the removal of the roof hatches and the construction of windows and doors in the front and rear walls (Veniaminov 1984: 264), and the construction of wooden benches and flooring (Lantis 1984: 167).

Contrary to Rezanov's opinion, a number of older Aleuts believed the Russian

innovations to be harmful to their health, asserting that the construction of low doorways and small windows restricted air circulation (Veniaminov 1984: 265). Indeed, given the difficulty of adequately heating above-ground dwellings, and the fact that the introduction of such dwellings in the Pribilof Islands in the latter half of the nineteenth century resulted in a significant increase in the incidence of respiratory illness and mortality (L. Black, footnote in Veniaminov 1984: 265), it appears that such housing was, in fact, more harmful to the Aleuts than beneficial (Laughlin, cited by L. Black, footnote in Veniaminov 1984: 265).

The dwellings of the northern coastal Eskimos were traditionally of two types: permanent, rectangular semi-subterranean structures utilized in the winter, and temporary skin tents used in the summer. At Point Barrow, winter houses were constructed of driftwood planks which formed the floor, walls, and sloping roof, the latter containing a window of seal intestine as well as a ventilation hole (Murdoch 1988: 72-74). Covering the entire structure, with the exception of the window and hole, were layers of sod. The living area, which measured approximately 8 to10 feet by 12 to14 feet (Murdoch 1988: 73), was entered through a trapdoor in the floor, which connected the area to a subterranean tunnel approximately 25 feet in length and 4 feet in height (Murdoch 1988: 72). This passageway acted as a trap, preventing cold air from entering the house (Oswalt 1967: 110). Storage rooms and a kitchen were located along the sides of the passageway. In the interior of the living area, a bench used for sleeping or sitting ran along the rear wall. At each end, a soapstone lamp provided light and heat, while racks were placed over the lamps for drying clothes. Each winter house usually accommodated two families averaging eight individuals (Burch 1981: 43; Spencer 1984b: 327), although Murdoch (1988: 75) knew of one house at Point Barrow with 13 occupants.

During the summer months, when winter dwellings became too wet to use (Murdoch

1988: 76), the Eskimos lived in tents made of caribou or seal skins stretched over a frame of driftwood poles (Oswalt 1967: 101; Murdoch 1988: 83-84). Measuring approximately 12 feet in diameter at its base, each tent housed one family. No oil lamps were used inside the tent, and all cooking was done outside over a fire (Murdoch 1988: 85).

According to Murdoch (1988: 420), the living areas of the winter houses at Point Barrow were kept clean inside, although earlier visitors to the area remarked that they were poorly ventilated and hot (Maguire 1969: 376). In contrast, the passageway and exterior of the houses were filthy, acting as receptacles for human waste, food refuse, and dog feces (F. Beechey 1831, 1: 367; Spencer 1959: 57; Murdoch 1988: 421). These conditions, combined with the poor air quality and circulation in the living area, undoubtedly provided an ideal breeding ground for disease (Fortuine 1989: 33). Early visitors also commented on the lack of cleanliness in the summer tents (F. Beechey 1831, 1: 361).

The housing of the northern coastal Eskimos underwent a number of changes following contact with whalers and traders. Canvas gradually replaced the caribou and seal skins traditionally used in the construction of summer dwellings (Murdoch 1988: 84), and at Point Barrow, the Eskimos were encouraged by the missionaries to abandon their traditional winter dwellings in favour of frame houses. As the latter were more difficult to heat, they tended to be cold and drafty, with the result that some of their occupants developed pneumonia (Brower 1942: 190).

Transportation

The Aleuts used two types of boats, large open vessels known in Russian as *baidaras,* and smaller kayaks, or *baidarkas*. The former, which could hold as many as 30 to 40 individuals (Levashov, cited in Masterson and Brower 1948: 58; Jones 1976: 12;

Shelikhov 1981: 78), were used for long, inter-island trips, for war parties (Jones 1976: 12), for transporting large cargoes (Veniaminov 1984: 275), and for moving women and children from one island to another (Masterson and Brower 1948: 45). In contrast, baidarkas, which accomodated one to three individuals, were used primarily for hunting and fishing (Jones 1976: 12). As Aleut males spent much of their time travelling and hunting on open water, they were frequently at risk of accidental death from drowning (Fortuine 1989: 45).

Among the northern coastal Eskimos, the primary means of water transportation was the *umiaq* , a large, open boat measuring up to 30 feet in length and consisting of a driftwood frame covered with sea mammal skins (Murdoch 1988: 335-337). Capable of accommodating 6 to12 people (Spencer 1984b: 330), the umiaq was used for hunting and fishing, as well as for traveling and trading expeditions (Spencer 1959: 201; Murdoch 1988: 335). Another important mode of water transportation was the kayak. Designed to carry only one person, the kayak was utilized primarily for short trips inland, or when traveling short distances between camps along the coast (Murdoch 1988: 328). Finally, two types of sleds were used for land transportation. Constructed of driftwood with bone runners, both types were drawn by dog teams (Murdoch 1988: 353, 357). Falls from moving sleds during subsistence pursuits were a potential cause of injury among the Eskimos (Fortuine 1989: 46).

Technology

The hunting and fishing equipment of the Aleuts included spears, knives, darts and arrows with bone or stone points, daggers, axes, fishhooks, harpoons, lances, and clubs (Laughlin 1980: 39-40; Veniaminov 1984: 283-285). All hunting and fishing implements were made of bone, stone or wood, and were manufactured using a variety of different tools. Household utensils included wooden bowls and buckets, large wooden or bone spoons, bone sewing needles, containers made of skins or organs, lamps, and woven grass baskets and mats (Lantis 1984: 169; Veniaminov 1984: 280). The Aleuts were already familiar with iron at the time of Russian contact (Steller 1988: 103), acquiring it from shipwrecks and from trade with mainland Eskimo groups (L. Black 1984: 62).

The Aleuts obtained a variety of new items as a result of their contact with Russians, including iron and copper kettles, iron knives and axes, fox traps, needles, glass bottles and beads, and dishes (Sauer 1802: 275; Sarychev 1807: 73; Laughlin 1980: 130; Veniaminov 1984: 280, 283). By the time of Veniaminov's arrival on Unalaska in 1824, the Aleuts were reportedly using few of their traditional implements with the exception of spears (Veniaminov 1984: 283). For their own protection, the Russians did not trade swords or firearms to the islanders (Laughlin 1980: 130).

The artifact assemblage of the northern coastal Eskimos was characterized by a wide variety of implements made of stone, wood, ivory or bone. Traditional hunting and fishing equipment included bows and arrows, harpoons, ice picks, lances, darts, throwing boards, knives, spears, nets, and fishhooks (Bockstoce 1977; Murdoch 1988). Household utensils consisted of skin bags, wooden buckets and tubs, bowls, spoons, ladles, wooden trays, whalebone cups, stone pots, soapstone lamps, and pottery vessels (Larsen and Rainey 1948: 181; Bockstoce 1977; Murdoch 1988). In addition, the Eskimos possessed an assortment of manufacturing tools (Larsen and Rainey 1948: 180-181; Bockstoce 1977; Murdoch 1988). At the time of contact, they had in their possession copper, which originated in Siberia (F. Beechey 1831, 2: 306).

By the 1880s, the traditional technology of the northern coastal Eskimos had undergone a number of important changes, most notably the addition of firearms, which contributed to the depletion of local game and periodic starvation (Foote 1964: 19). Originating from Russian ships and trading posts to the south, and from the Hudson's Bay

Company posts to the east, firearms probably did not reach the northern Alaskan coast until the mid-nineteenth century (Foote 1964: 17-18). By 1880, many Eskimos were in possession of muskets, which were replaced shortly after by repeating rifles, which soon became their primary hunting weapon (Foote 1964: 18). At the time of Murdoch's visit to Point Barrow, nearly all of the Eskimos there had guns and had become dependent on the whalers for ammunition (Murdoch 1988: 54). With the introduction of firearms, the use of the bow declined (Rainey 1947: 267; Bockstoce 1977: 20; J. Powell 1988: lxii), although some Point Barrow Eskimos still utilized this implement in the early 1880s (Murdoch 1988: 195).

Clothing

The traditional Aleut garment was the parka, made of sea mammal or bird skins (Merck 1980: 78, 169; Billings 1980: 200; Veniaminov 1984: 268). During rainy weather, males also wore a *kamleika*, a hooded waterproof garment made of sea lion or seal intestines (Makarova 1975: 80; Veniaminov 1984: 266). Other items of apparel included hats, worn by males to protect their eyes from the sun and salt water during hunting and fishing expeditions (Jochelson 1968: 26, Veniaminov 1984: 269), sealskin trousers (Waxell 1952: 118, cited in L. Black 1984: 59; Merck 1980: 77, 170), and various forms of footwear (Sauer 1802: 155; Merck 1980: 77, 170; L. Black 1984: 58-59; Veniaminov 1984: 267; Steller 1988: 103). Most individuals wore the same set of clothing year round (Merck 1980: 81). Early visitors to the Aleutians remarked that the skin clothing of the Aleuts was often infested with lice (Edgar in Cook 1967, 3(2): 1351), a potential cause of skin infections (Fortuine 1989: 65). In the later contact period, sea otter parkas were replaced by birdskin (Veniaminov 1984: 268) or fur seal skin parkas (Billings 1980: 201), following a Russian ban on the use of sea otter skins (L. Black 1984: 59). In addition to their traditional parkas, the Aleuts also

began wearing items of cloth, including shirts, trousers, neckties, waistcoats, dresses and shawls (Veniaminov 1984: 268).

The basic item of apparel of the northern coastal Eskimos was the parka, which consisted of a one-piece hooded garment made of caribou skins (Murdoch 1988: 109-110). In wet weather, both sexes wore over their parka a hooded, waterproof garment made of seal or walrus intestines (Murdoch 1988: 122). Other items of clothing included sealskin trousers and boots, caribou skin cloaks, gloves, mittens, and belts (Murdoch 1988: 110-111, 121, 135). Some individuals owned only one set of clothing, and most wore little clothing inside their homes (Murdoch 1988: 112). Like the clothing of the Aleuts, the garments worn by the Eskimos were commonly infested with lice (C. Hooper 1884: 103).

The Eskimos adopted a number of innovations in their clothing following contact with the whalers. Gloves became popular after the introduction of firearms (Murdoch 1988: 125), garments of cotton cloth, typically calico, were worn over parkas to keep out the snow (Murdoch 1988: 111), and pockets were added to clothing (Murdoch 1988: 112). However, the traditional fur parka continued to be the preferred choice of garment in winter (Murdoch 1988: 109).

Trade

The Aleuts traditionally traded primarily amongst themselves, exchanging such items as sea lion and sea otter pelts, wooden hats, clothing, and arrows (Shelikhov 1981: 77). Women never conducted trade (Wrangell 1980: 99), while the men traded through an intermediary, thus avoiding direct contact with one another (Veniaminov 1984: 212). Although it is unknown how often exchanges were made with people from distant settlements, the Aleuts are reported to have travelled as far as the Chugach and Kenai territories in south-central Alaska to obtain certain trade items (Veniaminov

1984: 213). Apparently, no regular trading relationship existed between the Aleuts and Eskimos (Jochelson 1968: 22).

The northern coastal Eskimos had a well-organized and widespread trade network (Oswalt 1979: 207), enabling them to obtain resources that were either lacking or unavailable in their own territory. Important trading centres were located at Hotham Inlet in Kotzebue Sound, at the mouth of the Utukok River between Icy Cape and Point Lay, at Negalik, an island at the mouth of the Colville River, and on Barter Island, east of Point Barrow (Oswalt 1967: 132) (see Spencer 1959 for map of aboriginal trade routes). Here, the northern coastal Eskimos came into contact with inland Alaskan Eskimos, Canadian Eskimos, and natives from Cape Prince of Wales, the Diomede Islands, and East Cape, Siberia (J. Simpson 1875: 236, 265-267; Rainey 1947: 240; Oswalt 1967: 132). The most important trading relationships were between the inland and coastal Eskimos, the latter exchanging sea mammal oil for caribou skins (Rainey 1947: 268).

Trading expeditions were carried out annually during the summer months, when large groups of Eskimos travelled by boat to the trading centres, where they remained for several weeks (Burch 1981: 57). The size of these settlements attests to their importance as trading centres. An estimated 600 individuals congregated at Negalik at the peak of the trading season (Oswalt 1967: 133), while at least one thousand people converged at the trading centre in Kotzebue Sound (Burch 1981: 57). Given their size and density, it is not surprising that native trading centres such as these have been identified as major foci of infectious diseases (Dobyns 1992; Herring 1992: 159).

Trade between different Eskimo groups reportedly intensified following Beechey's voyage to the northern Alaskan coast, resulting in widespread changes in the material culture of these groups (Spencer 1959: 359). However, the arrival of whalers in the mid-nineteenth century ultimately contributed to the breakdown of the traditional native trading system (Chance 1966: 13) as the Eskimos began acquiring goods directly from the whalers themselves, rather than from other native groups (Murdoch 1988: 49). The types of items exchanged also changed following European contact. Trade goods commonly sought from the whalers included rifles, ammunition, alcohol, iron, beads and tobacco (Burch 1981: 57; Murdoch 1988: 49). At the same time, the demand for such items as Siberian knives, stone lamps, and other stone artifacts declined (Murdoch 1988: 49).

Warfare

According to oral tradition, warfare was very common among the Aleuts prior to the arrival of Russians, although native reports of the frequency and severity of warfare were likely exaggerated in order to impress foreigners (Lantis 1970: 271). Some Aleut settlements are reported to have been fortified (Lantis 1984: 177), while their dwellings are said to have contained hidden exits in the walls in order to allow the occupants to escape in the event of an attack (Masterson and Brower 1948: 45).

When warfare did occur, it usually consisted of surprise attacks and ambushes by relatively small groups, the Aleuts relying more on strategy than on force to win (Lantis 1970: 268). The primary reason for these attacks was to exact revenge for insults, raids or murders (Lantis 1984: 177). Other contributing factors included the desire for women (Levashov, cited in Masterson and Brower 1948: 59), slaves, and certain rare materials (Jones 1976: 14).

Wars were fought between different dialect groups of Aleuts, and between the Aleuts and more distant, unrelated groups. The Aleuts on the Alaskan Peninsula were frequently raided by those on Unimak Island (Coxe 1780: 261), the Unalaskans, aided by their allies the Umnak Aleuts, waged war against the Atka islanders, and the Atka Aleuts raided both the Rat and Near islanders (Veniaminov 1984: 372). In addition, the Aleuts

engaged in warfare against the Koniags, whom they considered their worst enemies, and against the Aglegmiut Eskimos of the Bristol Bay-Nushagak region (L. Milan 1974: 16).

Enemy warriors were frequently killed in raids (Veniaminov 1984: 250), while the women and children were taken as slaves, or *kalgas* (Makarova 1975: 83), a practice which Lantis (1984: 177) considers to have been "the most important means of culture diffusion." Such slaves were sometimes physically abused or even killed (Merck 1980: 80). The presence of what appear to be cremated skeletal remains (USNM #378,731) in one of the Kagamil Island burial caves has been interpreted by Hrdlicka (1945: 150) as representing a sacrificial cremation of slaves.

In the years prior to the arrival of Russians, Aleut warfare is reported to have become so severe that entire settlements were destroyed and the native population was greatly reduced (Veniaminov 1984: 248, 250). According to Veniaminov (1984: 185, 250), the arrival of Russians in the mid-eighteenth century put an end to native warfare. At the time of his visit in 1778, Captain Cook commented that the Aleuts had no weapons of warfare due to their disarmament by the Russians, and that they lived peacefully with one another (Cook 1967, 3(1): 459, 462, 468). Similarly, Sarychev (1807: 78) reported peaceful relations among the Unalaskans 13 years later. However, if the oral tradition of the Atkan Aleuts is correct, warfare, in fact, continued well into the Russian period (Bergsland 1959, cited in L. Black 1984: 56). One incident of inter-tribal warfare is reported to have occurred on Attu Island as recently as 1827 (Khlebnikov 1979, cited in L. Black 1984: 81), while a raid on the Umnak islanders by a party of seven Atka Aleuts is said to have occurred sometime between 1795 and 1800 (Laughlin 1980: 54). Black (1984: 81) has hypothesized that such inter-tribal conflict may actually have intensified following contact due to competition for Russian trade.

According to Burch (1974), warfare in northwestern Alaska was widespread and

intense, although how frequently it occurred prior to contact is impossible to ascertain (1974: 3). Despite their close trading relationship, the northern coastal Eskimos and the inland Eskimos reportedly engaged in conflict with one another on occasion (Rainey 1947: 240; Gubser 1965: 39, 43), although their interdependence likely prevented such conflicts from continuing for any length of time (Oswalt 1967: 183). Consequences of such conflicts included starvation resulting from the loss of hunters, as reportedly occurred among the Point Hope Eskimos around 1800 (Jackson 1893: 1278).

Conflict took the form of family feuds, which were usually precipitated by a murder, and which had the potential of developing into pitched battles (Rainey 1947: 242). The underlying causes of such feuds, some of which lasted for generations (Rainey 1947: 242), included disputes over women (Oswalt 1967: 182), resources (Rainey 1947: 242), or, in later years, alcohol (Murdoch 1988: 41). The sole objective of these conflicts was to exact vengeance (Burch 1974: 3), ideally by destroying the enemy, including women and children (Burch 1974: 11). Like the Aleuts, the northern coastal Eskimos relied on surprise attacks at night to achieve their objective (Burch 1974: 8). In addition, they also engaged in "open battles" during the daytime (Burch 1974: 10). Unlike the Aleuts, the Eskimos rarely took prisoners and those they did take, usually women, did not survive for long (Burch 1974: 11). The arrival of Europeans reportedly put an end to native warfare soon after contact (Burch 1974: 1), although feuds resulting in murder continued to occur after 1885 (Brower 1942: 124, 181-182).

Summary

It is clear from the foregoing discussion that many aspects of their physical and cultural environment provided conditions favourable for the outbreak of disease among

the northern coastal Eskimos and Aleuts prior to, and following, contact. In terms of their subsistence, close contact with animals and their waste products predisposed them to a variety of zoonotic and parasitic infections (Fortuine 1989: 59-63). The practice of eating raw or undercooked foods also placed them at risk of parasitic infections (Fortuine 1989: 60, 315), while the ingestion of contaminated food and water increased the chance of infections of the gastrointestinal tract (Fortuine 1989: 70, 315). Periodic episodes of starvation provided the potential for vitamin and iron deficiencies to occur, and made these groups more susceptible to infectious diseases, while the nature of their climate and subsistence pursuits placed them at risk of traumatic injury, hypothermia, frostbite, and drowning (Fortuine 1989: 46, 315). The use of tobacco may have contributed to the development of respiratory infections (Fortuine 1989: 276), or aggravated existing ones (Murdoch 1988: 39), while the consumption of alcohol made these groups more susceptible to accidents, infections, and starvation (Fortuine 1989: 298-299).

The occupation of permanent winter villages coupled with the lack of sanitation in these villages undoubtedly provided conditions ideal for the spread of disease. Similarly, the occupation of permanent winter houses that were smoky, crowded, poorly ventilated, and filled with refuse also provided the opportunity for disease-causing microorganisms to flourish. Such conditions would have been particularly conducive to the spread of airborne infections (Fortuine 1989: 315). Compounding the risk of such infections was the lack of personal hygiene and the custom of wearing heavy fur clothing that could not be washed, thus allowing parasites such as lice to thrive (Fortuine 1989: 64).

Methods of transportation undoubtedly made the northern coastal Eskimos and Aleuts more susceptible to accidental injury or death. Among the Eskimos, falls from moving sleds were a potential cause of injury, while frequent water travel placed both groups at risk of drowning (Fortuine 1989: 45-46). Technology, particularly the introduction of firearms, clearly contributed to starvation and malnutrition due to the depletion of local game. Trade networks provided a good opportunity for the transmission of disease from one settlement to another, while the concentration of large numbers of people at trading centres made conditions ideal for the spread of infection. Finally, the practice of warfare prior to contact placed these groups at increased risk of injury (Weyer 1932: 155), starvation (Jackson 1893: 1278), and death.

CHAPTER 5

MATERIALS AND METHODS

Sample Selection

The selection of the samples utilized in the present study was based on three criteria: 1) size, 2) location, and 3) temporal position. Emphasis was placed on analysing the maximum number of specimens available that were of known provenience. Therefore no age or sex restrictions were placed on the sample selection. All individuals of uncertain temporal position or location were eliminated from the analysis. A total of twelve samples, six from Point Barrow, two from Point Hope, and four from the Aleutian Islands, were selected for examination, five of them representing the pre-contact period and seven, the late pre-contact/contact period (hereafter referred to as "post-contact") (see Table 1). A minimum of 592 individuals are represented by the samples, 193 from the earlier period and 399 from the later period. All of the remains are currently housed at the U.S. National Museum (USNM).

Sample Descriptions

I. Pre-Contact Samples

Kugusugaruk

From 1918 to 1919, a school teacher named W. B. Van Valin excavated six burial mounds at a place called Kugusugaruk, located approximately 16 km southwest of the village of Barrow (see Figure 2), for the University of Pennsylvania Museum. First transferred to the Wistar Institute of Anatomy in 1928, most of the collection was

Table 1 - Skeletal Samples Used in the Analysis

Sample	MNI*	Location	Temporal Position	Previous Studies
Pre-Contact Period				
Eskimos				
Kugusugaruk	42	Point Barrow	A.D. 500-900	Morant 1937
Kugok	11	Point Barrow	A.D. 500-900	Fischer-Moller 1937
Piginik	9	Point Barrow	A.D. 500-900	Hrdlicka 1930, 1942
Tigara	66	Point Hope	A.D. 1400-1850	Stewart 1939, 1959
Total	128			Jorgensen 1953
				Ford 1959
				Oschinsky 1964
				Zegura 1978
				Helmuth 1975
				Utermohle 1982, 1984
Aleuts				
Umnak Island I	65	Umnak Island	1000 B.C.-A.D. 1500	Hrdlicka 1944b, 1945
Total	65			Utermohle 1982, 1984
				Turner 1991
TOTAL	**193**			

* Minimum number of individuals

Table 1 - Continued

Sample	MNI*	Location	Temporal Position	Previous Studies
Post-Contact Period				
Eskimos				
Barrow	37	Point Barrow	19th century	Collins 1933
Nixerak	62	Point Barrow	18th-19th century	Morant 1937
Utkiavik	33	Point Barrow	19th century	Stewart 1959
Point Hope	40	Point Hope	19th-20th century	Hrdlicka 1927, 1930, 1942, 1943
Total	172			Jorgensen 1953
				Ford 1959
				Zegura 1971, 1975, 1978
				Helmuth 1975
				Szathmary and Ossenberg 1978
				Utermohle 1982, 1984
				Heathcote 1986
Aleuts				
Umnak Island II	6	Umnak Island	18th century	Hrdlicka 1941b, 1944b, 1945
Shiprock Island	62	Shiprock Island	14th-18th century	Turner 1967
Kagamil Island	159	Kagamil Island	A.D. 1400-1780	Ossenberg 1969, 1977
Total	227			Zegura 1971, 1975, 1978
				Szathmary and Ossenberg 1978
				Frohlich 1979
				Utermohle 1982, 1984
				Heathcote 1986
				Turner 1991
TOTAL	**399**			

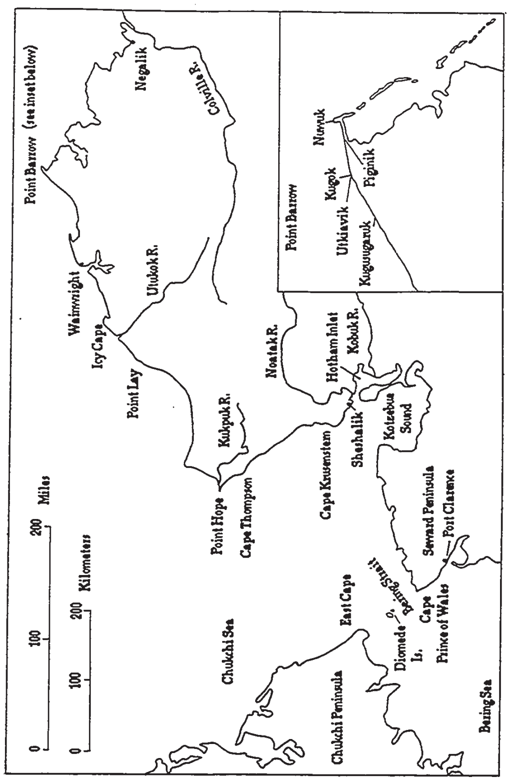

Figure 2. Northern coastal Alaska

donated to the U.S. National Museum in 1956. J. Alden Mason (1930), who compiled and published Van Valin's original fieldnotes, reported that the six mounds, each containing a structure, yielded the remains of 83 individuals. Most were lying on their backs on beds of moss or willow, or on wooden boards, with their personal belongings placed by their side. Ford (1959: 20-21) has recopied and reproduced Van Valin's original sketches of the burial positions and the artifacts associated with each one. While Van Valin thought the structures contained within the mounds were houses, whose inhabitants had died of starvation, an epidemic, or some other affliction (Mason 1930: 384), Mason (1930: 384-385), Brower (quoted in Hrdlicka 1930: 319) and Hrdlicka (1930: 322) believed them to be burial structures on the basis of the age distribution of the deceased (the majority of individuals were over 45 years of age), the orderly arrangement of the bodies, the large number of individuals contained within the structures, and the placement of their personal possessions by their side.

Van Valin considered the remains to date from the Thule period (Mason 1930: 392); however, more recent analyses of artifact types have placed the site within the Birnirk period, dated at A.D. 500 to 900 (Ford 1959: 21, Stanford 1976: 108). This placement has been corroborated by four radiocarbon dates ranging from A.D. 337 to A.D. 811 (Rainey and Ralph 1959: 367).

In 1928, Hrdlicka, who referred to the collection as the "Old Igloo" series, measured 52 of the crania and found them to be long and narrow, resembling those from Greenland and Labrador, but distinct from the more recent crania from Point Barrow, which tended to be broadheaded (Hrdlicka 1930: 323). He also noted the presence of arthritis in the skeletal remains, and the absence of trauma, syphilis, and scurvy (Hrdlicka 1930: 320-321). The Kugusugaruk sample utilized in the present study consists of the cranial and infracranial remains of 27 adult males, 13 adult females, and two subadults.

Kugok

The skeletal remains from the Kugok mounds, also known as the Utkiavik burial mounds (Stewart 1959: 245), consist of the incomplete cranial and infracranial remains of six adult males, three adult females, and two subadults. Excavated by James A. Ford in 1932 from the banks of a small gulley that runs through the village of Utkiavik (Ford 1959: 25) (Figure 2), Mound A yielded seven burials, while Mound B contained eight burials (Ford 1959: 25-30). In both mounds, the burials had been placed on wooden platforms located at a depth of 6 to 9 inches below the surface, and were associated with various artifacts. The bodies appeared to have been wrapped in skins and placed in an extended position on the platforms, their heads oriented to the east (Ford 1959: 30). Based on the decoration of several ivory artifacts found in association with the remains, Ford (1959: 31) suggested that the burials might be slightly earlier than the majority of cultural material from the Birnirk Site, falling within the Early (A.D. 500 to 700) and Middle (A.D. 700 to 800) Birnirk Periods (Stanford 1976: 98, 108). A series of cranial measurements of the collection has been published by Hrdlicka (1942) under the heading "old heaps near Utkiavik" (Stewart 1959: 246).

Piginik

This collection was excavated by Ford in 1932 and 1936 from two burial mounds at the Birnirk Site, located at the southern end of a sand spit midway between the village of Barrow and Point Barrow (Ford 1959: 33) (Figure 2). Mound A, measuring 12 feet in height and 80 feet in diameter (Ford 1959: 37), yielded the remains of six individuals (Ford 1959: 45), while Mound R, measuring three feet in height and 40 feet in diameter, contained the remains of three individuals (Ford 1959: 54). Grave goods associated with the burials indicate a Birnirk Period date (A.D. 500 to 900) for the remains (Ford 1959: 45, 55; Stanford 1976: 108). The incomplete cranial and

infracranial remains of two adult males, four adult females, and three subadults comprise the total sample.

Tigara

In 1929, Henry B. Collins excavated over 50 well-preserved skeletons from mounds located north of the village of Tigara (Figure 2). He noted that associated artifacts were rare, with the exception of large fragments of pottery which had been placed over the feet of many individuals (Collins 1929: 151). Larsen and Rainey (1948), who excavated 349 Tigara burials in 1941, described them as follows:

> Each contained only a single supine skeleton, with its head at the west and the arms and legs more or less flexed...The grave structures varied somewhat. Most of the bodies lay in what was apparently a log coffin, similar to those described for the Ipiutak culture... In other burials, the body was apparently surrounded by a log frame. Whalebone ribs, jaws, and scapulas were frequently part of the grave structure...The grave furniture was usually sparse; many burials had none. Pottery, especially small cups and lamps, usually found at the feet was characteristic. (Larsen and Rainey 1948: 175).

The lack of associated diagnostic artifacts makes dating of the Tigara remains somewhat problematic (Utermohle 1984: 102). Remarking that the burials "were original inhumations and did not represent collapsed platform burials", Collins (1929: 151) dated them to several hundred years ago, prior to the adoption of platform burials. The presence of Western Thule harpoon heads associated with two of the Tigara burials, (Larsen and Rainey 1948, pl. 88: 4-5; Stanford 1976: 101), suggest that these particular burials date to the Early Thule period (A.D. 900 to 1400) (Stanford 1976: 108). However, the majority of the burials are associated with elements of the Western Thule and Modern Phases (Larsen and Rainey 1948: 178), indicating a late pre-contact date. Utermohle (1984: 102) has placed the remains within the Late Thule period, dating from A.D. 1400 to the time of European contact (Stanford 1976: 90). The sample used in the present study consists of the cranial and infracranial remains of 34 adult males, 26 adult females, and six subadults.

Umnak Island I

The Umnak Island I sample was excavated by Ales Hrdlicka in 1938 from the southeast end of the Chaluka Site, a 4000-year old Aleut village site located within the present-day village of Nikolski on Umnak Island in the eastern Aleutians (see Figure 3). It consists of the cranial and infracranial remains of 29 adult males, 31 adult females, five subadults, and 16 boxes of comingled specimens representing adults and subadults of both sexes (see Appendix B). To date, this collection represents the earliest human skeletal remains recovered from Alaska from a clear archaeological context (Oswalt 1967: 64). A detailed analysis of the eleven stratigraphic units documented at the site indicates the first occurrence of burials in Unit VIII, dated to ca. 4000 B.P. (Turner et al. 1974: 140). Laughlin (1992: 6) has assigned a date of 1000 B.C. to A.D. 1500 to these early burials and this date is used here.

The remains were lying on one side in a tightly flexed position. Some had been placed on whalebones, others in boxes constructed of stones. Grave goods included amber beads, labrets, harpoon heads, lamps, and red ochre (Laughlin 1980: 89). All skeletons were of the dolichocranic, or "Paleo-Aleut" type (Laughlin 1963: 638). One Paleo-Aleut skull recovered from the lowest level of the site showed evidence of porotic hyperostosis (Laughlin 1963: 638).

Hrdlicka, who recognized two physically distinct populations in the Aleutian Islands, an early, long-headed group which he termed "Pre-Aleut" and a later, broad-headed group labelled "Aleut", postulated replacement of the former by the latter (1945: 586). Laughlin and Marsh (1951: 79) later renamed these groups "Paleo-Aleut" and

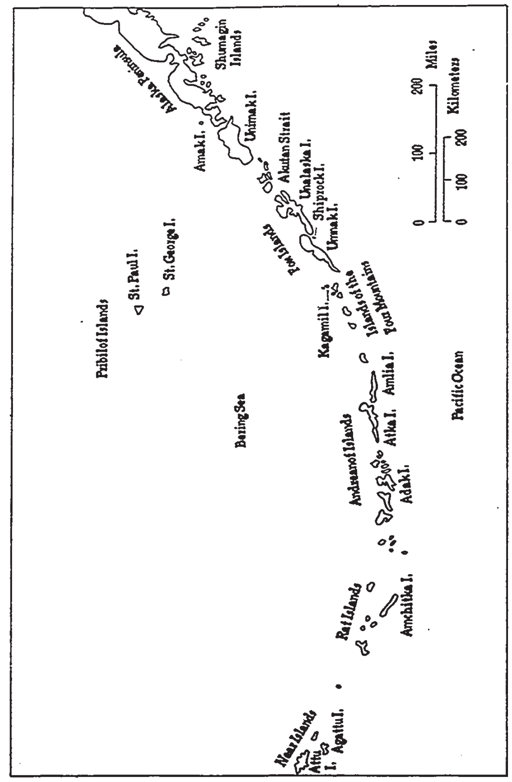

Figure 3. Aleutian Islands

"Neo-Aleut" to reflect their view of genetic continuity rather than population replacement.

II. Post-Contact Samples

Barrow

In 1926, Hrdlicka and two assistants collected four bags of skeletal remains from the surface of a burial area located east of Utkiavik (Figure 2), reportedly taking only those remains that had not been damaged by people or animals (Hrdlicka 1943: 127). The sample, which consists of the cranial remains of 17 adult males, 19 adult females, and one subadult, is believed to have the same provenience as the Utkiavik series (Utermohle 1984: 93).

Nixerak

This collection of cranial remains, representing 28 adult males, 31 adult females, three subadults, and the comingled remains of 12 adults and one subadult, was gathered by James A. Ford in 1932 from a cemetery (also referred to as Nixeruk (Ford 1959: 18) and Nexeura (Murdoch 1988: 424)) located on a small sand spit that connects the mainland with the village of Nuwuk, with which the cemetery is associated (Murdoch 1988: 424) (Figure 2). All skeletal remains were from surface burials and are therefore considered recent by virtue of their survival in the arctic environment (Stewart 1959: 245). No artifacts were found in association with the burials (Ford 1959: 18). Ford (pers. com. 1957, cited in Stewart 1959: 246) suggested that the Nixerak skulls might date to a slightly earlier period than those from Utkiavik. Zegura (1978: 16) employed a date of eighteenth to nineteenth century for the Nixerak series.

Utkiavik

This sample consists of the cranial remains of 12 adult males, 20 adult females, one subadult, and one box of comingled remains representing three individuals. The remains were collected by Ford in 1932 from an elevated area approximately two and a half kilometers east of the village of Utkiavik, also known as Ooglaamie (Murdoch 1988: 26), and Utqiagvik (Zimmerman and Aufderheide 1984) (Figure 2). In a letter to Stewart (1959: 246), Ford stated that the remains were gathered mainly

> from the tundra over a wide expanse, about 1 mile east of the village (of Barrow). Many had been placed in wooden boxes secured with iron nails. For this reason I would judge that this group dates after white contact, but before arrival of missionaries - say between 1880 and 1910. As a group these skulls may be slightly later than those from Nixeruk.

A statistical comparison of cranial measurements of the recent Point Barrow, Nixerak, and Utkiavik collections to earlier Birnirk samples revealed that the Utkiavik remains were more similar to those from Birnirk than were the Nixerak remains, despite the fact that the latter are believed to be older (Stewart 1959: 255).

Point Hope

This sample, consisting of the cranial remains of 23 adult males, 16 adult females and one subadult, was collected in 1884 by Captain M. A. Healy of the Revenue Steamer "Corwin", and in 1926 by Hrdlicka and his assistants, who were instructed to pick up every cranium and mandible they could find (Hrdlicka 1943: 115). Only those specimens labelled "surface" were utilized. These represent collapsed platform burials that had replaced the earlier subsurface burials sometime between 1800 and 1875 (Larsen and Rainey 1948: 178; Burch 1981: 47). They are believed to date from the late nineteenth to the early twentieth century (Zegura 1978: 20; Heathcote 1986: 36). Not examined were those remains recovered from the "burial hole", a mass grave containing skeletal remains of unknown context that had been collected and reburied in 1924 at the request of a local missionary (Hrdlicka 1943: 116).

Umnak Island II

In addition to the early Paleo-Aleut burials excavated by Hrdlicka from the Chaluka Site, a small number of later, intrusive burials were recovered from the uppermost layers of the site. These burials, classified by Hrdlicka as 'Aleut' on the basis of their craniometrics (Hrdlicka 1945), had been placed in both flexed and extended positions, the latter possibly reflecting European influences (Turner et al. 1974: 140). Hrdlicka (1945: 371) noted evidence of possible treponemal infection in one of these skeletons, and commented that none of the pre-contact burials showed any evidence of the disease. The study sample consists of the remains of six individuals, four adult males and two adult females.

Shiprock Island

Located in Umnak Pass (Figure 3), Shiprock Island was first visited in 1937 by Hrdlicka, who removed a series of skeletal remains from two separate rock shelters. In the first shelter, Hrdlicka noted the presence of two burial areas. The first one consisted of a group of mummies that had been placed on a structure of driftwood poles and whale bones, and covered by a roof of poles and skins (Hrdlicka 1941b: 118). All mummies were of the Paleo-Aleut type and exhibited no signs of European influence, although Hrdlicka did not consider them to be very old (1941b: 119). The only pathological condition observed in these remains was arthritis (Hrdlicka 1941b: 119). The second burial area contained later, Aleut burials. Exploration of the second rock shelter yielded the remains of approximately six individuals (Hrdlicka 1941b: 119). The Shiprock burial caves were probably used primarily by eastern Umnak Aleuts

(Turner 1991: 16).

During his 1938 expedition to Shiprock, Hrdlicka recovered additional Aleut burials from the same shelters. Artifacts associated with these remains included stone knives, lamps and scrapers, as well as white glass beads, indicating an early post-contact date for at least some of the remains (Hrdlicka 1941b: 119; Hrdlicka 1945: 335)). According to Laughlin (1958: 523, cited in Laughlin 1992: 7), some of the Shiprock burials may be more recent than the Kagamil burials, although the total time period represented by both series is unknown (Laughlin 1992: 19). The cranial and infracranial remains of 20 adult males, nine adult females, 33 subadults, as well as 20 boxes of comingled specimens representing adults and subadults of both sexes comprise the total sample.

Kagamil Island

From 1936 to 1938, the skeletal remains of approximately 234 individuals were removed from two caves located on the southwest coast of Kagamil Island in the eastern Aleutians (Figure 3). First entered by Europeans in 1874, when Captain E. Hennig of the Alaska Commercial Company recovered 12 mummies and several skulls (Hrdlicka 1941b: 9), the caves were later explored by Hrdlicka, who, in 1936, retrieved more than 50 mummies, mostly children, as well as approximately 30 skulls and various infracranial remains from the "warm" cave (Hrdlicka 1941b: 16; Hrdlicka 1945: 242). A subsequent survey of the "cold" cave yielded 24 sacks of bones of much poorer preservation (Hrdlicka 1941b: 18; Hrdlicka 1945: 244-245). In addition to the human remains, a wealth of cultural material was collected from the caves, including decorated matting, feather garments, cords, kayak frames, parts of war shields, ivory labrets, stone lamps, and slate knives (Hrdlicka 1941b: 18; Hrdlicka 1945: 242-243, 245).

Detailed descriptions of the Kagamil burials have been provided by Dall (1875), Jochelson (1925), Veniaminov (1984), and Laughlin (1980). Describing the mummies found in the warm cave, Dall (1875, cited in Hrdlicka 1941b: 9) writes

> Most of the mummies were wrapped up in skins or matting as previously described, but a few were encased in frames covered with sealskin or fine matting, and still retaining the sinew grummets by which they were suspended.... With them were found some wooden dishes, a few small ivory carvings and toys, a number of other implements, but no weapons except a few lance or dart heads of stone.

Referring to the mummies of children, Dall (1875: 436, cited in Hrdlicka 1941b: 10) remarks

> The case was sometimes cradle-shaped, especially when the body was that of an infant. On these occasions it was often of wood, ornamented as highly as their resources would allow, painted with red, blue or green native pigments, carved, adorned with pendants of carved wood and suspended by braided cords of whale sinew from two wooden hoops... The innermost wrappings of infants was usually of the finest fur...

The dating of the Kagamil material has been the subject of dispute among researchers. A radiocarbon date of ca. 900 to 1100 B.P. has been obtained by Theodore Bank (personal communication 1979, in L. Black 1983: 57) from mask fragments recovered from the cold cave. However, both Hrdlicka (1941b: 124) and Laughlin (1980: 101) believed the remains to be only a few hundred years old, some of them dating from the period of Russian contact as indicated by the presence of canvas, glass beads and probable cases of syphilis (Laughlin 1980: 101). Relatively recent dates of A.D. 1700 to 1800 (Heathcote 1986: 36) and A.D. 1400 to 1780 (Laughlin 1992: 6) have been assigned to the collection by other researchers. In the summer of 1991, the discovery of a lead musket ball embedded in the ilium of an adult male from one of the caves (USNM #378,447) provided positive proof that the Aleuts were still utilizing the burial caves after the arrival of Russians (Laughlin 1992: 18). Hopefully, the proposed dating of three skeletons from Kagamil will shed additional light on the

temporal position of these burials (Laughlin 1992: 20). The total time period represented by the Kagamil remains is unknown; however, the artifact associations suggest that the majority span less than 600 years (Laughlin 1992: 19).

The study sample consists of the cranial and infracranial remains of 58 adult males, 57 adult females, 45 subadults, as well as 55 boxes of comingled specimens representing adults and subadults of both sexes.

Methodology

Inventory

Each skeleton utilized in the present study had been previously catalogued and packed separately in its own storage container in the U.S. National Museum. Similarly, each box of comingled remains had been given its own catalogue number (see Appendix B), although in many cases, these boxes contained the remains of more than one individual. A detailed inventory was taken of all skeletal and dental elements (see Appendix C for inventory forms). Each element was scored as present or absent, and the degree of completeness and preservation were recorded for each of the six major long bones. The overall preservation of each skeleton was also noted (see Table 1, Appendix D for the complete list of specimens examined).

Sex determination

Basic to any evaluation of health and disease in past populations is a knowledge of the sex of each individual in the sample. Such information allows a researcher to check for possible biases in a sample that could lead to incorrect interpretations of the pathological data, to evaluate possible adaptive differences between the sexes, and to more accurately diagnose particular pathological conditions, thereby aiding in the assessment of the prevalence of specific diseases in a population (M. Powell 1988: 86).

The sex of all adults in the study sample was determined using standard morphological and metric criteria. The specific criteria used to determine sex from the crania consisted of the degree of prominence of the supraorbital ridges, the shape of the supraorbital margins, the size of the palate and mastoid processes, chin shape, and the degree of development of the nuchal crests (Bass 1987: 81). For sex determination from the pelvic bones, the criteria employed included the subpubic concavity, ventral arc, and medial aspect of the ischiopubic ramus (Phenice 1969), the width of the sciatic notch, the size of the acetabulum, and the presence or absence of a preauricular sulcus (Bass 1987: 202). In cases where the skull and pelvic bones were absent or fragmentary, metric data obtained from the infracranial remains were employed to determine sex. These consisted of the maximum head diameter of the femur (Stewart 1979b: 120), the midshaft circumference of the femur (T. Black 1978), and the maximum head diameter of the humerus (Stewart 1979b: 100) (See Table 1, Appendix D for the sex distribution of all specimens analyzed).

All of the specimens utilized in the present study had been previously classified as male or female by Hrdlicka, who was known for his ability to accurately determine sex from Eskimo crania (Stewart 1959: 245). A comparison of his assessments, listed in the USNM card catalogue, with those obtained in the present study, revealed an agreement in almost every case. With the exception of late adolescents, no attempt was made to determine the sex of the subadults in the study samples due to the difficulty of obtaining accurate results in such cases (Bass 1987: 19).

Age Estimation

As in the case of sex determination, knowledge of the age distribution of a skeletal sample is necessary for any proper analysis of health and disease in a population. The

age at death of all subadults was estimated using the following criteria: dental eruption, diaphyseal length, and degree of epiphyseal union (Ubelaker 1989). Although dental development is considered to be a more reliable method of age estimation in subadults than dental eruption (Ubelaker 1989: 63), it was not utilized due to the researcher's limited access to x-ray facilities. For adults, estimation of the age at death was based on pubic symphysis morphology (McKern and Stewart 1957, Gilbert and McKern 1973, Suchey and Katz 1986, Suchey et al. 1988), sternal rib end morphology (Iscan et al. 1984, 1985), maxillary suture obliteration (Mann et al. 1991), dental attrition (Brothwell 1965: 69), and endocranial suture closure (Krogman and Iscan 1986: 113) (see Table 1, Appendix D for the age distribution of all specimens analyzed). Given that most of the published standards are based on analyses of North American white and black populations, any estimate of age at death obtained from the application of these standards to the Eskimo and Aleut populations used in the present study can only be considered approximate. For this reason, age ranges, rather than specific ages, were assigned to most individuals. Hrdlicka (1942, 1944b) provided specific age estimates for many of the skeletons from Point Hope, Point Barrow, and the Aleutian Islands; however, these estimates tended to be somewhat higher than those obtained by the present researcher and others (eg. Turner 1991: 15). For purposes of the analysis, adults were assigned to one of four age categories: 18 to 20, 21 to 35, 36 to 50, and 50+ years.

Skeletal Indicators of Health

The twelve study samples described above were examined for eight specific health indicators: 1) porotic hyperostosis and cribra orbitalia, 2) trauma, 3) specific and non-specific infections, 4) enamel hypoplasia, 5) dental caries, 6) dental abscesses, 7) antemortem tooth loss, and 8) periodontal disease. The data were recorded on prepared forms (see Appendix C), while detailed descriptions of observed pathological conditions,

as well as the methods of sex determination and age estimation used for each individual, were recorded in notebooks. Although data on adult long bone lengths were recorded, it was later deemed of little use as an indicator of changing health over time due to the small size of the final sample. The original plan to score cortical bone loss was rejected due to time contraints and to limited access to x-ray facilities. Discussions of each of the health indicators selected for analysis are presented below. Included are descriptions of previous studies, a discussion of methodological issues and problems associated with each indicator, and a description of the methodology used in the present study.

Porotic hyperostosis and cribra orbitalia

Porotic hyperostosis, a term first coined by Angel (1966), refers to a condition characterized by lesions found on the parietal and occipital bones, and on the superior orbital plates (this last condition has been termed 'cribra orbitalia'). The lesions appear as areas of porous and thickened bone resulting from hypertrophy of the diploe, thinning of the outer cortical bone, and exposure of the inner trabecular bone (Steinbock 1976: 214-215). Radiographically, the cranium is characterized by a distinctive 'hair-on-end' appearance, caused by the perpendicular arrangement of new bone formed during the expansion of the diploe (Steinbock 1976: 219). Infracranial involvement may also occur, although the nature and distribution of the lesions is dependent upon their underlying etiology (Steinbock 1976).

Although the exact nature of the relationship between porotic hyperostosis and cribra orbitalia is still unclear, recent research using macroscopic, microscopic, radiographic, and demographic data indicates that the two conditions are related and that cribra orbitalia may represent the initial stage of the disease process (Lallo et al. 1977; Stuart-Macadam 1989). Cribra orbitalia usually occurs bilaterally (Steinbock 1976: 239), and may or may not be accompanied by porotic hyperostosis (Ortner and

Putschar 1985: 259).

Porotic hyperostosis has been found to occur more frequently in subadults than in adults, reflecting greater iron requirements during the growth period, and the greater malleability and smaller marrow space of the subadult cranium (Stuart-Macadam 1991: 37). Data presented by Stuart-Macadam (1985) suggest that porotic hyperostosis in adults represents a childhood episode of anemia rather than one that occurred shortly before, or at the time of death. Most studies have revealed no significant sex differences in the incidence of the condition (Stuart-Macadam 1991: 37).

Although there is still some debate among researchers regarding the etiology of porotic hyperostosis, the most widely accepted theory is that it is caused by some form of anemia, either genetic or acquired. A recent comparison of clinical studies of anemic patients and anthropological studies of crania with porotic hyperostosis revealed numerous similarities between the two groups, providing strong support for the anemia theory (Stuart-Macadam 1987).

In the Old World, the occurrence of porotic hyperostosis has been attributed largely to the hemolytic anemias thalassemia and sickle cell anemia. The geographic distribution of these conditions has been found to be closely correlated with that of endemic malaria (Steinbock 1976: 234). Since malaria and abnormal hemoglobins are presumed to have been absent in the pre-Columbian New World (El-Najjar 1976: 333), porotic hyperostosis in prehistoric Amerindian skeletal remains has been attributed to iron deficiency anemia resulting from a low dietary intake of iron, poor intestinal absorption of iron, or excess loss of iron (Steinbock 1976; El-Najjar et al. 1976; Goodman et al. 1984: 31; Ortner and Putschar 1985). It has therefore been viewed as a useful marker of nutritional stress in past populations (Goodman et al. 1984: 31).

A number of different factors have been implicated in the development of iron deficiency anemia in archaeological populations. These include a reliance on a diet low in iron, poor intestinal absorption of iron, and excess loss of iron due to infectious diseases (Goodman et al. 1984: 31). In their analysis of 539 prehistoric and historic Anasazi Indian crania (adult and subadult) from the American southwest, El-Najjar and his colleagues (El-Najjar et al. 1976) found porotic hyperostosis to occur more frequently in those individuals occupying canyon bottoms, where reliance on maize was heavier, than in those individuals inhabiting sage plains. The agent responsible for the development of porotic hyperostosis in this particular case was phytic acid contained in the maize, a substance known to inhibit the absorption of iron (El-Najjar et al. 1976: 484).

A second study by El-Najjar (1976) also identified diet as the primary cause of porotic hyperostosis. His analysis of 3,361 adult and subadult crania from seven different geographic localities in North and South America revealed a greater frequency of cranial lesions in the maize-dependent groups than in the non-maize dependent groups for both children and adults. The nutritional properties of maize, as well as the techniques used to process it, were cited as the two main factors responsible for the higher incidence of iron deficiency anemia in the former.

Kent (1986) has challenged El-Najjar's (1976) hypothesis that a dietary deficiency of iron was the primary cause of porotic hyperostosis in the Anasazi Indians. Using archaeological data, she argues that the Anasazi were not primarily dependent on a maize diet but subsisted on a varied and nutritionally adequate diet consisting of both meat and vegetable products. In her opinion, the porotic hyperostosis observed in these individuals was the result of increased levels of viral, parasitic, and bacterial infection accompanying sedentism and aggregation.

The occurrence of porotic hyperostosis in other skeletal samples has also been linked to infectious diseases. An analysis of 241 subadult crania from the Libben Site in

Ohio revealed a strong positive correlation between periosteal lesions and porotic hyperostosis in children aged 6 to 24 months, illustrating the synergistic relationship between iron deficiency anemia and infectious diseases (Mensforth et al. 1978). Similarly, an analysis of 269 subadult crania from Illinois and Ohio revealed a significant association between porotic hyperostosis and infracranial infection (Lallo et al. 1977: 479), while a high incidence of cribra orbitalia in a marine-dependent California Indian population has been linked, in part, to diarrheal infections resulting from the use of contaminated water supplies (Walker 1986a).

The previous studies have all considered iron deficiency anemia to be a negative outcome of poor nutrition or exposure to infectious disease, reflecting an individual's unsuccessful adaptation to its environment. This traditional interpretation has recently been questioned by Stuart-Macadam (1992), who suggests that the condition may, in fact, represent a positive adaptation to a high pathogen load. According to this view, the withholding of iron by the human body represents a form of defense against invading pathogens which require iron for their growth and development.

In the present study, all crania were examined macroscopically for evidence of porotic hyperostosis. The condition was scored as present or absent, as well as active or healed. Since the term 'porotic hyperostosis', by definition, refers to both pitting and thickening of bone (Mann and Murphy 1990: 22), crania that exhibited only pitting were classified under the category "ectocranial porosis" (after Mann and Murphy 1990: 22). All supraorbital plates were examined macroscopically for evidence of cribra orbitalia. Due to the difficulty encountered by the researcher in distinguishing between the various stages of development of the condition described by Nathan and Haas (1966: 174) and Webb (1989: 22), cribra orbitalia was simply scored as present or absent, and active or healed, for each individual orbit.

Trauma

Trauma, as it pertains to the skeleton, may be classified into four categories: 1) fractures, 2) dislocations and displacements, 3) disruptions in nerve or blood supply, and 4) artificial deformation (Ortner and Putschar 1985: 55). Fractures, the most common type of traumatic injury observed in archaeological populations (Goodman et al. 1984: 34), can provide valuable insight into the behavioural patterns of past populations, particularly as they relate to subsistence practices. Decreased fracture rates have been associated with the transition from a hunting and gathering to an agricultural mode of subsistence. An analysis of infracranial fractures in a series of North American Indian populations revealed fracture rates ranging from 10.7% in a Middle Archaic hunting and gathering population from Indian Knoll, Kentucky (Snow 1948, cited in Steinbock 1976: 23), to 1.2% in a Mississipian period agricultural population from Illinois (Morse 1969, cited in Steinbock 1976: 23). This decrease has been attributed, in part, to increased sedentism accompanying the adoption of agriculture (Steinbock 1976: 23). Other studies have provided additional support for this trend, although some have yielded conflicting results (Cohen and Armelagos 1984: 591).

Fracture patterns have also been used to investigate differences in activity patterns between individuals of different rank. Based on the hypothesis that differing cultural activities between high and low status individuals will be reflected in the frequency, location, and type of fractures, Lahren and Berryman's (1984) analysis of 80 adult skeletons from the Chucalissa Site, a Mississippian mound center in Tennessee, revealed a significantly greater number of fractures in the high status males in comparison to both the high status females and the lower status groups of both sexes. In particular, intentionally inflicted fractures (parry fractures and multiple fractures) occurred more frequently among the elite males than among the other groups, suggesting that

these individuals were engaging in activities that placed them at greater risk of injury.

An analysis of fracture rates and types can also provide information on levels of interpersonal conflict within and between populations. Parry fractures of the ulna, sustained when the arm is raised to shield the head from a blow, are commonly encountered in populations that engage in warfare. For this reason, they are considered to be good indicators of interpersonal violence. Depression fractures of the cranium may also reflect levels of violence in past populations. An analysis of 744 crania from the northern Channel Islands and adjacent mainland coast of California revealed a higher frequency of cranial trauma among the island groups than among those occupying the mainland, an observation attributed to increased competition for limited resources on the islands (Walker 1989).

Direct comparisons of fracture rates in different skeletal populations have been hindered by the lack of standardization in the collection and presentation of data (M. Powell 1988: 75). In an attempt to overcome this problem, Lovejoy and Heiple (1981) have introduced a quantitative approach to the analysis of long-bone fractures to facilitate comparative studies of fracture incidence. Using this approach, fracture rates are calculated by dividing the total number of complete bones exhibiting fractures by the total number of complete bones examined (Lovejoy and Heiple 1981: 535).

Dislocations represent another type of traumatic injury sometimes observed in archaeological populations. Only those dislocations that have remained unreduced long enough to allow bone modifications to occur will be visible (Steinbock 1976: 39). Dislocations involving the hip and shoulder are the most common types recorded in skeletal populations. Hip dislocations may be either traumatic or congenital in origin (Steinbock 1976: 39), while those of the shoulder are commonly caused by indirect force resulting from a backward fall in which the hands are used to break the fall (Ortner and Putschar 1985: 86). The last two categories of trauma, disruptions in nerve or blood supply and artificial deformation, are less frequently observed in skeletal samples, particularly those representing northern populations. For this reason, they will not be discussed here.

All skeletal remains were examined macroscopically for evidence of trauma. The location, extent, severity, and type of all observed cases of trauma were recorded. Traumatic lesions were classified as either unhealed or healed, and evidence of complications (eg. inflammation, atrophy, shortened length, necrosis, arthritis, and ankylosis (Ortner and Putschar 1985: 64-69)), and treatment (eg. amputation), were noted if present. Detailed descriptions were accompanied by skeletal drawings (in the case of cranial trauma), photographs, and, in some cases, radiographs. Cranial lesions of traumatic origin were distinguished from those of infectious origin using the criteria employed by Walker (1989). Cranial lesions were considered indicative of trauma if they lacked reactive bone suggestive of an infectious origin, if they tended to be single rather than multiple, with no lesions elsewhere in the skeleton, if they were well-delineated, and if they were associated with fracture lines (Walker 1989: 313). Crania exhibiting evidence of infection that was clearly secondary to a traumatic injury were included in the sample (Walker 1989: 313). All major long bones that were less than two thirds complete were eliminated from the calculation of fracture rates unless they exhibited evidence of trauma. Although fractures occurring around the time of death may be difficult to distinguish from postmortem fractures (Ortner and Putschar 1985: 72), cases of suspected perimortem trauma (suggested by the nature of the wound ie. weapon injury, or indicated by the presence of healing) were included in the analysis.

Infections

Infections in bone can be classified as either specific or non-specific. Since acute infectious diseases leave no evidence in bone, skeletal evidence represents chronic

infections which may or may not have been the direct cause of death of an individual (Ortner and Putschar 1985: 105). Because they can be caused by a wide variety of pathogens, their etiology is often very difficult, if not impossible, to determine (Larsen 1987: 380). Non-specific infections are more common in archaeological remains (Goodman et al. 1984: 32) and can be classified into two groups, periostitis and osteomyelitis. Both may be specific diseases by themselves, or part of other diseases, for example syphilis (Ortner and Putschar 1985: 131).

Periostitis refers to an infection characterized by inflammation of the periosteum. It may result from localized trauma or infection (primary periostitis), or from the hematogenous spread of micro-organisms associated with specific infections (secondary periostitis) (Ortner and Putschar 1985: 132). The condition is characterized by the formation of plaque-like bone, of varying thickness, on the external surface of the cortex. Any skeletal element may be affected, although the major long bones, particularly the tibiae, are frequent sites of infection, due, in part, to their greater susceptibility to direct trauma (Ortner and Putschar 1985: 132). While periosteal lesions may eventually be remodeled (Ortner and Putschar 1985: 130), traces may persist long after the infection has disappeared.

Osteomyelitis, defined as "inflammation of the marrow cavity" (Steinbock 1976: 60), is caused by pyogenic bacteria, which reach the bone in one of three ways: 1) by direct infection, 2) by direct extension from an adjacent soft tissue infection, or 3) through the blood stream from a site of infection elsewhere in the body (Ortner and Putschar 1985: 105). Although *Staphylococcus aureus* has been identified as the primary causative organism (Steinbock 1976: 60), other micro-organisms can produce osteomyelitis, including streptococci, meningococci, and pneumococci (Steinbock 1976: 61).

A number of studies have indicated a relationship between rates of non-specific

infection and subsistence practices. Comparisons of hunting and gathering populations with agricultural populations have revealed increased rates of infection in the latter groups, a phenomenon attributed to their increased population size and density, which promote the spread of infections (Larsen 1987: 382).

In order to fully understand the significance of non-specific infections in skeletal populations, Goodman et al. (1984: 33) stress the importance of recording the location, nature, and severity of all infectious lesions, noting the age and sex distributions of the lesions, distinguishing between specific and non-specific infections, considering possible relationships between infection and other health indicators, and examining the ecological and cultural context of skeletal samples.

An analysis of the prevalence of specific infections in past populations is complicated by the fact that different diseases may produce similar bone lesions, making diagnosis difficult (Cohen 1989: 106). Some infections, such as tuberculosis, do not always show skeletal involvement while others, for example syphilis, show involvement of bone only after a prolonged period of time. Given their known presence in arctic populations following contact, tuberculosis and treponemal infections will be the focus of discussion here.

Tuberculosis is a chronic infectious disease caused by the micro-organism *Mycobacterium tuberculosis*. The most common route of entry into the body is through the respiratory tract, the primary infectious focus developing in the lung. The intestinal pathway, although a much less common route, may become the focus of infection as a result of the ingestion of contaminated milk. Lesions in the lung will often be self-contained, without progressing to a more severe stage of the disease. However, if the lesion ruptures, the tubercle bacilli may be carried through the bloodstream to other tissues and organs, including the skeleton. Bone involvement is uncommon, representing only 3% (Ortner and Putschar 1985: 142) to 7% (Steinbock 1976: 175)

of the total number of cases of the disease.

An examination of the age and sex distribution of tuberculosis reveals a predominance of male over female cases (Ortner and Putschar 1985: 142), and a predilection for infants and children (Ortner and Putschar 1985: 144). Because of the ability of the tubercle bacilli to remain dormant in the body for years and infect new hosts long after the original episode of infection, the disease can be maintained at low levels in small populations (M. Powell 1988: 153).

Within the skeleton, the tubercle bacilli have a predilection for areas rich in cancellous bone. Although any bone may be affected, common sites of involvement include the spine, particularly the lower thoracic and lumbar vertebrae, the ribs, the hip, and the knee (Ortner and Putschar 1985: 142). Multiple lesions in two or more different areas of the skeleton are uncommon. However, when they do occur, they tend to affect the vertebral column, hip and knee simultaneously (Steinbock 1976: 176). Skeletal changes resulting from tuberculosis consist of lytic destruction, with little or no reactive bone. In the vertebrae, the disease causes local destruction and cavitation of the vertebral body, which may lead to vertebral collapse, resulting in kyphosis. In some cases, ankylosis of adjacent vertebrae may also occur (Ortner and Putschar 1985: 145, 148).

Diagnosis of tuberculosis, particularly in the spine, is complicated by the fact that a number of other diseases may produce lesions of similar appearance. These include the various fungal infections, such as blastomycosis, pyogenic osteomyelitis, histiocytosis X, and malignant tumors (Buikstra 1976). Therefore, careful consideration must be given to the nature and distribution of all lesions, as well as to the age and sex of the affected individual, before a diagnosis is made.

Four different syndromes of treponemal infection are known to exist in human populations: venereal syphilis, endemic syphilis, pinta and yaws (Steinbock 1976:

86). Since the latter three occur in either temperate, subtropical, or tropical regions of the world, this discussion will focus on venereal syphilis, the only one of the four treponemal infections known to have affected arctic populations in the past. The causative micro-organism of venereal syphilis is *Treponema pallidum*. It enters the body via sexual contact (acquired syphilis), or is passed from the mother to the fetus (congenital syphilis). The disease may be divided into three stages: primary, secondary, and tertiary. The first stage is characterized by the appearance of the distinctive chancre and the involvement of the surrounding lymph nodes. In the second stage, the micro-organisms are disseminated through the blood stream, resulting in the development of mucous membrane lesions and skin rashes. Finally, the tertiary stage, which is reached approximately 2 to 10 years after the initial infection, is characterized by involvement of the skeleton and other tissues and organs (Ortner and Putschar 1985: 182). Prior to the introduction of penicillin, the frequency of bone involvement ranged from 10% to 20% of cases (Steinbock 1976: 109).

Skeletal changes associated with the acquired form of venereal syphilis consist of both destructive and proliferative lesions, affecting one or more bones. Favoured sites are the cranial vault, the nose and palate, and the tibiae. Unlike tuberculosis, the disease rarely affects the spine (Ortner and Putschar 1985: 182). Cranial lesions usually begin in the frontal bone and subsequently spread to the parietal and facial bones. The diagnostic lesion, termed "caries sicca" (Virchow 1858, cited in Ortner and Putschar 1985: 190), causes destruction of the outer table and part of the diploe of the vault, and proliferation of the surrounding bone, leading to the formation of a distinct stellate scar upon healing. The inner table is often unaffected (Ortner and Putschar 1985: 190). In the nasal region, the septum, nasal bones and hard palate may be partly destroyed (Ortner and Putschar 1985: 192).

Of the two types of syphilitic lesions observed in long bones, nongummatous and

gummatous osteoperiostitis, the latter is the more characteristic lesion. Its features include "scooped-out" defects extending into the cortex, surrounded by hypervascular periosteal reactive bone, and endosteal bone formation resulting in a narrowing of the medullary cavity (Ortner and Putschar 1985: 197). In contrast, the nongummatous type of lesion is characterized by extensive periosteal thickening, a roughened and hypervascular outer surface, and cortical thickening which may completely obliterate the medullary canal (Ortner and Putschar 1985: 197).

Skeletal changes associated with congenital syphilis include osteochondritis, defined as "increased calcification in the metaphysis" (Steinbock 1976: 99), especially that of the distal femur and the proximal tibia (Ortner and Putschar 1985: 198), periostitis, gummatous osteomyelitis of the long bones (Steinbock 1976: 102), and abnormalities of the incisors and first molars (Steinbock 1976: 107). Particularly diagnostic in late congenital syphilis is the saber-shin tibia, resulting from the "subperiosteal apposition of new bone on the anterior surface" (Steinbock 1976: 102).

In the present study, all bones were examined macroscopically for evidence of infection. The location, extent, and type (ie. resorptive, proliferative, periostitis, osteomyelitis) of each observed lesion were recorded. In addition, all lesions were noted as being either active or healing/healed. Long bones that were less than two thirds complete, or whose cortices were poorly preserved, were eliminated from the analysis unless they exhibited infectious lesions. The importance of obtaining good descriptive data in palaeopathology has been well-emphasized (eg. Rose et al. 1991: 7; Ortner and Aufderheide 1991: 1). For this reason, emphasis was placed on obtaining as detailed a description as possible of each lesion recorded, although tentative diagnoses were made in some cases. Photographs and radiographs were also taken of some of the specimens.

Enamel Hypoplasia

Enamel hypoplasia refers to a deficiency in enamel thickness caused by a disruption in the secretory phase of amelogenesis, the initial stage of enamel production in which enamel matrix is formed (Goodman et al. 1984: 25). Systemic disruptions may be distinguished from localized trauma by the number of teeth affected, the latter usually involving only one or two teeth (Goodman and Armelagos 1985: 479). Since it is rarely possible to link enamel defects with their underlying etiology (Hutchinson and Larsen 1988: 106), these defects are considered nonspecific indicators of systemic stress. Formed during the development of the tooth crowns, they are not remodeled in later life and therefore provide permanent markers of stress episodes occurring during infancy and childhood (Goodman et al. 1984: 27).

Enamel hypoplasia takes the form of either a linear arrangement of pits or horizontal grooves on the enamel surface. The frequency of these defects has been found to vary both within and between the teeth. Studies by Goodman and Armelagos (1985) and El-Najjar et al. (1978), among others, have revealed greater frequencies of enamel defects in the anterior teeth than in the posterior teeth. The maxillary central incisors and the mandibular canines have been found to be particularly sensitive to systemic stress and, when used together, may record over 95% of total growth disruptions (Goodman et al. 1980: 526).

While the variation in frequencies of defects observed between the different tooth types has commonly been attributed to the variation in the timing of crown development (eg. Pindborg 1970, cited in Goodman and Armelagos 1985: 481), Goodman and Armelagos (1985) have suggested that this differential distribution may be due to differences in susceptibility to growth disruption. More specifically, those teeth that are under greatest genetic control (ie. the most developmentally stable teeth) may be more susceptible to enamel hypoplasia by virtue of their inability to respond to

environmental disruptions (Goodman and Armelagos 1985: 491). Within each tooth, enamel hypoplasia most commonly occurs in the middle and cervical thirds (Goodman and Armelagos 1985). Enamel prism direction and length have been cited as two possible explanations for this distribution (Goodman and Armelagos 1985: 488). Deciduous teeth are less frequently affected than the permanent teeth, an observation attributed to the buffering effects of the intrauterine environment (Sciulli 1977: 76).

Researchers have attempted to determine the age of an individual at the time of defect formation by measuring the distance of the hypoplastic line to the cemento-enamel junction and converting the measurement into a chronological age, using published reference standards of dental crown development. The reference standards most commonly employed for this purpose are those of Goodman et al. (1980), modified from Swardstedt (1966), whose data was derived from a medieval Swedish population. However, the application of these standards to other populations is problematic, as it erroneously assumes constant crown dimensions and uniform timing of crown formation within and between populations (Hillson 1986: 134; Goodman and Rose 1991: 289).

Researchers have also attempted to establish the peak age of stress in skeletal populations, using multiple teeth such as the maxillary central incisors and the mandibular canines. Commonly found to occur between the ages of two and four years (Goodman et al. 1984; Lanphear 1990), such peaks have frequently been attributed to weaning stress (Larsen 1987: 375). However, in Skinner and Goodman's (1992: 168) opinion, these peaks are more likely an "artifact of flawed methodology", reflecting the age of maximum enamel formation (Skinner and Goodman 1992: 169). One possible solution to this problem is to use the individual, rather than the tooth, as the unit of analysis (Skinner and Goodman 1992: 169). By focusing on the age of formation of the earliest hypoplastic defect in each individual, a more uniform distribution of the age at stress may be obtained (Corruccini et al. 1985, cited in Skinner and Goodman 1992:

167-168).

More than 100 different factors have been linked to the development of enamel hypoplasia (Cutress and Suckling 1982). These include nutritional stress, such as protein-calorie malnutrition, vitamin and mineral deficiencies, and stress associated with weaning, tooth trauma, ingestion of toxic substances, and childhood diseases causing high fevers (Neiburger 1990). Enamel hypoplasia as an indicator of nutritional stress has received a great deal of attention in the literature (Goodman and Rose 1991). A number of researchers have used it to investigate changing levels of health associated with the transition from a hunting and gathering to an agricultural mode of subsistence. An analysis of the dentition of 111 adults representing three prehistoric populations from Dickson Mounds, Illinois, revealed an increased incidence of enamel hypoplasia over time, reflecting an increased reliance on a less nutritional maize diet (Goodman et al. 1980). Other studies have yielded similar results (Cohen and Armelagos 1984).

Enamel hypoplasia has also been used to investigate changing health patterns associated with other major cultural changes, such as European contact and industrialization. Hutchinson and Larsen's (1988) analysis of hypoplasias in pre-contact and contact period skeletal samples from St. Catherines Island, Georgia, revealed evidence of increased duration of stress in the later period, as indicated by the greater width of hypoplastic defects. Increased sedentism and the introduction of new pathogens by Europeans are proposed as possible explanations for this observation. More recently, enamel hypoplasia has been used to explore health effects of the transition from agricultural to industrial society (Lanphear 1990). An analysis of a skeletal sample of 296 individuals from the nineteenth century Monroe County Poorhouse cemetery in Rochester, New York, revealed a high incidence of hypoplastic defects in this group, suggesting increased levels of childhood stress, possibly due to "early weaning in an overcrowded and unsanitary 19th century environment" (Lanphear 1990: 42).

In order to assess the prevalence of enamal hypoplasia in the present study, the labial surfaces of all permanent maxillary and mandibular incisors and canines were first cleaned with rubbing alcohol and q-tips to remove surface debris (excluding calculus). They were then examined under a strong oblique light for evidence of hypoplasias. Identification of defects was aided by the use of a dental probe. Those teeth that exhibited severe attrition resulting in the loss of more than the incisal/occlusal third of the tooth (cf. Hutchinson and Larsen 1988: 96), heavy calculus deposits, or severe postmortem damage, were recorded as indeterminate.

Enamel hypoplasia was scored using the classfication scheme employed by Patterson (1984: 386-388) (see Appendix C). Because of the variation in timing and susceptibility of defects between tooth types (Goodman and Armelagos 1985), observations were recorded by individual tooth type. Defects were classified as either linear arrangements of pits, horizontal grooves, or both. The amount of tooth surface area affected by pitting and/or grooving was scored as slight (affecting less than a quarter of the surface), medium (affecting up to half of the surface), considerable (affecting more than half of the surface), and extensive (affecting more than three quarters of the surface). The number of hypoplastic defects was recorded for each affected tooth, and measurements were taken, to the nearest 0.1mm, from the midline of the cemento-enamel junction to the lowest and highest defects on each tooth using needle-pointed Helios dial calipers. Goodman et al.'s (1980) standards were used to calculate the age of defect formation.

Dental caries

Dental caries may be defined as the "demineralization of dental hard tissues by organic acids produced by the bacterial fermentation of dietary carbohydrates, especially sugars" (Larsen 1987: 375). This fermentation is facilitated by bacterial

organisms, which collect on the tooth surface in the form of plaque. *Streptococcus mutans* has been identified as the primary agent responsible for crown surface caries, while *Actinomyces viscosus* is the dominant organism in root surface lesions (Hillson 1986: 292). Although the disease has been described by some researchers as 'progressive', (Patterson 1984: 62; Lukacs 1989: 265), carious lesions may remain stable for considerable periods of time or even undergo remineralization (Hillson 1986: 287).

The three principal factors involved in the cariogenic process are the host, particularly the teeth and the saliva, the pathogenic organism, and diet (Newbrun 1982: 418). The last factor has been identified as "the most important exogenous feature in the determination of caries prevalence and severity" (M. Powell 1988: 71). Diets containing refined sugars have been found to be more cariogenic than those consisting of unrefined carbohydrates, while diets high in protein and fat and low in carbohydrates are known to impede caries formation (M. Powell 1988: 72). The texture of food is also a contributing factor, sticky foods being more cariogenic than rough-textured foods (Hillson 1986: 293).

The frequency of dental caries has been found to vary between different subsistence groups, generally ranging from low levels in hunting and gathering populations, to higher frequencies in agricultural groups, with some exceptions (Larsen 1987: 377-379). An examination of 727 permanent teeth in a skeletal series from the Kane Mounds Site in Illinois, a Mississippian period agricultural site dating to A.D. 1150 to 1250, revealed an overall caries rate of 28.3%, which conforms to that previously reported for other agricultural populations (Milner 1984). Similarly, an analysis of dental caries in four skeletal samples from Georgia and the Florida coast, two from the pre-contact period and two from the contact period, revealed a general increase in the prevalence of caries through time. Particularly noteworthy was the dramatic increase

in caries in the late contact period, reflecting an intensification of maize agriculture (Larsen et al. 1991: 198).

A number of studies have focused on the effects of dietary change on dental health. A 1969 investigation of caries in a group of Canadian Inuit from Igloolik, N.W.T., revealed a significant increase in caries associated with the increased consumption of foods containing refined sugars (Mayhall 1970). Four years later, the rate had increased by 66% (Mayhall 1975). This increase was most apparent among younger individuals, reflecting their greater consumption of processed foods. Similarly, studies of modern Alaskan Eskimos and Aleuts have revealed significant increases in tooth decay resulting from a dietary shift to non-traditional food items (Moorrees 1957; Russell et al. 1961; Mayhall et al. 1970).

While caries rates have been interpreted largely in terms of dietary composition, tooth decay is also influenced by a wide variety of other factors, including tooth crown morphology, attrition, dental hygiene, enamel hypoplasia, periodontal disease, fluoride consumption, and enamel elemental composition (Larsen et al. 1991: 179). A reduction in the prevalence of dental caries in modern populations has been linked to the increased ingestion of fluoride, a substance known to enhance the ability of the enamel to resist destruction by organic acids (Leverett 1982).

While carious lesions may begin anywhere on the tooth where plaque accumulates, they occur most frequently in the posterior teeth, where pits and fissures, acting as food traps, constitute prime targets (Hillson 1986: 290). Following the molars and premolars, the next most commonly affected sites are the interproximal surfaces of the teeth where, again, food debris may become trapped, promoting cariogenesis (Hillson 1986: 290). Sex differences in caries frequencies have been noted, females showing greater frequencies than males (eg. Hillson 1986, Larsen 1983). Possible explanations include a higher carbohydrate intake (Larsen 1987: 378) and earlier eruption of teeth in females (Walker 1986b, cited in Larsen 1987: 378), and behavioural differences in subsistence pursuits (Larsen 1983).

A number of studies have indicated a negative correlation between dental attrition and caries. Based on their analysis of the permanent dentition of 50 whalers from a Dutch whaling station dating to the seventeenth and eighteenth centuries, Maat and Van der Velde (1987) found the relationship between dental caries and attrition to be a competitive one, with caries decreasing as dental attrition increased, due to the cleansing effect of attrition and the removal of potential sites of caries formation. In contrast, a recent analysis of the dentition from two Portuguese Mesolithic sites suggests a cooperative relationship between caries and attrition, the two conditions acting as independent variables, both being independently correlated with diet (Meiklejohn et al. 1990).

Caution must be used when comparing caries frequencies obtained from an analysis of one skeletal sample with those derived from other studies for several reasons. Methods of defining and recording carious lesions may vary from one researcher to another, and caries rates may be influenced by dental attrition, tooth type, and the age and sex distribution of a sample (Milner 1984: 89). In some cases, researchers have employed correction factors to account for possible caries in teeth that have been lost postmortem (eg. Costa 1980a).

All permanent and deciduous teeth were examined macroscopically for carious lesions. Since visual methods of caries identification have been found to be more reliable than clinical methods (Rudney et al. 1983), only those lesions that were clearly visible to the naked eye were recorded. Caries were classified using the scheme employed by Patterson (1984: 378-379), with some modifications (see Appendix C). Teeth that were heavily worn, missing enamel, or unerupted, were scored as unobservable. In order to assess the relationship between caries and attrition, all teeth examined were

scored for wear using Smith's (1984) classification scheme, which records wear on a scale of one to eight based on the exposure of dentine.

Alveolar Abscesses

Alveolar abscesses are the result of infection caused by the invasion of bacteria into the dental tissues. They are classified into two main types: periapical abscesses and infra-alveolar, or periodontal abscesses (Costa 1980a: 501). Periapical abscesses occur when bacterial infiltration, resulting from exposure of the pulp cavity, causes local inflammation (pulpitis) and the subsequent destruction of pulp, the bacteria proceeding down the root canal into the alveolar bone, leading to periapical inflammation and the formation of an abscess (Hillson 1986: 316). Causes of pulp exposure include trauma, caries, and attrition, the latter two being more common in archaeological remains (Hillson 1986: 317).

Since abscesses do not always perforate the bone, particularly those in the mandible, they are not always visible to the naked eye. Therefore, ideally, all specimens should be radiographed in order to prevent a possible underestimation of the actual incidence of the condition (Patterson 1984: 78). In addition, care must be taken to distinguish abscesses from postmortem destruction (Lukacs 1989: 271).

The maxillary and mandibular dentitions in the study samples were visually examined for evidence of abscesses. While all forms of abscesses were recorded (periapical, periodontal, teeth abscessed out), no attempt was made to distinguish between the various types. Abscesses were scored using the classification scheme employed by Patterson (1984: 380-381), with some modifications (see Appendix C). No radiographs were taken of any of the dentitions due to limited access to x-ray facilities. Therefore the actual incidence of abscesses may be underestimated to some degree.

Antemortem Tooth Loss

Since antemortem tooth loss (AMTL) is often the result of dental pathology, it is a useful indicator of dental health in past populations. A low incidence of AMTL may be interpreted as reflecting a generally good state of dental health (Cybulski 1973: 87), while a high incidence is indicative of poor health. Causes of AMTL include caries, attrition, periodontal disease, abscesses, and trauma (Costa 1980b). The latter may be either intentional, as in the case of ritual ablation (Hrdlicka 1940), or accidental (Merbs 1968). The antemortem loss of anterior teeth among certain Eskimo populations has been attributed to heavy attrition and accidental trauma caused by the use of the teeth as tools (Merbs 1968; Costa 1980b), while the loss of posterior teeth in a series of Alaskan Eskimo samples has been linked to heavy attrition and periodontal disease (Costa 1980b). In modern populations, the major cause of tooth loss is caries (Menaker 1980, cited in M. Powell 1988: 120).

In the present study, all dentitions were examined for antemortem tooth loss. Teeth were scored as having been lost antemortem only if there was clear evidence of some remodeling of the tooth socket. No attempt was made to assign causes to the tooth loss (see Appendix C). Unless they had been lost postmortem, missing third molars were recorded as congenitally absent rather than lost prior to death.

Periodontal Disease

Periodontal disease may be defined as "the intermittent degeneration of the supporting tissues of the teeth", namely the gingiva, cementum, periodontal ligament, and alveolar bone (Hildebolt and Molnar 1991: 225). Clinically, it is classified as either gingivitis, inflammation of the gingiva or gums, or periodontitis, inflammation of the underlying alveolar bone. While the former is a chronic, mild condition that may or may not progress to a more severe stage (Costa 1982), the latter is more severe,

causing resorption of alveolar bone, altered morphology of the alveolar crest, loss of cortical bone exposing the underlying cancellous bone, and, in some cases, tooth loss (Clarke 1990: 371).

Periodontal disease may be classified into four main types: prepubertal, juvenile, rapidly progressive, and adult periodontitis (Hildebolt and Molnar 1991: 225). The last type is the most common and is easily identifiable in dry bone (Hildebolt and Molnar 1991: 226). Affecting most individuals, adult periodontitis usually begins after 30 years of age, is more prevalent and severe in older age groups, affects all teeth, and progresses irregularly, with both active and dormant phases (Hillson 1986: 308).

While the etiology of adult periodontal disease is still poorly understood, the condition appears to be the result of a complex interaction of many factors (Hildebolt and Molnar 1991: 228). Although bacterial plaque is a common irritant, no one species of bacteria is responsible for the disease, nor is calculus considered to be a primary cause (Hillson 1986: 310). Other predisposing factors include poor oral hygiene, diet, dental anomalies such as crowding or malocclusion, vitamin deficiencies, attrition, and heredity (Hillson 1986: 310-312; Hildebolt and Molnar 1991: 228).

There has been much disagreement among researchers concerning the identification and quantification of periodontal disease (Hildebolt and Molnar 1991: 225). Although a number of schemes have been proposed to classify the disease, many of these are subjective or based on the false assumption that periodontal disease is progressive in nature (Hildebolt and Molnar 1991: 230). Attempts have been made to quantify alveolar bone loss by measuring the distance from the cemento-enamel junction to the alveolar crest. However, these methods have failed to take into consideration the supereruption of teeth to compensate for heavy attrition (Costa 1982:106-107), the degree of preservation of the alveolar bone, normal age-related changes to the alveolus, and the variable condition of the alveolar crest within an individual (Hildebolt and

Molnar 1991: 232). As a result, the incidence of periodontal disease in skeletal populations has often been overestimated. Other methodological problems that have led to an overestimation of the condition in past populations include the failure to distinguish between bone loss due to periodontal disease and bone loss resulting from pulpal pathology (Clarke 1990), as well as the failure to distinguish between periodontal and postmortem changes in alveolar bone (Hildebolt and Molnar 1991: 228).

In an attempt to avoid these problems, a number of new techniques have recently been employed to record the disease in dry bone. In his analysis of the dentition of the Tigara and Ipiutak Eskimos from Point Hope, Alaska, Costa (1982) focused his attention on the cross-sectional shape and amount of osteoporosis of the interdental septa. These areas are known to be particularly susceptible to periodontal disease (Polson and Caton 1985, cited in Kerr 1988: 68), and, unlike the buccal and labial alveolar surfaces, are not subject to alteration by mechanical forces or developmental defects (Kerr 1988: 68). Under his classification, the shape of each septum was recorded as either convex, flat, or concave, while osteoporosis was recorded as either present or absent. A convex and osteoporotic septum was considered to indicate slight periodontal disease, a flat osteoporotic septum moderate disease, and a concave osteoporotic septum extreme periodontal disease. In addition, Costa recorded the degree of alveolar resorption and the presence or absence of infrabony pockets. The form and texture of the interdental septa were also the focus of Kerr's (1988) assessment of periodontal disease in a Late Medieval Scottish skeletal sample (N=69). However, unlike Costa (1982), Kerr attempted a more precise differentiation of septal changes, classifying textural and contour changes into six categories, three of which were considered to be indicative of periodontal disease.

In a series of 1149 crania representing 34 populations, Clarke et al. (1986)

recorded periodontal disease as present only when the alveolar crest exhibited either an altered morphology or loss of cortical bone, revealing the underlying cancellous bone. While this technique is much more simplified that those used by Costa (1982) and Kerr (1988), the primary aim of Clarke and his colleagues was to distinguish between periodontal disease of gingival origin and periodontal lesions of pulpal origin, the latter being classified as dental abscesses.

A survey of the literature reveals a wide range of variability in the incidence of periodontal disease reported for different skeletal samples (1.9% to 85.7%) (Patterson 1984: 88). However, given the methodological problems of some of these studies and the probability that the incidence of the disease has, in some cases, been overestimated, the reported figures must be accepted with caution. A recent analysis of periodontal disease in 1149 crania representing 32 "premodern" and 2 "modern" populations revealed an extremely low overall frequency of the disease in the former group (9.2%). In contrast, the modern populations, represented by the Terry collection and a South African Bantu collection, exhibited a significantly higher frequency of the disease (25.3%), although the incidence of severe alveolar bone loss in these groups remained very low (2.5%) (Clarke et al. 1986). In a modern Canadian Inuit population, individuals who consumed European food items had a greater rate of periodontal disease than those who continued to rely on a traditional diet (Mayhall 1977: 224-225), although both groups showed little evidence of advanced periodontal disease (Mayhall 1970: 120).

Following Costa's (1982) methodology, the interdental septa of all dentitions were examined for evidence of periodontal disease. The disease was recorded as being present only if the septa exhibited an altered morphology, or a porous appearance indicating loss of cortical bone and exposure of cancellous bone (after Clarke 1990). All lesions that appeared to be pulpal in origin were classified as alveolar abscesses rather than

periodontal lesions. Observations were made of the septa mesial to each tooth. The contour of each septum was scored as either convex, flat, or concave, and osteoporosis was recorded as being either present or absent (see Appendix C). Septa mesial to teeth that had been lost antemortem, or those that had been damaged postmortem, were scored as indeterminate (after Kerr 1988: 68). In affected teeth, the distance from the cemento-enamel junction to the alveolar crest was measured on the mesial root at the midline using a Helios dial caliper.

Statistical Analysis

Two non-parametric statistics, appropriate for nominal data, were selected for data analysis: chi-square and Fisher's Exact Test. Chi-square analysis was performed using the StatView 512 statistical program designed for the Macintosh (a Macintosh Classic was used in this case). Fisher's Exact tests were calculated using the EpiInfo (StatCalc) program for the IBM. The choice of statistic was based on the following guidelines: the chi-square test was used when the sample size (N) was greater than 40, or when N was between 20 and 40 and the smallest expected frequency value was greater than 5. In contrast, the Fisher's Exact test was employed when N was less than 20, or when N was between 20 and 40 and the smallest expected frequency value was less than 5 (Thomas 1976: 298). The results of the statistical analysis are presented in Chapter 6. For chi-square analysis, both the uncorrected and corrected chi-square values are provided. For the Fisher's Exact Test, one-tailed p values are given.

In addition to chi-square and Fisher's Exact tests, three-way log-linear analysis was employed in order to examine possible relationships between three variables (Willigan and Lynch 1982: 273), in this case, time period (pre-contact vs. post-contact), ethnicity (Eskimo vs. Aleut), and each of the following: sex, age, cribra orbitalia, porotic hyperostosis, cranial trauma, infracranial trauma, cranial infection,

infracranial infection, enamel hypoplasia, dental caries, dental abscesses, antemortem tooth loss, and periodontal disease. A relatively new statistical technique, log-linear analysis utilizes categorical data, of which nominal data is the simplest form (Willigan and Lynch 1982: 274). Four different three-variable models were considered: 1) mutual independence, 2) one, two-factor interaction, 3) two, two-factor interactions, and 4) a three-factor interaction (Reynolds 1977: 117-121). The goodness-of-fit of the data to each of eight possible models was assessed using the likelihood-ratio chi-square (G^2) (Fienberg 1980: 40). All calculations were performed using the Systat program for the IBM.

For the purposes of analysis, the twelve study samples were grouped into four larger samples. These consisted of a pre-contact Eskimo sample (Kugusugaruk, Kugok, Piginik, and Tigara), a pre-contact Aleut sample (Umnak Island I), a post-contact Eskimo sample (Barrow, Nixerak, Utkiavik, and Point Hope), and a post-contact Aleut sample (Umnak Island II, Kagamil Island, and Shiprock Island).

Hypotheses

Based on the preceding discussion of the eight health indicators utilized in the present study, as well as our knowledge of the historical background and ethnography of the northern coastal Eskimos and Aleuts, and the cultural changes that occurred within these populations following contact, three hypotheses may be proposed for each of the health indicators examined. These hypotheses, presented in Table 2, are based on three sets of comparisons: 1) the pre-contact Eskimos and Aleuts, 2) the pre-contact and post-contact Eskimos, and 3) the pre-contact and post-contact Aleuts. In the next chapter, the results of these comparisons will be presented and compared with the original expectations, outlined below.

Table 2 - Hypotheses

Skeletal Indicators of Health	Expectations
Porotic Hyperostosis and Cribra Orbitalia	There will be no significant difference between the pre-contact Eskimo and Aleut samples, reflecting their consumption of iron-rich foods, and exposure to similar levels of bacterial and parasitic infections. The later Eskimo sample will display more cribra orbitalia and porotic hyperostosis than the earlier Eskimo sample due to increased levels of infection resulting from the introduction of new pathogens following contact. The later Aleut sample will exhibit more cribra orbitalia and porotic hyperostosis than the earlier Aleut sample due to increased levels of infection resulting from the introduction of new pathogens following contact.
Trauma	There will be no significant difference between the pre-contact Eskimo and Aleut samples, reflecting the involvement of both groups in native warfare. The later Eskimo sample will display less trauma than the earlier Eskimo sample due to the decline in native warfare following contact. The later Aleut sample will exhibit less trauma than the earlier Aleut sample due to the decline in native warfare following contact.
Infection	There will be no significant difference between the pre-contact Eskimo and Aleut samples, reflecting their exposure to similar levels of bacterial and parasitic infections. The later Eskimo sample will display more infection than the earlier Eskimo sample due to the introduction of new pathogens, most notably syphilis and tuberculosis, following contact. The later Aleut sample will exhibit more infection than the earlier Aleut sample due to the introduction of new pathogens, most notably syphilis and tuberculosis, following contact.

Table 2 - continued

Skeletal Indicators of Health	Expectations
Enamel Hypoplasia	There will be no significant difference between the pre-contact Eskimo and Aleut samples, reflecting similar levels of childhood stress. The later Eskimo sample will show more enamel hypoplasia than the earlier Eskimo sample due to an increased prevalence of childhood diseases following contact. The later Aleut sample will exhibit more enamel hypoplasia than the earlier Aleut sample due to an increased prevalence of childhood diseases following contact.
Dental Caries	There will be no significant difference between the pre-contact Eskimo and Aleut samples, reflecting the absence of refined sugars in their traditional diets. The later Eskimo sample will display more carious lesions than the earlier Eskimo sample due to the consumption of non-traditional food items containing refined sugars. The later Aleut sample will show more carious lesions than the earlier Aleut sample due to the consumption of non-traditional food items containing refined sugars.
Dental Abscesses	There will be no significant difference between the pre-contact Eskimo and Aleut samples, reflecting similar levels of caries and attrition in the two groups. The later Eskimo sample will display more abscesses than the earlier Eskimo sample due to an increased rate of caries resulting from the consumption of refined sugars. The later Aleut sample will display more abscesses than the earlier Aleut sample due to an increased rate of caries resulting from the consumption of refined sugars.

Table 2 - continued

Skeletal Indicators of Health	Expectations
Antemortem Tooth Loss	There will be no significant difference between the pre-contact Eskimo and Aleut samples, reflecting similar levels of caries, attrition, and tooth trauma in the two groups. The later Eskimo sample will display more antemortem tooth loss than the earlier Eskimo sample due to an increased rate of dental caries. The later Aleut sample will show more antemortem tooth loss than the earlier Aleut sample due to an increased rate of dental caries.
Periodontal Disease	There will be no significant difference between the pre-contact Eskimo and Aleut samples, reflecting similar levels of dental health. The later Eskimo sample will show more periodontal disease than the earlier Eskimo sample due to dietary changes following contact. The later Aleut sample will show more periodontal disease than the earlier Aleut sample due to dietary changes following contact.

CHAPTER 6

RESULTS

Sex Distribution

The sex distribution of each of the twelve samples utilized in the present study is illustrated in Tables 1 and 2, Appendix D. The pre-contact Eskimo sample (PCE) contained more adult males (54.69%) than adult females (35.16%) and more males overall (55.47%) than females (36.72%), when subadults for whom sex could be determined were included (Table 2, Appendix D). The pre-contact Aleut sample (PCA) exhibited a more balanced sex ratio, with 44.62% of the sample consisting of adult males, 46.15% total males, and 47.69% adult females and total females. The post-contact Eskimo sample (CE) was comprised of 46.51% adult males and total males, 50.00% adult females, and 51.74% total females. Finally, the post-contact Aleut sample (CA) had more adult males (36.12%) than adult females (29.52%) and more males overall (38.33%) than females (33.48%).

A statistical comparison of the pre-contact Eskimo and Aleut samples revealed no significant difference between the two samples with respect to the sex distribution of adults only and adults and subadults combined (Table 3). Similarly, there was no significant difference between the earlier and later Aleut samples. In contrast, the earlier Eskimo sample had significantly more adult males (x^2=3.892, 4.387 before Yates correction (BYC)) and significantly more males overall (x^2=4.089, 4.589 BYC) than the later Eskimo sample. Log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between time period, ethnicity, and sex (Table 4). The data is best explained by the interaction between time period and ethnicity in the presence of sex (model #4), when adults and

Table 3 - Sex Distribution - Statistics

Adults Only

Samples	Males	Females	X^2	Degrees of Freedom	Significance
PCE	70/115	45/115	2.522*	1	.1123
PCA	29/60	31/60	2.038**	1	.1534
PCE	70/115	45/115	4.387†	1	.0362
CE	80/166	86/166	3.892	1	.0485
PCA	29/60	31/60	.771	1	.3799
CA	82/149	67/149	.526	1	.4685

All Individuals

Samples	Males	Females	X^2	Degrees of Freedom	Significance
PCE	71/118	47/118	1.975	1	.1599
PCA	30/61	31/61	1.553	1	.2126
PCE	71/118	47/118	4.589†	1	.0322
CE	80/169	89/169	4.089	1	.0432
PCA	30/61	31/61	.313	1	.5759
CA	87/163	76/163	.167	1	.6824

* Uncorrected
** Yates Corrected
† Statistically significant

Table 4 - Log-Linear Analysis for Sex (S), Ethnicity (E), and Time Period (T)

Adults Only

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) S + E + T	19.94	4	.001
One, Two-Way Interaction:			
2) T*S + E	18.18	3	.000
3) S*E + T	19.15	3	.000
4) T*E + S	8.27	3	.041
Two, Two-Way Interactions:			
5) E*T + E*S	7.47	2	.024
6) T*S + E*T	6.50	2	.039
7) T*S + S*E	17.38	2	.000
Complete Interaction:			
8) S*E + T*E + S*T	5.98	1	.014

Adults and Subadults Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) S + E + T	23.82	4	.000
One, Two-Way Interaction:			
2) T*S + E	21.22	3	.000
3) S*E + T	23.11	3	.000
4) T*E + S	7.74	3	.052
Two, Two-Way Interactions:			
5) E*T + E*S	7.04	2	.030
6) T*S + E*T	5.15	2	.076
7) T*S + S*E	20.52	2	.000
Complete Interaction:			
8) S*E + T*E + S*T	4.79	1	.029

subadults are combined.

Age Distribution

The age distribution of each of the twelve study samples is illustrated in Tables 3 and 4, Appendix D. The pre-contact Eskimo sample consisted of 115 adults and 13 subadults. Of the adults, 28.70% were estimated to be over 50 years of age, while the majority (71.30%) were under the age of 50, the highest number (36.52%) falling into the 21-35 year age category (Table 3, Appendix D). All subadults in the pre-contact Eskimo sample were two years of age or older, the majority (53.85%) being 7-12 years of age. The pre-contact Aleut sample contained 60 adults and only five subadults. Most of the adults (66.67%) were over the age of 50. One of the subadults was an infant (0-2 years of age), while the remaining subadults (80%) were over the age of seven. The post-contact Eskimo sample was comprised of 166 adults and six subadults. Of the adults, 83.73% were less than 50 years of age, while only 16.27% were over the age of 50. Most of the younger adults (<50) (60.84%) fell within the 36-50 year age range. All of the subadults were two years of age or older, the majority (66.67%) falling within the 2-7 year and 13-17 year age ranges. The post-contact Aleut sample contained 149 adults and 78 subadults. Approximately sixty-seven percent of the adults were under 50 years of age, while 32.89% were over 50. The greatest number of the younger adults (34.23%) fell within the 21-35 year age category. The sample contained more subadults in the younger age categories, most notably in the 0-2 year age range (32.05%), than the other three samples.

A statistical comparison of the pre-contact Eskimo and Aleut samples revealed a significantly higher frequency of younger adults (<50) in the Eskimo sample, and a significantly higher frequency of older adults in the Aleut sample (x^2=21.846, 23.381

BYC) (Table 5). In contrast, there was no significant difference between the two samples with respect to the distribution of adults vs. subadults. A statistical comparison of the earlier and later Eskimo samples indicated that the earlier sample had significantly more older adults (x^2=5.533, 6.251 BYC) and more subadults (x^2=4.434, 5.5 BYC) than the later sample. Similarly, a comparison of the earlier and later Aleut samples revealed that the earlier sample had significantly more older adults than the later sample (x^2=18.606, 19.964 BYC). In contrast, the later sample had significantly more subadults than the earlier sample (x^2=16.378, 17.665 BYC). Finally, log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between time period, ethnicity, and age (Table 6). The data is best explained by the simultaneous interaction between age and ethnicity, time period and ethnicity, and age and time period (model #8), when only adults are considered. Each set of interactions made a significant contribution to the likelihood ratio chi-square.

Cribra Orbitalia

Cribra orbitalia and porotic hyperostosis were initially analysed separately in order to facilitate comparisons of the results with those of Nathan and Haas (1966), who focused exclusively on cribra orbitalia in their analysis of an Eskimo sample from northern coastal Alaska. In the pre-contact Eskimo sample, the frequency of cribra orbitalia was lowest in the Kugok sample (0%) and highest in the Piginik sample (14.29%) (Table 5, Appendix D). Combining all four samples yielded a total frequency of 8.47%. Significantly more females were affected than males (x^2=7.44, 9.498 BYC), while significantly more subadults were affected than adults (x^2=4.681, 7.762 BYC) (Table 7). Of the total number of cases of cribra orbitalia recorded in the pre-contact Eskimo sample, nine (90%) were healed and only one (10%) was active (Table

Table 5 - Age Distribution - Statistics

Adults Only

Sample	<50	>50	X^2	Degrees of Freedom	Significance
PCE	82/115	33/115	23.381*†	1	1.0000E-4
PCA	20/60	40/60	21.846**	1	1.0000E-4
PCE	82/115	33/115	6.251†	1	.0124
CE	139/166	27/166	5.533	1	.0187
PCA	20/60	40/60	19.964†	1	1.0000E-4
CA	100/149	49/149	18.606	1	1.0000E-4

Adults vs. Subadults

Sample	Adults	Subadults	X^2	Degrees of Freedom	Significance
PCE	115/128	13/128	.309	1	.578
PCA	60/65	5/65	.087	1	.7684
PCE	115/128	13/128	5.5†	1	.019
CE	166/172	6/172	4.434	1	.0352
PCA	60/65	5/65	17.665†	1	1.0000E-4
CA	149/227	78/227	16.378	1	1.0000E-4

* Uncorrected
** Yates Corrected
† Statistically significant

Table 6 - Log-Linear Analysis for Age (A), Ethnicity (E), and Time Period (T)

Adults Only

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) A + T + E	94.05	4	.000
One, Two-Way Interaction:			
2) T*A + E	70.67	3	.000
3) A*E + T	51.18	3	.000
4) T*E + A	82.37	3	.000
Two, Two-Way Interactions:			
5) E*T + E*A	39.50	2	.000
6) T*A + E*T	58.99	2	.000
7) T*A + A*E	27.80	2	.000
Complete Interaction:			
8) A*E + T*E + A*T	3.42	1	.064

Adults and Subadults Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) A + T + E	131.61	4	.000
One, Two-Way Interaction:			
2) T*A + E	110.24	3	.000
3) A*E + T	86.46	3	.000
4) T*E + A	88.54	3	.000
Two, Two-Way Interactions:			
5) E*T + E*A	43.40	2	.000
6) T*A + E*T	67.17	2	.000
7) T*A + A*E	65.09	2	.000
Complete Interaction:			
8) A*E + T*E + A*T	32.92	1	.000

Table 7 - Cribra Orbitalia - Statistics

Significance by Sex

Sample	Males	Females	X^2	Degrees of Freedom	Significance
PCE	1/66	8/45	9.498*†	1	.0021
			7.44**	1	.0064
PCA	1/27	1/25	3.081E-3	1	.9557
			.444	1	.5053
CE	7/76	10/76	.596	1	.4401
			.265	1	.6068
CA	10/75	12/74	.246	1	.6199
			.07	1	.791

Significance by Age

Sample	Adults	Subadults	X^2	Degrees of Freedom	Significance
PCE	7/109	3/9	7.762†	1	.0053
			4.681	1	.0305
PCA	2/52	0/2	.08	1	.7775
			2.64	1	.1041
CE	14/149	6/6	42.13†	1	0
			34.45	1	0
CA	15/136	36/85	28.912†	1	1.0000E-4
			27.174	1	1.0000E-4

* Uncorrected
** Corrected
† Statistically significant

Table 7 - Cribra Orbitalia - Statistics - continued

Males and Females Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	9/111	102/111	1.022*	1	.312
PCA	2/52	50/52	.457**	1	.499
PCE	9/111	102/111	.681	1	.4091
CE	17/152	135/152	.38	1	.5377
PCA	2/52	50/52	4.371†	1	.0366
CA	22/149	127/149	3.394	1	.0654

Adults and Subadults Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	10/118	108/118	1.299	1	.2543
PCA	2/54	52/54	.668	1	.4137
PCE	10/118	108/118	1.343	1	.2464
CE	20/155	135/155	.929	1	.3352
PCA	2/54	52/54	10.469†	1	.0012
CA	51/221	170/221	9.261	1	.0023

6, Appendix D). Of the nine healed cases, five were adult females, three were subadults, and one was an adult male.

The pre-contact Aleut sample from Umnak Island had only two cases (3.7%) of cribra orbitalia, both of them adults. Females were slightly more frequently affected than males, however the difference was not statistically significant (Table 7). Both of the affected individuals had healed lesions (Table 6, Appendix D).

In the post-contact Eskimo sample, the frequency of cribra orbitalia was lowest in the Point Hope sample (10%) and highest in the Barrow sample (14.81%) (Table 5, Appendix D). Combining all four samples yielded a total frequency of 12.90%. Females were slightly more frequently affected than males; however, the difference was not statistically significant (Table 7). In contrast, subadults showed a significantly higher frequency of the condition than adults (x^2=34.45, 42.13 BYC). Of the total number of cases observed, 17 (85%) were healed and only three (15%) were active. All of the active cases involved subadults.

The post-contact Aleut sample showed frequencies of cribra orbitalia ranging from 0% in the Umnak Island sample to 35.59% in the Shiprock Island sample. Combining all three samples yielded a total frequency of 23.08%. More females were affected than males; however, the difference was not statistically significant. In contrast, significantly more subadults were affected than adults (x^2=27.174, 28.912 BYC). Of the total number of cases recorded in the sample, 27 (52.94%) were healed and 24 (47.06%) were active. Significantly more active cases involved subadults (23/51) than adults (1/51) (x^2=24.029, 26.372 BYC).

A statistical comparison of the pre-contact Eskimo and Aleut samples and the earlier and later Eskimo samples revealed no significant difference between the two sets of samples when males and females were combined, or when adults and subadults were combined (Table 7). In contrast, a comparison of the earlier and later Aleut samples

revealed that the later sample had a significantly higher frequency of cribra orbitalia than the earlier sample for males and females combined (x^2=3.394, 4.371 BYC) and for adults and subadults combined (x^2=9.261, 10.469 BYC). Finally, log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between time period, ethnicity, and cribra orbitalia (Table 8). The data is best explained by the simultaneous interaction between time period and cribra orbitalia, and time period and ethnicity (model #6), when males and females are combined. Of the two sets of interactions, the interaction between time period and ethnicity made a significant contribution to the likelihood ratio chi-square.

Porotic Hyperostosis

The age and sex distribution of porotic hyperostosis are illustrated in Table 7, Appendix D. The frequency of porotic hyperostosis in the pre-contact Eskimo sample ranged from 0% in the Kugok sample to 16.67% in the Piginik sample. Combining all four samples yielded a total frequency of 3.88%. There was no significant age or sex difference (Table 9). All affected individuals were adults (Table 8, Appendix D).

Of the 52 crania examined in the pre-contact Aleut sample, none showed evidence of porotic hyperostosis. In the post-contact Eskimo sample, the frequency of the condition was lowest in the Point Hope and Utkiavik samples (0%) and highest in the Barrow sample (7.14%). Combining all four samples yielded a total frequency of 2.17%. There were no significant age or sex differences.

The post-contact Aleut sample showed frequencies of porotic hyperostosis ranging from 0% in the Umnak Island sample to 10.34% in the Shiprock Island sample. All three samples combined yielded a total frequency of 4.04%. Again, no significant age or sex differences were noted. All individuals with active lesions were subadults, while those with healed lesions were adults.

Table 8 - Log-Linear Analysis for Cribra Orbitalia (CO), Ethnicity (E), and Time Period (T)

Males and Females Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) CO + T + E	30.26	4	.000
One, Two-Way Interaction:			
2) T*CO + E	23.33	3	.000
3) CO*E + T	30.11	3	.000
4) T*E + CO	10.03	3	.018
Two, Two-Way Interactions:			
5) E*T + E*CO	9.88	2	.007
6) T*CO + E*T	3.10	2	.212
7) T*CO + CO*E	23.19	2	.000
Complete Interaction:			
8) CO*E + T*E + CO*T	3.10	1	.078

Adults and Subadults Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) CO + T + E	87.61	4	.000
One, Two-Way Interaction:			
2) T*CO + E	64.37	3	.000
3) CO*E + T	81.07	3	.000
4) T*E + CO	32.52	3	.000
Two, Two-Way Interactions:			
5) E*T + E*CO	25.98	2	.000
6) T*CO + E*T	9.28	2	.010
7) T*CO + CO*E	57.82	2	.000
Complete Interaction:			
8) CO*E + T*E + CO*T	7.52	1	.006

Table 9 - Porotic Hyperostosis - Statistics

Significance by Sex

Sample	Males	Females	X^2	Degrees of Freedom	Significance
PCE	4/60	0/38	2.64*	1	.1041
			1.21**	1	.2708
PCA	0/24	0/26	NO TEST RUN		
CE	3/68	0/68	.37	1	.5444
			.13	1	.7236
CA	4/71	1/69	1.779	1	.1822
			.772	1	.3797

Significance by Age

Sample	Adults	Subadults	X^2	Degrees of Freedom	Significance
PCE	4/96	0/7	.30	1	.5817
			.21	1	.6438
PCA	0/50	0/2	NO TEST RUN		
CE	3/133	0/5	.12	1	.7342
			1.49	1	.2216
CA	4/127	4/71	.725	1	.3946
			.226	1	.6347

* Uncorrected
** Corrected
† Statistically significant

Table 9 - Porotic Hyperostosis - Statistics - continued

Males and Females Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	4/98	94/98	2.098*	1	.1475
PCA	0/50	50/50	.832**	1	.3616
PCE	4/98	94/98	.691	1	.406
CE	3/136	133/136	.195	1	.6584
PCA	0/50	50/50	1.834	1	.1757
CA	5/140	135/140	.705	1	.4011

Adults and Subadults Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	4/103	99/103	2.073	1	.1499
PCA	0/52	52/52	.816	1	.3664
PCE	4/103	99/103	.611	1	.4343
CE	3/138	135/138	.155	1	.6935
PCA	0/52	52/52	2.17	1	.1407
CA	8/198	190/198	1.062	1	.3027

Statistical comparisons of the the pre-contact Eskimo and Aleut samples, the earlier and later Eskimo samples, and the earlier and later Aleut samples revealed no significant differences in the total frequency of porotic hyperostosis when males and females were combined or when adults and subadults were combined (Table 9). Log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between time period, ethnicity, and porotic hyperostosis. The data is best explained by the interaction between time period and ethnicity in the presence of porotic hyperostosis (model #4) for males and females combined, and for adults and subadults combined.

Cribra Orbitalia and Porotic Hyperostosis Combined

In addition to being analysed separately, cribra orbitalia and porotic hyperostosis were combined in order to assess the overall prevalence of iron deficiency anemia in the four sets of samples. In the pre-contact Eskimo sample, the frequency of affected individuals with one or both of the conditions ranged from 0% in the Kugok sample to 28.57% in the Piginik sample (Table 9, Appendix D). Combining all four samples yielded a total frequency of 11.86%. There was no significant sex or age difference (Table 10). Those individuals with healed lesions included ten adults and three subadults aged 13-17 years (Tables 10 and 11, Appendix D).

Only two (3.64%) of the 55 crania examined in the pre-contact Aleut sample from Umnak Island had cribra orbitalia and/or porotic hyperostosis (Table 9, Appendix D). Both affected individuals were adults and both had healed lesions (Table 10, Appendix D). The post-contact Eskimo sample showed frequencies ranging from 10% in the Point Hope sample to 21.43% in the Barrow sample. Combining all four samples yielded a total frequency of 13.92% (Table 9, Appendix D). There was no significant sex difference; however, significantly more subadults were affected than adults (x^2=31.451, 38.555

Table 10 - Cribra Orbitalia and Porotic Hyperostosis Combined - Statistics

Significance by Sex

Sample	Males	Females	X^2	Degrees of Freedom	Significance
PCE	5/66	8/45	2.693*	1	.1008
			1.797**	1	.1801
PCA	1/27	1/25	3.081E-3	1	.9557
			.444	1	.5053
CE	9/77	10/78	.046	1	.8298
			9.014E-4	1	.976
CA	14/79	12/76	.104	1	.7476
			.011	1	.9149

Significance by Age

Sample	Adults	Subadults	X^2	Degrees of Freedom	Significance
PCE	11/109	3/9	4.295	1	.0382
			2.36	1	.1245
PCA	2/52	0/3	.12	1	.7293
			1.54	1	.2150
CE	16/152	6/6	38.555†	1	1.0000E-4
			31.451	1	1.0000E-4
CA	18/142	38/86	28.701†	1	1.0000E-4
			27.026	1	1.0000E-4

* Uncorrected
** Corrected
† Statistically significant

Table 10 - Cribra Orbitalia and Porotic Hyperostosis Combined - Statistics - continued

Males and Females Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	13/111	98/111	2.622*	1	.1054
PCA	2/52	50/52	1.765**	1	.184
PCE	13/111	98/111	.018	1	.8926
CE	19/155	136/155	3.140E-3	1	.9553
PCA	2/52	50/52	5.564†	1	.0183
CA	26/155	129/155	4.513	1	.0336

Adults and Subadults Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	14/118	104/118	3.026	1	.0819
PCA	2/55	53/55	2.125	1	.1449
PCE	14/118	104/118	.253	1	.6152
CE	22/158	136/158	.104	1	.7474
PCA	2/55	53/55	11.907†	1	6.0000E-4
CA	56/228	172/228	10.658	1	.0011

BYC) (Table 10). Of the subadults involved, all were four years of age or older, the majority falling within the 4-6 year and 13-17 year age categories (Table 11, Appendix D). The three youngest subadults had active lesions (Table 12, Appendix D).

In the post-contact Aleut sample, the frequencies of cribra orbitalia and/or porotic hyperostosis ranged from 0% in the Umnak Island sample to 40.32% in the Shiprock Island sample. Combining all three samples yielded a total frequency of 24.56% (Table 9, Appendix D). There was no significant sex difference; however, significantly more subadults were affected than adults (x^2=27.026, 28.701 BYC) (Table 10). Of the affected subadults, the majority (39.47%) were two years of age or younger (Table 11, Appendix D). Subadults exhibited a higher frequency of active than healed lesions, the majority of the active cases being individuals aged 0-2 years (Table 12, Appendix D).

Statistical comparisons of the pre-contact Eskimo and Aleut samples and the earlier and later Eskimo samples revealed no significant difference between the two sets of samples with respect to the overall frequency of cribra orbitalia and/or porotic hyperostosis when males and females were combined or when adults and subadults were combined (Table 10). In contrast, the later Aleut sample had a significantly higher frequency of one or both of the conditions than the earlier Aleut sample for males and females combined (x^2=4.513, 5.564 BYC) and for adults and subadults combined (x^2=10.658, 11.907 BYC). Finally, log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between time period, ethnicity, and cribra orbitalia and porotic hyperostosis (Table 11) for males and females combined, and for adults and subadults combined.

Table 11 - Log-Linear Analysis for Cribra Orbitalia and Porotic Hyperostosis Combined (COPH), Ethnicity (E) and Time Period (T)

Males and Females Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) COPH + T + E	33.32	4	.000
One, Two-Way Interactions:			
2) T*COPH + E	28.99	3	.000
3) COPH*E + T	33.30	3	.000
4) T*E + COPH	11.65	3	.009
Two, Two-Way Interactions:			
5) E*T + E*COPH	11.63	2	.003
6) T*COPH + E*T	7.31	2	.026
7) T*COPH + COPH*E	28.97	2	.000
Complete Interaction:			
8) COPH*E + T*E + COPH*T	7.04	1	.008

Adults and Subadults Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) COPH + T + E	86.96	4	.000
One, Two-Way Interactions:			
2) T*COPH + E	69.25	3	.000
3) COPH*E + T	83.32	3	.000
4) T*E + COPH	31.53	3	.000
Two, Two-Way Interactions:			
5) E*T + E*COPH	27.89	2	.000
6) T*COPH + E*T	13.82	2	.001
7) T*COPH + COPH*E	65.61	2	.000
Complete Interaction:			
8) COPH*E + T*E + COPH*T	13.16	1	.000

Trauma

All individuals exhibiting evidence of cranial trauma are listed in Table 13, Appendix D, while those showing infracranial trauma are listed in Table 14, Appendix D. Detailed descriptions of trauma by individual are provided in Appendix E. In the pre-contact Eskimo sample, three individuals from Tigara had cranial trauma. Two of these individuals had healed fractures of the facial bones and mandible, while the third individual had an unreduced dislocated mandible. Thirteen individuals, two from Kugusugaruk and 11 from Tigara, displayed evidence of infracranial trauma. Six individuals had sustained rib fractures involving one or more ribs, while the remaining seven affected individuals had fractures involving one or more of the clavicles, scapulae, radii, tibiae, fibulae and foot bones. All injuries were partly or completely healed at the time of death.

The pre-contact Aleut sample from Umnak Island contained eight individuals with cranial trauma and nine individuals with infracranial trauma (one individual had both cranial and infracranial trauma). All traumatic injuries were partly or completely healed at the time of death. Seven adults exhibited small depression fractures involving one or more of the frontal, parietal, and occipital bones. Two individuals had rib fractures, while the remaining individuals with infracranial trauma had fractures involving one or more of the radii, scapulae, humeri, fibulae, femora and pelvic bones.

The post-contact Eskimo sample contained nine individuals with some form of cranial trauma. In all but one individual, the injuries were healed at the time of death. Seven individuals exhibited depression fractures involving one or more of the frontal, parietal, and occipital bones. In all cases, the depression fractures were shallow and did not affect the inner table of bone. Of the two remaining individuals with cranial trauma, one, a middle-aged male from Point Hope (#333,441), displayed evidence of possible

perimortem gunshot trauma. A small, circular entrance wound approximately one centimetre in diameter was located in the mid-region of the right parietal bone, while a larger, irregularly-shaped exit wound was found in the left temporal bone anterior to the auditory meatus. The external margins of the latter were bevelled, and there was no evidence of healing. Only six individuals in the post-contact Eskimo sample had infracranial remains (see Table 1, Appendix D), and none showed any evidence of trauma.

Eighteen cases of cranial trauma were observed in the post-contact Aleut sample, one from Shiprock Island and seventeen from Kagamil Island. Five of these individuals also had infracranial trauma. Two individuals from Kagamil Island (#377,817 and #377,858) exhibited evidence of possible perimortem trauma. Four individuals showed evidence of healed traumatic injuries to the face and/or mandible. The remaining twelve affected individuals exhibited healed depression fractures of the frontal and/or parietal bones. In all but one case, the lesions were shallow and did not affect the inner table of bone. A *minimum* of fourteen individuals, one from Shiprock Island and thirteen from Kagamil Island, showed evidence of infracranial trauma (note: specimens #378,535, #377,791, #377,801, and #378,446 were excluded, as they represent comingled specimens that may belong to individuals with infracranial trauma already represented by another catalogue number. Specimens #377,813, 377,821, and 378,447 were counted as separate individuals as their affected elements are duplicated in other individuals with infracranial trauma). Most common were rib fractures, noted in six adults, two subadults, and two comingled specimens. All but one of these fractures were partly or completely healed at the time of death. Other traumatic injuries recorded in the sample involved one or more of the scapulae, clavicles, radii, fibulae, and foot bones. Most noteworthy was a case of gunshot trauma involving the left pelvic bone of an adult male (#378,447). A lead musket ball measuring approximately 8 mm in diameter was embedded in the ilium 23 mm inferior to the iliac crest and 25 mm superior and anterior to the auricular surface. The shot appeared to have entered the ilium through the ventral surface and had partially broken through to the dorsal surface. The presence of reactive bone around the injury indicated that some healing had taken place following the injury.

Statistical Analysis of Cranial Trauma

The age and sex distribution of cranial trauma in the study samples are illustrated in Table 15, Appendix D. In the pre-contact Eskimo sample, the frequency of cranial trauma ranged from 0% in the Kugusugaruk, Kugok, and Piginik samples, to 5.17% in the Tigara sample. Combining all four samples yielded a total frequency of 2.91%. There was no significant age or sex difference within the sample (Table 12). All three affected individuals were adults, two of them over the age of 50 (Table 16, Appendix D), and all injuries were healed at the time of death (Table 17, Appendix D).

Of the 53 crania examined in the pre-contact Aleut sample, eight (15.09%) showed evidence of trauma. Only adults were affected, half of them over 50 years of age. There was no significant age or sex difference within the sample. All lesions were healed.

The frequency of cranial trauma in the post-contact Eskimo sample was lowest in the Utkiavik sample (3.03%) and highest in the Barrow sample (10.34%). Combining all four samples yielded a total frequency of 6.38%. All affected individuals were adults, the majority of these (77.78%) being 36-50 years of age. There was no significant sex or age difference within the sample. Eight out of the nine cases observed (88.89%) were healed.

In the post-contact Aleut sample, the frequency of cranial trauma ranged from 0% in the Umnak Island sample to 12.41% in the Kagamil Island sample. Combining all three samples produced a total frequency of 9%. There was no significant sex difference,

Table 12 - Cranial Trauma - Statistics

Significance by Sex

Sample	Males	Females	X^2	Degrees of Freedom	Significance
PCE	1/59	2/37	1.034*	1	.3092
			.172**	1	.6787
PCA	6/25	2/26	2.563	1	.1094
			1.478	1	.2241
CE	3/70	6/68	1.165	1	.2804
			.54	1	.4626
CA	9/71	9/70	1.038E-3	1	.9743
			.048	1	.8258

Significance by Age

Sample	Adults	Subadults	X^2	Degrees of Freedom	Significance
PCE	3/96	0/7	.23	1	.6350
			.48	1	.4906
PCA	8/51	0/2	.37	1	.5433
			.16	1	.6900
CE	9/136	0/5	.35	1	.5522
			.11	1	.7362
CA	16/129	2/71	5.138†	1	.0234
			4.035	1	.0446

* Uncorrected
** Corrected
† Statistically significant

Table 12 - Cranial Trauma - Statistics - continued

Males and Females Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	3/96	93/96	7.591*†	1	.0059
PCA	8/51	43/51	5.885**	1	.0153
PCE	3/96	93/96	1.343	1	.2466
CE	9/138	129/138	.735	1	.3912
PCA	8/51	43/51	.273	1	.6014
CA	18/141	123/141	.08	1	.7768

Adults and Subadults Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	3/103	100/103	7.923†	1	.0049
PCA	8/53	45/53	6.173	1	.013
PCE	3/103	100/103	1.533	1	.2157
CE	9/141	132/141	.881	1	.348
PCA	8/53	45/53	1.688	1	.1939
CA	18/200	182/200	1.091	1	.2962

Table 12 - Cranial Trauma - Statistics - continued

Males Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCE	1/59	58/59	11.436†	1	7.0000E-4
PCA	6/25	19/25	8.703	1	.0032

Females Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCE	2/37	35/37	.134	1	.714
PCA	2/26	24/26	.025	1	.8743

Adults Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCE	3/96	93/96	7.591†	1	.0059
PCA	8/51	43/51	5.885	1	.0153

however, significantly more adults were affected than subadults (x^2=4.035, 5.138 BYC). The majority of affected adults (38.89%) fell within the 21-35 year age range.

A statistical comparison of the pre-contact Eskimo and Aleut samples revealed a significantly higher frequency of cranial trauma in the Aleut sample when males and females were combined (x^2=5.885, 7.591 BYC) and when adults and subadults were combined (x^2=6.173, 7.923 BYC) (Table 12). Significantly more males (x^2=8.703, 11.436 BYC) and more adults (x^2=5.885, 7.591 BYC) were affected in the Aleut sample than in the Eskimo sample, while there was no significant difference between females. Statistical comparisons of the earlier and later Eskimo and Aleut samples revealed no significant differences between the two sets of samples for males and females combined or for adults and subadults combined. Finally, log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between time period, ethnicity, and cranial trauma (Table 13). The data is best explained by the simultaneous interaction between ethnicity and time period, and ethnicity and cranial trauma (model #5) for males and females combined and for adults and subadults combined. Both sets of interactions made a significant contribution to the likelihood ratio chi-square.

Statistical Analysis of Infracranial Trauma

A quantitative analysis of infracranial trauma in the Eskimo and Aleut samples was somewhat hampered by the poor or incomplete preservation of the skeletal remains of many individuals in the study samples. Frequency data is presented for both individuals and for each of the six major long bones. Given that many of the skeletons in the samples were incomplete, the number of individuals exhibiting some form of infracranial trauma must be considered the *minimum* number of affected individuals only. As noted

Table 13 - Log-Linear Analysis for Cranial Trauma (CT), Ethnicity (E), and Time Period (T)

Males and Females Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) CT + T + E	33.18	4	.000
One, Two-Way Interaction:			
2) T*CT + E	32.30	3	.000
3) CT*E + T	17.29	3	.001
4) T*E + CT	18.41	3	.000
Two, Two-Way Interactions:			
5) E*T + E*CT	2.52	2	**.284**
6) T*CT + E*T	17.53	2	.000
7) T*CT + CT*E	16.40	2	.000
Complete Interaction:			
8) CT*E + T*E + CT*T	2.42	1	.120

Adults and Subadults Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) CT + T + E	56.16	4	.000
One, Two-Way Interaction:			
2) T*CT + E	55.98	3	.000
3) CT*E + T	45.20	3	.000
4) T*E + CT	15.85	3	.001
Two, Two-Way Interactions:			
5) E*T + E*CT	4.89	2	**.087**
6) T*CT + E*T	15.67	2	.000
7) T*CT + CT*E	45.02	2	.000
Complete Interaction:			
8) CT*E + T*E + CT*T	4.72	1	.030

previously, four comingled specimens from Shiprock and Kagamil Islands were not counted as separate individuals as they may belong to individuals with infracranial trauma already represented by another catalogue number.

The age and sex distribution of infracranial trauma by individual are presented in Table 18, Appendix D. In the pre-contact Eskimo sample, the frequency of infracranial trauma ranged from 0% in the Kugok and Piginik samples to 17.74% in the Tigara sample. Combining all four samples yielded a total frequency of 11.61%. There was no significant age or sex difference within the sample (Table 14). Only adults were affected, the majority of them (69.23%) over the age of 50 (Table 19, Appendix D). In all of these individuals, the traumatic injuries were partly or completely healed at the time of death. An examination of the distribution of infracranial trauma by element (Table 20, Appendix D) revealed that of the six major long bones, the tibia was most frequently affected (1.23%), followed by the fibula (0.67%) and the radius (0.65%). The humeri, ulnae, and femora were unaffected. There was no significant difference between the upper and lower limb bones. All affected long bones were healed (Tables 21 and 22, Appendix D).

A minimum of 9 individuals (15.79%) in the pre-contact Aleut sample had some form of infracranial trauma. There was no significant age or sex difference within the sample. All affected individuals were adults, the majority (66.67%) of them over the age of 50, and all had healed or partly healed injuries. Of the six long bones, the fibula showed the highest frequency of trauma (1.3%), followed by the radius (1.23%), the humerus (1.01%), and the femur (0.98%). The ulnae and tibiae were unaffected. There was no significant difference between the upper and lower limb bones. All four affected long bones were healed.

Only six individuals in the post-contact Eskimo sample had infracranial remains (Table 1, Appendix D) and none of them exhibited any evidence of trauma. The post-

Table 14 - Infracranial Trauma - Statistics

Significance by Sex

Sample	Males	Females	X^2	Degrees of Freedom	Significance
PCE	9/63	4/39	.352*	1	.5532
			.083**	1	.7737
PCA	7/28	2/25	2.708	1	.0999
			1.636	1	.2009
CE	0/2	0/3		NO TEST RUN	
CA	6/43	7/32	.803	1	.3701
			.346	1	.5565

Significance by Age

Sample	Adults	Subadults	X^2	Degrees of Freedom	Significance
PCE	13/101	0/11	1.60	1	.2057
			.59	1	.4413
PCA	9/52	0/5	1.03	1	.3107
			.14	1	.7101
CE	0/4	0/2		NO TEST RUN	
CA	12/71	2/23	.923	1	.3367
			.389	1	.5328

Significance by Skeletal Region

Sample	Upper Limbs	Lower Limbs	X^2	Degrees of Freedom	Significance
PCE	1/482	3/482	1.004	1	.3163
			.251	1	.6163
PCA	2/268	2/276	8.716E-4	1	.9764
			.223	1	.6367
CE	0/12	0/12		NO TEST RUN	
CA	2/797	3/1050	.02	1	.8867
			.096	1	.7568

* Uncorrected
** Corrected
† Statistically significant

Table 14 - Infracranial Trauma - Statistics - continued

Males and Females Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	13/102	89/102	.514*	1	.4735
PCA	9/53	44/53	.225**	1	.6353
PCE	13/102	89/102	.725	1	.3944
CE	0/5	5/5	.023	1	.8802
PCA	9/53	44/53	2.706E-3	1	.9585
CA	13/75	62/75	.035	1	.8526

Adults and Subadults Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	13/112	99/112	.584	1	.4449
PCA	9/57	48/57	.273	1	.6016
PCE	13/112	99/112	.783	1	.3763
CE	0/6	6/6	.046	1	.8294
PCA	9/57	48/57	.022	1	.8819
CA	14/94	80/94	7.239E-3	1	.9322

Table 14 - Infracranial Trauma - Statistics - continued

Significance by Element (Upper and Lower Limbs Combined)

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	4/964	960/964	.676	1	.4109
PCA	4/544	540/544	.205	1	.6503
PCE	4/964	960/964	.1	1	.7518
CE	0/24	24/24	1.719	1	.1899
PCA	4/544	540/544	2.419	1	.1199
CA	5/1847	1842/1847	1.338	1	.2473

contact Aleut sample had frequencies of infracranial trauma by individual ranging from 0% in the Umnak Island sample to 20.31% in the Kagamil Island sample. Combining all three samples yielded a total frequency of 14.89%. There was no significant age or sex difference within the sample. The majority (50%) of affected individuals fell into the 50+ age category and all but one individual had healed or partly healed injuries. Only two of the six major long bones, the radius and fibula, were involved at .84% and 1.15% respectively. There was no significant difference between these upper and lower limb bones, and all affected long bones were healed.

A statistical comparison of the pre-contact Eskimo and Aleut samples, the earlier and later Eskimo samples, and the earlier and later Aleut samples revealed no significant differences between the three sets of samples with respect to the frequency of infracranial trauma by individual or by element (Table 14). Log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between time period, ethnicity, and infracranial trauma. The data is best explained by the interaction between time period and ethnicity in the presence of infracranial trauma (model #4).

Statistical Analysis of Cranial and Infracranial Trauma Combined

In addition to being analysed separately, cranial and infracranial trauma were also combined in order to assess the overall prevalence of trauma in the study samples. The age and sex distribution are illustrated in Table 23, Appendix D. In the pre-contact Eskimo sample, the frequency of trauma ranged from 0% in the Kugok and Piginik samples to 21.21% in the Tigara sample. Combining all four samples yielded a total frequency of 12.50%, compared to 2.91% for cranial trauma only and 11.61% for infracranial trauma. There was no significant age or sex difference within the sample (Table 15).

Table 15 - Cranial and Infracranial Trauma Combined - Statistics

Significance by Sex

Sample	Males	Females	X^2	Degrees of Freedom	Significance
PCE	10/70	6/46	.036*	1	.8495
			7.295E-3**	1	.9319
PCA	12/30	4/31	5.785†	1	.0162
			4.47	1	.0345
CE	3/80	6/88	.778	1	.3777
			.291	1	.5899
CA	13/86	13/76	.118	1	.7307
			.017	1	.8968

Significance by Age

Sample	Adults	Subadults	X^2	Degrees of Freedom	Significance
PCE	16/115	0/13	2.07	1	.1505
			.99	1	.3196
PCA	16/60	0/5	1.77	1	.1835
			.62	1	.4297
CE	9/166	0/6	.34	1	.5580
			.12	1	.7284
CA	24/149	3/78	7.345†	1	.0067
			6.221	1	.0126

* Uncorrected
** Yates corrected
† Statistically significant

Table 15 - Cranial and Infracranial Trauma Combined - Statistics - continued

Males and Females Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	16/116	100/116	4.175*†	1	.041
PCA	16/61	45/61	3.377**	1	.0661
PCE	16/116	100/116	6.083†	1	.0136
CE	9/168	159/168	5.078	1	.0242
PCA	16/61	45/61	3.004	1	.083
CA	26/162	136/162	2.375	1	.1233

Adults and Subadults Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	16/128	112/128	4.575†	1	.0324
PCA	16/65	49/65	3.741	1	.0531
PCE	16/128	112/128	5.074†	1	.0243
CE	9/172	163/172	4.167	1	.0412
PCA	16/65	49/65	6.512†	1	.0107
CA	27/227	200/227	5.538	1	.0186

Table 15 - Cranial and Infracranial Trauma Combined - Statistics Continued

Males Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCE	10/70	60/70	8.092†	1	.0044
PCA	12/30	18/30	6.663	1	.0098
PCE	10/70	60/70	5.235†	1	.0221
CE	3/80	77/80	3.989	1	.0458
PCA	12/30	18/30	8.146†	1	.0043
CA	13/86	73/86	6.74	1	.0094

Females Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCE	6/46	40/46	3.2237E-4	1	.9857
PCA	4/31	27/31	.107	1	.7432
PCE	6/46	40/46	1.436	1	.2308
CE	6/88	82/88	.774	1	.379
PCA	4/31	27/31	.291	1	.5896
CA	13/76	63/76	.061	1	.8042

Adults Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCE	16/115	99/115	4.292†	1	.0383
PCA	16/60	44/60	3.481	1	.0621
PCE	16/115	99/115	6.043†	1	.014
CE	9/166	157/166	5.041	1	.0248
PCA	16/60	44/60	3.082	1	.0792
CA	24/149	125/149	2.437	1	.1185

Of the 65 individuals in the pre-contact Aleut sample, 16 (24.62%) had cranial and/or infracranial trauma, compared to 15.09% with cranial trauma only and 15.79% with infracranial trauma. There was no significant age difference, however significantly more males were affected than females (x^2=4.47, 5.785 BYC).

In the post-contact Eskimo sample, the frequency of trauma was lowest in the Utkiavik sample (3.03%) and highest in the Barrow sample (8.11%). When the four samples were combined, a total frequency of 5.23% was obtained, compared to 6.38% for cranial trauma only and 0% for infracranial trauma. There was no significant age or sex difference within the sample.

The post-contact Aleut sample had a frequency of trauma ranging from 0% in the Umnak Island sample to 16.35% in the Kagamil Island sample. Combining all three samples yielded a total frequency of 11.89%, compared to 9% for cranial trauma only and 14.89% for infracranial trauma. There was no significant sex difference within the sample; however, significantly more adults were affected than subadults (x^2=6.221, 7.345 BYC).

A statistical comparison of the pre-contact Eskimo and Aleut samples revealed a significantly higher frequency of trauma in the Aleut sample for males and females combined (x^2=3.377, 4.175 BYC) and for adults and subadults combined (x^2=3.741, 4.575 BYC) (Table 15). Significantly more males (x^2=6.663, 8.092) and more adults (x^2=3.481, 4.292 BYC) were affected in the Aleut sample, while there was no significant difference between females.

A statistical comparison of the earlier and later Eskimo samples revealed a significantly higher frequency of trauma in the earlier sample for males and females combined (x^2=5.078, 6.083 BYC) and for adults and subadults combined (x^2=4.167, 5.074 BYC). In addition, significantly more males (x^2=3.989, 5.235 BYC) and more adults (x^2=5.041, 6.043 BYC) were affected in the earlier sample. However, such

results may be inaccurate given the lack of infracranial remains in the later sample and the possible underrepresentation of trauma in this sample.

A comparison of the earlier and later Aleut samples revealed a significantly higher frequency of trauma in the earlier sample when adults and subadults were combined (x^2=5.538, 6.512 BYC). In addition, significantly more males were affected in the earlier sample (x^2=6.74, 8.146 BYC), while there was no significant difference between the females in the two samples. Finally, log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between time period, ethnicity, and cranial and infracranial trauma (Table 16). The data is best explained by the simultaneous interaction between ethnicity and cranial and infracranial trauma, time period and ethnicity, and time period and cranial and infracranial trauma (model #8) for males and females combined, and for adults and subadults combined. Each set of interactions made a significant contribution to the likelihood ratio chi-square.

Infection

All individuals exhibiting cranial infection are listed in Table 24, Appendix D, while those displaying infracranial infection are listed in Table 25, Appendix D. Detailed descriptions of infection by individual are provided in Appendix E. In the pre-contact Eskimo sample, four individuals showed evidence of infection involving the cranium, particularly the facial bones. In all four cases, the lesions were active at the time of death. Five individuals displayed infection of the infracranial skeleton, four of them with active lesions (one of these individuals also had cranial infection). In two of the affected individuals, the infection was restricted to the ribs and appeared to be secondary to a traumatic injury. One individual, a young adult male (#381,101),

Table 16 - Log-Linear Analysis for Cranial and Infracranial Trauma Combined (CTIT), Ethnicity (E), and Time Period (T)

Males and Females Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) CTIT + T + E	41.25	4	.000
One, Two-Way Interactions:			
2) T*CTIT + E	33.43	3	.000
3) CTIT*E + T	27.58	3	.000
4) T*E + CTIT	26.16	3	.000
Two, Two-Way Interactions:			
5) E*T + E*CTIT	12.49	2	.002
6) T*CTIT + E*T	18.34	2	.000
7) T*CTIT + CTIT*E	19.76	2	.000
Complete Interaction:			
8) CTIT*E + T*E + CTIT*T	.74	1	.389

Adults and Subadults Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) CTIT + T + E	67.60	4	.000
One, Two-Way Interactions:			
2) T*CTIT + E	57.41	3	.000
3) CTIT*E + T	59.18	3	.000
4) T*E + CTIT	24.53	3	.000
Two, Two-Way Interactions:			
5) E*T + E*CTIT	16.11	2	.000
6) T*CTIT + E*T	14.34	2	.001
7) T*CTIT + CTIT*E	48.99	2	.000
Complete Interaction:			
8) CTIT*E + T*E + CTIT*T	.02	1	.890

had active periostitis on the pleural surfaces of the fourth, fifth, eighth and ninth right ribs and the seventh left rib suggestive of a possible respiratory infection.

None of the crania examined in the pre-contact Aleut sample showed any evidence of infection. In contrast, a minimum of 13 individuals in this sample exhibited infracranial infection. Two of these individuals had infectious lesions that were secondary to a traumatic injury. Nine individuals displayed evidence of infection, primarily periostitis, affecting one to three of the six major long bones, most of them lower limb bones. In five individuals, only the femur was involved, and in three individuals, only the tibiae were affected. Two individuals showed extensive involvement of the infracranial skeleton. The first individual (#378,612), an older male, had active periostitis on the scapulae, radii, pelvic bones, femora, tibiae, fibulae, three left ribs, the calcanei, three metacarpals, seven metatarsals, and eight proximal phalanges. The second individual (#378,618), a middle-aged male, had active periostitis on the scapulae, humeri, radii, ulnae, pelvic bones, femora, tibiae, and right calcaneus.

In the post-contact Eskimo sample, six adults had cranial infection, five of them with healed lesions. None of these individuals had associated infracranial remains. Of the six individuals in this sample with infracranial elements, only two showed evidence of infection and in both cases, only one element was involved.

In the post-contact Aleut sample, 51 individuals displayed cranial infection, two from Umnak Island, twenty-four from Shiprock Island, and twenty-five from Kagamil Island. Nine of these individuals also had infracranial infection. Eighteen subadults, seventeen of them aged 0-4 years (#378,434, -501, -510, -512, -513, -515, -516, -517, -518, -520, -521; 377,826, -828, -887, -889, -892, -896) and one aged 7-12 years (377,879), exhibited active or partly healed periostitis on the endocranial surface of one or more of the frontal, parietal, occipital, sphenoid, and temporal bones. The periostitis was located most frequently in the sagittal and

transverse sulcuses of the occipital bone, and in the sagittal sulcus of the parietal bones. It was also observed in the region of the parietal eminences. Only three of these individuals had associated infracranial remains and all were normal. Other individuals in this sample with cranial infection exhibited either periostitis or lytic/proliferative lesions on the ectocranial surface.

Twenty-two individuals and 73 comingled elements showed infracranial infection. Of the comingled specimens, the tibia was the most frequently affected element. One individual (#377,902), a young adult male, had partly healed periostitis on the right scapula and on eight left ribs that appeared to be secondary to a traumatic injury. Another individual, a middle-aged male (#378,543), had active periostitis on the pleural surfaces of the right third to eleventh ribs suggestive of a respiratory infection.

Most noteworthy in the post-contact Aleut sample were a number of possible cases of treponemal infection. Two of the most probable cases are older females, one from Umnak Island and one from Kagamil Island. The first individual (#378,606), previously reported by Holcomb (1940: 183) as exhibiting bone changes consistent with syphilis, had multiple, partly healed lytic/proliferative lesions covering most of the frontal bone and much of the parietal bones. Periostitis was present on the mandible, clavicles, left humerus, and a number of ribs. The second individual (#377,819), previously documented by Steinbock (1976: 133) as a case of syphilis, displayed partly healed lytic/proliferative lesions involving a large portion of the frontal bone. Also affected were the frontal processes of the maxillary bones, and the distal shafts of the right humerus, radius and ulna.

Other possible cases of treponemal infection in the post-contact Aleut sample included four individuals from Shiprock Island (#378,462, #378,463, #378,476, #378,485) and three individuals from Kagamil Island (#377,860, #377,912, #378,432). All of the these individuals had multiple lytic/proliferative lesions of the

frontal and/or parietal bones. The lesions were restricted primarily to the outer table and had the appearance of stellate scars characteristic of venereal syphilis. Those individuals with infracranial elements showed infracranial involvement in the form of periostitis and/or osteomyelitis.

Statistical Analysis of Cranial Infection

The age and sex distribution of cranial infection in the study samples is illustrated in Table 26, Appendix D. For the purposes of the statistical analysis, those individuals with infection secondary to trauma were excluded (#346,296). In the pre-contact Eskimo sample, the frequency of cranial infection ranged from 0% in the Kugok and Piginik samples to 3.39% in the Tigara sample. Combining all four samples yielded a total frequency of 2.88%. There was no significant sex or age difference within the sample (Table 17). Only adults were affected, the majority of these (66.67%) being over 50 years of age (Table 27, Appendix D). All affected individuals had active lesions (Table 28, Appendix D).

No cases of cranial infection were observed in the pre-contact Aleut sample from Umnak Island. The post-contact Eskimo sample showed frequencies of cranial infection ranging from 0% in the Point Hope sample to 6.38% in the Nixerak sample. Combining all four samples yielded a total frequency of 4.29%. There was no significant age or sex difference within the sample. Only adults were affected, the majority of these (83.33%) being 36-50 years of age. Five out of the six affected individuals had healed lesions.

In the post-contact Aleut sample, the frequency of cranial infection was lowest in the Kagamil Island sample (17.99%) and highest in the Umnak and Shiprock Island samples (40%). Combining all three samples yielded a total frequency of 25%. There was no significant age or sex difference within the sample. Of the adults involved, the

Table 17 - Cranial Infection - Statistics

Significance by Sex

Sample	Males	Females	X^2	Degrees of Freedom	Significance
PCE	2/60	1/37	.03*	1	.8617
			.184**	1	.6676
PCA	0/24	0/26		NO TEST RUN	
CE	2/68	4/69	.667	1	.4141
			.159	1	.6897
CA	17/71	15/72	.199	1	.6555
			.06	1	.806

Significance by Age

Sample	Adults	Subadults	X^2	Degrees of Freedom	Significance
PCE	3/97	0/7	.22	1	.6368
			.49	1	.4858
PCA	0/50	0/2		NO TEST RUN	
CE	6/135	0/5	.23	1	.6299
			.41	1	.5206
CA	30/131	21/73	.86	1	.3536
			.576	1	.4479

* Uncorrected
** Corrected
† Statistically significant

Table 17 - Cranial Infection - Statistics - continued

Males and Females Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	3/97	94/97	1.579*	1	.209
PCA	0/50	50/50	.411**	1	.5217
PCE	3/97	94/97	.254	1	.6141
CE	6/137	131/137	.025	1	.8735
PCA	0/50	50/50	13.413†	1	2.0000E-4
CA	32/143	111/143	11.844	1	6.0000E-4

Adults and Subadults Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	3/104	101/104	1.529	1	.2162
PCA	0/52	52/52	.382	1	.5363
PCE	3/104	101/104	.33	1	.5658
CE	6/140	134/140	.053	1	.8175
PCA	0/52	52/52	16.234†	1	1.0000E-4
CA	51/204	153/204	14.705	1	1.0000E-4

Table 17 - Cranial Infection - Statistics - continued

Males Only

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCA	0/24	24/24	6.999†	1	.0082
CA	17/71	54/71	5.464	1	.0194

Females Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCA	0/26	26/26	6.396†	1	.0114
CA	15/72	57/72	4.889	1	.027

Adults Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCA	0/50	50/50	13.725†	1	2.0000E-4
CA	30/131	101/131	12.119	1	5.0000E-4

majority (27.45%) were over the age of 50 years.

A statistical comparison of the pre-contact Eskimo and Aleut samples and the earlier and later Eskimo samples revealed no significant difference between the two sets of samples in the frequency of cranial infection (Table 17). In contrast, the later Aleut sample had significantly more cranial infection than the earlier Aleut sample when males and females were combined (x^2=11.844, 13.413 BYC) and when adults and subadults were combined (x^2=14.705, 16.234 BYC). Significantly more males (x^2=5.464, 6.999 BYC) and females (x^2=4.889, 6.396 BYC) were involved in the Aleut sample. Finally, log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between ethnicity, time period, and cranial infection (Table 18).

Statistical Analysis of Infracranial Infection

The age and sex distribution of infracranial infection is illustrated Table 29, Appendix D. For the purposes of the statistical analysis, those individuals with infection secondary to trauma were excluded (#346,182, #346,293, #378,456, #378,617, and #377,902). In the pre-contact Eskimo sample, the frequency of infracranial infection by individual ranged from 0% in the Kugok and Piginik samples to 5.26% in the Kugusugaruk sample. Combining all four samples yielded a total frequency of 2.68%. There was no significant sex or age difference within the sample (Table 19). Only adults were involved, the majority of these (66.67%) being in the 36-50 year age category (Table 30, Appendix D). Two out of the three affected individuals had active lesions (Table 31, Appendix D). An examination of the frequency of infracranial infection by element revealed that of the six major long bones, the tibia was most frequently affected (1.84%), followed by the fibula (1.33%), the femur (1.18%), and the humerus (0.61%) (Table 32, Appendix D). The lower limb bones showed

Table 18 - Log-linear Analysis for Cranial Infection (CI), Ethnicity (E), and Time Period (T)

Males and Females Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) CI + T + E	72.88	4	.000
One, Two-Way Interactions:			
2) T*CI + E	43.28	3	.000†
3) CI*E + T	54.83	3	.000
4) T*E + CI	55.71	3	.000
Two, Two-Way Interactions:			
5) E*T + E*CI	37.66	2	.000
6) T*CI + E*T	26.11	2	.000†
7) T*CI + CI*E	25.23	2	.000†
Complete Interaction:			
8) CI*E + T*E + CI*T	14.13	1	.000†

Adults and Subadults Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) CI + T + E	126.50	4	.000
One, Two-Way Interactions:			
2) T*CI + E	79.74	3	.000†
3) CI*E + T	92.40	3	.000
4) T*E + CI	81.62	3	.000
Two, Two-Way Interactions:			
5) E*T + E*CI	47.52	2	.000
6) T*CI + E*T	34.86	2	.000†
7) T*CI + CI*E	45.64	2	.000†
Complete Interaction:			
8) CI*E + T*E + CI*T	15.39	1	.000†

† results are suspect due to small sample size

Table 18 - Log-linear Analysis for Cranial Infection (CI), Ethnicity (E), and Time Period (T)

Males and Females Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) CI + T + E	68.63	4	.000 (YC)*
One, Two-Way Interactions:			
2) T*CI + E	40.45	3	.000 (YC)†
3) CI*E + T	51.01	3	.000 (YC)
4) T*E + CI	51.57	3	.000 (YC)
Two, Two-Way Interactions:			
5) E*T + E*CI	33.95	2	.000 (YC)
6) T*CI + E*T	23.40	2	.000 (YC)†
7) T*CI + CI*E	22.83	2	.000 (YC)
Complete Interaction:			
8) CI*E + T*E + CI*T	11.63	1	.001 (YC)†

Adults and Subadults Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) CI + T + E	121.23	4	.000 (YC)
One, Two-Way Interactions:			
2) T*CI + E	76.48	3	.000 (YC)†
3) CI*E + T	88.07	3	.000 (YC)
4) T*E + CI	76.64	3	.000 (YC)
Two, Two-Way Interactions:			
5) E*T + E*CI	43.49	2	.000 (YC)
6) T*CI + E*T	31.89	2	.000 (YC)†
7) T*CI + CI*E	43.33	2	.000 (YC)
Complete Interaction:			
8) CI*E + T*E + CI*T	12.88	1	.000 (YC)†

* Yates corrected

Table 19 - Infracranial Infection - Statistics

Significance by Sex

Sample	Males	Females	X^2	Degrees of Freedom	Significance
PCE	1/63	2/39	1.058*	1	.3037
			.181**	1	.6704
PCA	6/28	5/25	.016	1	.8981
			.045	1	.8327
CE	0/2	2/3		1-tailed#	.3
				2-tailed	.4
CA	12/43	9/32	4.3259E-4	1	.9834
			.057	1	.811

Significance by Age

Sample	Adults	Subadults	X^2	Degrees of Freedom	Significance
PCE	3/101	0/11	.336	1	.5623
			.163	1	.6863
PCA	11/52	0/5	1.311	1	.2523
			.304	1	.5812
CE	2/4	0/2		1-tailed	.4
				2-tailed	.4666667
CA	20/71	1/23	5.682†	1	.0171
			4.392	1	.0361

* Uncorrected
** Corrected
† Statistically significant
\# Fisher's exact

Table 19 - Infracranial Infection - Statistics - continued

Males and Females Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	3/102	99/102	13.47*†	1	2.0000E-4
PCA	11/53	42/53	11.389**	1	7.0000E-4
PCE	3/102	99/102	14.695†	1	1.0000E-4
CE	2/5	3/5	7.553	1	.006
PCA	11/53	42/53	.869	1	.3511
CA	21/75	54/75	.526	1	.4683

Adults and Subadults Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	3/112	109/112	13.733†	1	2.0000E-4
PCA	11/57	46/57	11.633	1	6.0000E-4
PCE	3/112	109/112	13.189†	1	3.0000E-4
CE	2/6	4/6	6.716	1	.0096
PCA	11/57	46/57	.197	1	.6575
CA	21/94	73/94	.057	1	.8119

Table 19 - Infracranial Infection - Statistics - continued

Significance by Skeletal Region

Sample	Upper Limbs	Lower Limbs	X^2	Degrees of Freedom	Significance
PCE	1/482	7/482	4.538†	1	.0332
			3.151	1	.0759
PCA	9/268	23/276	6.079†	1	.0137
			5.214	1	.0224
CE	0/12	1/12		1-tailed	.5
				2-tailed	1.0
CA	29/797	77/1050	11.433†	1	7.0000E-4
			10.76	1	.001

Significance by Element - Upper and Lower Limbs Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	8/964	956/964	34.38†	1	1.0000E-4
PCA	32/544	512/544	32.451	1	1.0000E-4
PCE	8/964	956/964	2.889	1	.0892
CE	1/24	23/24	.375	1	.5405
PCA	32/544	512/544	.016	1	.8997
CA	106/1847	1741/1847	4.5754E-4	1	.9829

Table 19 - Infracranial Infection - Statistics - continued

Males Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCE	1/63	62/63	10.747†	1	.001
PCA	6/28	22/28	8.135	1	.0043

Females Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCE	2/39	37/39	3.459	1	.0629
PCA	5/25	20/25	2.101	1	.1472

Adults Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCE	3/101	98/101	13.653†	1	2.0000E-4
PCA	11/52	41/52	11.553	1	7.0000E-4

significantly higher frequencies of infection than the upper limb bones (x^2=3.151, 4.538 BYC). Of the eight affected elements, seven had active lesions and one had healed lesions (Tables 33 and 34, Appendix D).

In the pre-contact Aleut sample from Umnak Island, a minimum of 11 out of 57 individuals (19.30%) displayed evidence of infracranial infection. There was no significant sex or age difference within the sample. Only adults were affected, the majority of these (72.73%) being over 50 years of age. Seven individuals had active lesions and four had healed lesions. Of the major long bones, the tibia was most frequently involved (12.37%), followed by the femur (8.82%), radius (6.17), fibula (2.60%), ulna (2.27%), and humerus (2.02%). The lower limb bones displayed a significantly higher frequency of involvement than the upper limb bones (x^2=5.214, 6.079 BYC), and more elements had active lesions than healed ones.

Of the six individuals in the post-contact Eskimo sample with infracranial remains, only two exhibited evidence of infection, both of them young adult females from Utkiavik. In both cases, the lesions were healed at the time of death. Of the long bones, only one femur showed evidence of infection.

In the post-contact Aleut sample, the frequency of infracranial infection by individual ranged from 19.23% in the Shiprock Island sample to 50% in the Umnak Island sample. Combining all three samples yielded a total frequency of 22.34%. The majority of affected individuals (57.14%) were over the age of 50. There was no significant sex difference within the sample; however, significantly more adults were affected than subadults (x^2=4.392, 5.682 BYC). Twelve individuals had active lesions, while nine individuals had healed ones. An examination of infracranial infection by element revealed that of the long bones, the tibia was most frequently involved (12.39%), followed by the fibula (6.13%), ulna (5.08%), femur (4.07%), humerus (3.31%), and radius (2.51%). The lower limb bones showed significantly more

infection than the upper limb bones (x^2=10.76, 11.433 BYC).

A statistical comparison of the pre-contact Eskimo and Aleut samples revealed a significantly higher frequency of infracranial infection by individual in the Aleut sample when males and females were combined (x^2=11.389, 13.47 BYC) and when adults and subadults were combined (x^2=11.633, 13.733 BYC) (Table 19). Significantly more males (x^2=8.135, 10.747 BYC) and more adults (x^2=11.553, 13.653 BYC) were affected in the Aleut sample, while there was no significant difference between females. The Aleut sample also exhibited a significantly higher frequency of infracranial infection by element than the Eskimo sample (x^2=32.451, 34.38 BYC).

A statistical comparison of the earlier and later Eskimo samples revealed that the later sample had a significantly higher frequency of infracranial infection by individual than the earlier sample for males and females combined (x^2=7.553, 14.695 BYC) and for adults and subadults combined (x^2=6.716, 13.189 BYC). However, given the small size of the later sample, these results may not be an accurate reflection of the true prevalence of infracranial infection in this sample. There was no significant difference between the two samples with respect to the frequency of infracranial infection by element. A comparison of the earlier and later Aleut samples revealed no significant difference between the two samples with respect to the frequency of infracranial infection by individual or by element. Finally, log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between ethnicity, time period, and infracranial infection (Table 20).

Statistical Analysis of Cranial and Infracranial Infection Combined

In addition to being analysed separately, cranial and infracranial infection were also combined in order to assess the overall prevalence of infection in the study samples.

Table 20 - Log-Linear Analysis for Infracranial Infection (II), Ethnicity (E), and Time Period (T)

Males and Females Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) II+ T + E	147.45	4	.000
One, Two-Way Interactions:			
2) T*II + E	128.95	3	.000
3) II*E + T	111.29	3	.000
4) T*E + II	44.44	3	.000†
Two, Two-Way Interactions:			
5) E*T + E*II	8.29	2	.016†
6) T*II + E*T	25.94	2	.000†
7) T*II + II*E	92.79	2	.000†
Complete Interaction:			
8) II*E + T*E + II*T	5.27	1	.022†

Adults and Subadults Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) II+ T + E	169.13	4	.000
One, Two-Way Interactions:			
2) T*II + E	154.93	3	.000
3) II*E + T	135.42	3	.000
4) T*E + II	40.54	3	.000
Two, Two-Way Interactions:			
5) E*T + E*II	6.83	2	.033
6) T*II + E*T	26.34	2	.000†
7) T*II + II*E	121.22	2	.000†
Complete Interaction:			
8) II*E + T*E + II*T	5.54	1	.019

† results are suspect due to small sample size

Table 20 - Log-Linear Analysis for Infracranial Infection (II), Ethnicity (E), and Time Period (T)

Males and Females Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) II+ T + E	144.82	4	.000 (YC)*
One, Two-Way Interactions:			
2) T*II + E	125.80	3	.000 (YC)
3) II*E + T	109.92	3	.000 (YC)
4) T*E + II	44.75	3	.000 (YC)
Two, Two-Way Interactions:			
5) E*T + E*II	9.86	2	.007 (YC)
6) T*II + E*T	25.74	2	.000 (YC)†
7) T*II + II*E	90.90	2	.000 (YC)†
Complete Interaction:			
8) II*E + T*E + II*T	6.33	1	.012 (YC)

Adults and Subadults Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) II+ T + E	166.42	4	.000 (YC)
One, Two-Way Interactions:			
2) T*II + E	151.75	3	.000 (YC)
3) II*E + T	133.95	3	.000 (YC)
4) T*E + II	40.89	3	.000 (YC)
Two, Two-Way Interactions:			
5) E*T + E*II	8.42	2	.015 (YC)
6) T*II + E*T	26.22	2	.000 (YC)
7) T*II + II*E	119.28	2	.000 (YC)†
Complete Interaction:			
8) II*E + T*E + II*T	6.79	1	.009 (YC)

* Yates corrected

In the pre-contact Eskimo sample, a minimum of five individuals exhibited evidence of infection, the frequency ranging from 0% in the Kugok and Piginik samples to 7.14% in the Kugusugaruk sample (Table 35, Appendix D). Combining all four samples yielded a total frequency of 3.91%, compared to 2.88% for cranial infection alone, and 2.68% for infracranial infection. There was no significant age or sex difference within the sample (Table 21).

A minimum of 11 individuals out of 65 (16.92%) in the pre-contact Aleut sample exhibited some form of infection, all of it involving only the infracranial remains. There was no significant sex or age difference within the sample.

In the post-contact Eskimo sample, the frequency of infection by individual was lowest in the Point Hope sample (0%) and highest in the Utkiavik sample (12.12%). Combining all four samples yielded a total frequency of 4.65%, compared to 4.29% for cranial infection alone and 33.33% for infracranial infection. There was no significant age or sex difference within the sample. The post-contact Aleut sample had frequencies of infection by individual ranging from 21.38% in the Kagamil Island sample to 50% in the Umnak Island sample. Combining all three samples yielded a total frequency of 27.75%, compared to 25% for cranial infection and 22.34% for infracranial infection. Again there was no significant sex or age difference within the sample.

A statistical comparison of the pre-contact Eskimo and Aleut samples revealed a significantly higher frequency of infection in the Aleut sample than in the Eskimo sample when males and females were combined (x^2=7.563, 9.155 BYC) and when adults and subadults were combined (x^2=7.971, 9.607 BYC) (Table 21). Significantly more males (x^2=4.558, 6.332 BYC) and more adults (x^2=7.677, 9.284 BYC) were affected in the Aleut sample, while there was no significant difference between females. In contrast, statistical comparisons of the earlier and later Eskimo and Aleut samples

Table 21 - Cranial and Infracranial Infection Combined - Statistics

Significance by Sex

Sample	Males	Females	X^2	Degrees of Freedom	Significance
PCE	3/70	2/46	2.5964E-4*	1	.9871
			.204**	1	.6519
PCA	6/30	5/31	.155	1	.6942
			3.608E-3	1	.9521
CE	2/80	6/88	1.723	1	.1893
			.902	1	.3422
CA	25/86	19/76	.338	1	.5611
			.163	1	.6861

Significance by Age

Sample	Adults	Subadults	X^2	Degrees of Freedom	Significance
PCE	5/115	0/13	.588	1	.4431
			1.3922E-4	1	.9906
PCA	11/60	0/5	1.103	1	.2935
			.185	1	.6674
CE	8/166	0/6	.30	1	.5818
			.19	1	.6629
CA	44/149	19/78	.683	1	.4086
			.449	1	.5027

* Uncorrected
** Yates corrected
† Statistically significant

Table 21 - Cranial and Infracranial Infection Combined - Statistics -continued

Males and Females Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	5/116	111/116	9.155*†	1	.0025
PCA	11/61	50/61	7.563**	1	.006
PCE	5/116	111/116	.032	1	.858
CE	8/168	160/168	.012	1	.9125
PCA	11/61	50/61	1.987	1	.1587
CA	44/162	118/162	1.526	1	.2167

Adults and Subadults Combined

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	5/128	123/128	9.607†	1	.0019
PCA	11/65	54/65	7.971	1	.0048
PCE	5/128	123/128	.098	1	.754
CE	8/172	164/172	7.158E-4	1	.9787
PCA	11/65	54/65	3.133	1	.0767
CA	63/227	164/227	2.586	1	.1078

Table 21 - Cranial and Infracranial Infection Combined - Statistics - continued

Males Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCA	6/30	24/30	6.332†	1	.0119
PCE	3/70	67/70	4.558	1	.0328

Females Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCA	5/31	26/31	3.11	1	.0778
PCE	2/46	44/46	1.848	1	.174

Adults Only

Sample	Present	Absent	x^2	Degrees of Freedom	Significance
PCA	11/60	49/60	9.284†	1	.0023
PCE	5/115	110/115	7.677	1	.0056

revealed no significant differences between the two sets of samples. Finally, log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between ethnicity, time period, and cranial and infracranial infection (Table 22). The data is best explained by the simultaneous interaction between ethnicity and time period, and ethnicity and cranial and infracranial infection (model #5) for males and females combined and for adults and subadults combined. Both sets of interactions made a significant contribution to the likelihood ratio chi-square.

Enamel Hypoplasia

An examination of all deciduous dentitions in the study samples revealed no evidence of enamel hypoplasia (Table 36, Appendix D). In the permanent dentition, the frequency of the condition in the pre-contact Eskimo sample ranged from 5.95% in the maxillary canines to 37.5% in the mandibular canines for males and females combined (Table 37, Appendix D). The mandibular teeth exhibited higher frequencies than the maxillary teeth for each of the three tooth types examined. When both dentitions were combined, canines had the highest frequency of enamel hypoplasia (22.78%), followed by the central incisors (13.27%), and the lateral incisors (11.71%). There was no significant sex difference within the sample (Tables 38 and 39, Appendix D). Only three teeth in the pre-contact Aleut sample from Umnak Island had enamel hypoplasia, all of them canines. The mandibular canines displayed a higher frequency (4.65%) than the maxillary canines (2.5%). There was no significant sex difference within the sample.

In the post-contact Eskimo sample, only two teeth were affected, both of them maxillary central incisors. No significant sex difference was noted in the sample. A total of nine teeth in the post-contact Aleut sample displayed enamel hypoplasia, the

Table 22 - Log-Linear Analysis for Cranial and Infracranial Infection Combined (CIII), Ethnicity (E), and Time Period (T)

Males and Females Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) CIII + T + E	73.25	4	.000
One, Two-Way Interactions:			
2) T*CIII + E	66.05	3	.000
3) CIII*E + T	18.45	3	.000
4) T*E + CIII	58.15	3	.000
Two, Two-Way Interactions:			
5) E*T + E*CIII	3.36	2	.187
6) T*CIII+ E*T	50.96	2	.000
7) T*CIII + CIII*E	11.26	2	.004
Complete Interaction:			
8) CIII*E + T*E + CIII*T	.56	1	.454

Adults and Subadults Combined

Model Tested	Likelihood Ratio	D.F.	p
Complete independence:			
1) CIII + T + E	117.78	4	.000
One, Two-Way Interactions:			
2) T*CIII + E	101.86	3	.000
3) CIII*E + T	48.76	3	.000
4) T*E + CIII	74.71	3	.000
Two, Two-Way Interactions:			
5) E*T + E*CIII	5.69	2	.058
6) T*CIII+ E*T	58.80	2	.000
7) T*CIII + CIII*E	32.84	2	.000
Complete Interaction:			
8) CIII*E + T*E + CIII*T	.66	1	.416

frequency ranging from 0% in the maxillary lateral incisors and the mandibular central and lateral incisors, to 4.46% in the maxillary canines for males and females combined. When both dentitions were combined, the frequency was highest in the canines (4.3%), followed by the central incisors (1.05%). The lateral incisors were unaffected, and there was no significant sex difference within the sample.

A statistical comparison of the pre-contact Eskimo and Aleut samples by tooth type revealed a significantly higher frequency of enamel hypoplasia in the Eskimo sample for the canines (x^2=13.63, 14.974 BYC) and lateral incisors (x^2=3.746, 5.126 BYC) (Table 23). There was no significant difference between the two samples with respect to the central incisors. A comparison of the earlier and later Eskimo samples by tooth type revealed a significantly higher frequency of enamel hypoplasia in the earlier sample for the canines (x^2=11.312, 12.8 BYC), while there was no significant difference for the incisors. A comparison of the earlier and later Aleut samples by tooth type revealed no significant difference between the two samples with respect to the canines and central incisors. The lateral incisors were unaffected in both samples. Finally, log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between ethnicity, time period, and enamel hypoplasia (Table 24). For the lateral and central incisors, the data is best explained by the simultaneous interaction between ethnicity and time period, and ethnicity and enamel hypoplasia (model #5). The interaction between ethnicity and time period made a significant contribution to the likelihood ratio chi-square for the central incisors, while both sets of interactions made a significant contribution to the likelihood ratio chi-square for the lateral incisors.

Table 23 - Enamel Hypoplasia - Statistics

Canines

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	41/180	139/180	14.974*†	1	1.0000E-4
PCA	3/83	80/83	13.63**	1	2.0000E-4
PCE	41/180	139/180	12.8†	1	3.0000E-4
CE	0/46	46/46	11.312	1	8.0000E-4
PCA	3/83	80/83	.069	1	.7928
CA	8/186	178/186	4.987E-3	1	.9437

Lateral Incisors

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	13/111	98/111	5.126†	1	.0236
PCA	0/40	40/40	3.746	1	.0529
PCE	13/111	98/111	1.83	1	.1761
CE	0/14	14/14	.789	1	.3744
PCA	0/40	40/40	NO TEST RUN		
CA	0/110	110/110			

* Uncorrected
** Yates Corrected
† Statistically significant

Table 23 - Enamel Hypoplasia - Statistics - continued

Central Incisors

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	13/98	85/98	3.563	1	.0591
PCA	0/24	24/24	2.306	1	.1289
PCE	13/98	85/98	.011	1	.9165
CE	2/14	12/14	.099	1	.7531
PCA	0/24	24/24	.255	1	.6137
CA	1/95	94/95	.557	1	.4553

Table 24 - Log-Linear Analysis for Enamel Hypoplasia (EH), Ethnicity (E), and Time Period (T)

Canines

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) EH + T + E	232.04	4	.000
One, Two-Way Interactions:			
2) T*EH + E	196.38	3	.000 (YC)**†
3) EH*E + T	182.27	3	.000
4) T*E + EH	72.08	3	.000
Two, Two-Way Interactions:			
5) E*T + E*EH	22.31	2	.000
6) T*EH + E*T	40.71	2	.000
7) T*EH + EH*E	150.90	2	.000
Complete Interaction:			
8) EH*E + T*E + EH*T	10.91	1	.001 (YC)†

Lateral Incisors

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) EH + T + E	174.36	4	.000 (YC)†
One, Two-Way Interactions:			
2) T*EH + E	161.19	3	.000 (YC)†
3) EH*E + T	148.11	3	.000 (YC)†
4) T*E + EH	27.63	3	.000 (YC)
Two, Two-Way Interactions:			
5) E*T + E*EH	1.37	2	.503 (YC)†
6) T*EH + E*T	14.46	2	.001 (YC)†
7) T*EH + EH*E	134.94	2	.000 (YC)†
Complete Interaction:			
8) EH*E + T*E + EH*T	.18	1	.670 (YC)†

** Yates corrected
† results are suspect due to small sample size

Table 24 - Log-Linear Analysis for Enamel Hypoplasia (EH), Ethnicity (E), and Time Period (T)

Central Incisors

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) EH + T + E	169.30	4	.000 (YC)
One, Two-Way Interactions:			
2) T*EH + E	163.24	3	.000 (YC)†
3) EH*E + T	148.89	3	.000 (YC)†
4) T*E + EH	20.60	3	.000 (YC)†
Two, Two-Way Interactions:			
5) E*T + E*EH	.19	2	.910 (YC)†
6) T*EH + E*T	14.54	2	.001 (YC)†
7) T*EH + EH*E	142.82	2	.000 (YC)†
Complete Interaction:			
8) EH*E + T*E + EH*T	.01	1	.919 (YC)†

Dental Caries

An examination of all deciduous dentition (351 teeth) in the study samples revealed no carious lesions (Table 40, Appendix D). An analysis of the permanent dentition revealed only one carious tooth out of a total of 5041 examined. The affected tooth was a maxillary first molar of a middle-aged male from Kugusugaruk (#381,090) (Table 41, Appendix D). Given the absence of caries in all but one of the study samples, no statistical analyses were performed on the data.

Dental Abscesses

Of the deciduous dentition, only one tooth, a second maxillary molar of a child aged 2 to 4 years from Shiprock Island (#378,507), was abscessed (Table 42, Appendix D). All remaining 730 teeth/alveoli examined showed no evidence of abscesses. An examination of the permanent dentition revealed relatively low frequencies of abscesses in most of the study samples. In the pre-contact Eskimo sample, the frequency of the condition ranged from 2.7% in the mandibular premolars to 11.08% in the mandibular molars for males and females combined (Table 43, Appendix D). The maxillary premolars, canines and incisors had higher frequencies than the corresponding mandibular teeth, while the mandibular molars had a higher frequency than the maxillary molars. When both dentitions were combined, the molars had the highest frequency (10.1%), followed by the incisors (4.11%), the canines (3.85%), and the premolars (3.07%). Males showed significantly higher frequencies than females for the molars (x^2=5.685, 6.15 BYC), premolars (x^2=5.745, 6.747 BYC), and canines (x^2=6.658, 8.034 BYC) (Tables 44 and 45, Appendix D). Individuals over the age of 50 had significantly higher frequencies than individuals under 50 for all four tooth types (Tables 46 and 47, Appendix D).

The frequency of dental abscesses in the pre-contact Aleut sample ranged from 0%

in the mandibular canines to 13.26% in the mandibular molars for males and females combined. The maxillary premolars, canines, and incisors had higher frequencies than the corresponding mandibular teeth, while the mandibular molars had a higher frequency than the maxillary molars. Combining both dentitions revealed the highest frequency in the molars (9.66%), followed by the canines (6.40%), the incisors (3.94%), and the premolars (3.77%). There was no significant sex difference within the sample; however, older adults (50+ years) had significantly higher frequencies than younger adults (<50) for the molars (x^2=7.279, 8.043 BYC) and premolars (x^2=4.479, 5.717 BYC).

The frequency of abscesses in the post-contact Eskimo sample was lowest in the mandibular incisors (0%) and highest in the maxillary molars (8.63%). The maxillary molars and incisors had higher frequencies than the mandibular molars and incisors, while the mandibular premolars and canines had higher frequencies than the corresponding maxillary teeth. When both dentitions were combined, the molars showed the highest frequency of abscessing (8.18%), followed by the premolars (1.82%), the incisors (1.65%), and the canines (1.45%). There was no significant sex difference within the sample; however, older adults had significantly higher frequencies than younger adults for the molars (x^2=5.632, 6.497 BYC) and canines (x^2=9.142, 14.353 BYC).

In the post-contact Aleut sample, the frequency of abscesses ranged from 1.71% in the mandibular premolars to 9.83% in the maxillary molars. The maxillary dentition had higher frequencies for all four tooth types than the mandibular dentition. When both dentitions were combined, the molars had the highest frequency of abscesses (9.11%), followed by the incisors (4.13%), the premolars (3.06%), and the canines (2.82%). There was no significant sex difference within the sample; however, significantly more older adults were affected than younger adults for the molars (x^2=122.967, 125.294

BYC), premolars (x^2=17.368, 19.247 BYC), and incisors (x^2=4.539, 5.353 BYC).

A statistical comparison of the pre-contact Eskimo and Aleut samples by tooth type revealed no significant difference between the two samples for all four tooth types (Table 25). A comparison of the earlier and later Eskimo samples revealed no significant difference between the two samples for the molars, premolars, and canines, while the earlier sample had a significantly higher frequency of abscessing in the incisors than the later sample (x^2=5.887, 6.667 BYC). A comparison of the earlier and later Aleut samples revealed no significant difference between the two samples for the molars, premolars, and incisors, while the earlier sample had a significantly higher frequency of abscessing in the canines than the later sample (x^2=3.718, 4.607 BYC). Finally, log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between ethnicity, time period, and dental abscesses (Table 26). For the molars and premolars, the data is best explained by the interaction between time period and ethnicity in the presence of dental abscesses (model #4). For the canines, the data is best explained by the simultaneous interaction between time period and dental abscesses, and time period and ethnicity (model #6). The interaction between time period and ethnicity made a significant contribution to the likelihood ratio chi-square.

Antemortem Tooth Loss

No evidence of antemortem tooth loss (AMTL) was observed in the deciduous dentition of any of the study samples (Table 48, Appendix D). In the permanent dentition, the frequency of AMTL in the pre-contact Eskimo sample ranged from 8.56% for the mandibular canines to 26.2% for the mandibular molars for males and females combined (Table 49, Appendix D). The maxillary premolars, canines, and incisors were

Table 25 - Dental Abscesses - Statistics

Molars

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	130/1287	1157/1287	.753*	1	.3855
PCA	64/559	495/559	.616**	1	.4324
PCE	130/1287	1157/1287	2.087	1	.1486
CE	63/770	707/770	1.867	1	.1718
PCA	64/559	495/559	2.362	1	.1243
CA	112/1229	1117/1229	2.107	1	.1467

Premolars

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	27/880	853/880	.423	1	.5153
PCA	15/398	383/398	.232	1	.6304
PCE	27/880	853/880	2.069	1	.1504
CE	10/548	538/548	1.605	1	.2052
PCA	15/398	383/398	.435	1	.5096
CA	26/851	825/851	.239	1	.6248

* Uncorrected
** Yates Corrected
† Statistically significant

Table 25 - Dental Abscesses - Statistics - continued

Canines

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	17/441	424/441	2.034	1	.1538
PCA	13/203	190/203	1.5	1	.2206
PCE	17/441	424/441	3.428	1	.0641
CE	4/275	271/275	2.637	1	.1044
PCA	13/203	190/203	4.607†	1	.0318
CA	12/425	413/425	3.718	1	.0538

Incisors

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	36/875	839/875	.021	1	.8837
PCA	16/406	390/406	3.3868E-5	1	.9954
PCE	36/875	839/875	6.667†	1	.0098
CE	9/546	537/546	5.887	1	.0153
PCA	16/406	390/406	.026	1	.8725
CA	35/847	812/847	5.8978E-5	1	.9939

Table 26 - Log-Linear Analysis for Dental Abscesses (DA), Ethnicity (E), and Time Period (T)

Molars

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) DA + T + E	527.42	4	.000
One, Two-Way Interactions:			
2) T*DA + E	522.87	3	.000
3) DA*E + T	526.93	3	.000
4) T*E + DA	6.56	3	.087
Two, Two-Way Interactions:			
5) E*T + E*DA	6.06	2	.048
6) T*DA + E*T	2.00	2	.367
7) T*DA + DA*E	522.37	2	.000
Complete Interaction:			
8) DA*E + T*E + DA*T	.01	1	.913

Premolars

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) DA + T + E	332.41	4	.000
One, Two-Way Interactions:			
2) T*DA + E	330.81	3	.000
3) DA*E + T	331.14	3	.000
4) T*E + DA	4.53	3	.209
Two, Two-Way Interactions:			
5) E*T + E*DA	3.26	2	.196
6) T*DA + E*T	2.93	2	.231
7) T*DA + DA*E	329.54	2	.000
Complete Interaction:			
8) DA*E + T*E + DA*T	.52	1	.471

Table 26 - Log-Linear Analysis for Dental Abscesses (DA), Ethnicity (E), and Time Period (T)

Canines

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) DA + T + E	171.72	4	.000
One, Two-Way Interactions:			
2) T*DA + E	164.20	3	.000
3) DA*E + T	169.57	3	.000
4) T*E + DA	12.88	3	.005
Two, Two-Way Interactions:			
5) E*T + E*DA	10.72	2	.005
6) T*DA + E*T	5.35	2	.069
7) T*DA + DA*E	162.04	2	.000
Complete Interaction:			
8) DA*E + T*E + DA*T	.05	1	.822

Incisors

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) DA + T + E	323.49	4	.000
One, Two-Way Interactions:			
2) T*DA + E	321.40	3	.000
3) DA*E + T	322.79	3	.000
4) T*E + DA	9.44	3	.024
Two, Two-Way Interactions:			
5) E*T + E*DA	8.75	2	.013
6) T*DA + E*T	7.35	2	.025
7) T*DA + DA*E	320.71	2	.000
Complete Interaction:			
8) DA*E + T*E + DA*T	5.70	1	.017

more frequently affected than the corresponding mandibular teeth, while the mandibular molars were more frequently involved than the maxillary molars. When both dentitions were combined, the frequency of AMTL was highest in the molars (23.42%), followed by the incisors (19.43%), the premolars (12.97%), and the canines (11.64%). There was no significant sex difference within the sample (Tables 50 and 51, Appendix D); however, older adults had significantly higher frequencies than younger adults for all four tooth types (Tables 52 and 53, Appendix D).

In the pre-contact Aleut sample, the frequency of AMTL was lowest for the mandibular canines (6.19%) and highest for the maxillary incisors (29.67%). The maxillary premolars, canines, and incisors had higher frequencies than the corresponding mandibular teeth, while the mandibular molars had a higher frequency than the maxillary molars. Combining both dentitions revealed the highest frequency of AMTL in the incisors (27.38%), followed by the molars (21.15%), the premolars (9.87%), and the canines (7.92%). Females had significantly higher frequencies than males for the molars (x^2=15.416, 16.252 BYC) and incisors (x^2=23.086, 24.187 BYC), while older adults had significantly higher frequencies than younger adults for all four tooth types.

In the post-contact Eskimo sample, the frequency of AMTL ranged from 7.89% for the maxillary canines to 36.81% for the mandibular molars. All four mandibular tooth types had higher frequencies than the corresponding maxillary teeth. When the dentitions were combined, the molars had the highest frequency of AMTL (24.84%), followed by the incisors (23.99%), the premolars (20.66%), and the canines (12%). For all four tooth types, males had significantly higher frequencies than females, and older adults had significantly higher frequencies than younger adults.

The frequency of AMTL in the post-contact Aleut sample ranged from 1.38% for the mandibular premolars to 12.43% for the maxillary incisors. All four maxillary tooth

types had higher frequencies of AMTL than the corresponding mandibular teeth. When the dentitions were combined, the incisors had the highest frequency of AMTL (10.06%), followed by the molars (7.92%), the premolars (3.89%), and the canines (2.60%). Females had significantly higher frequencies than males for the molars (x^2=13.888, 14.677 BYC), canines (x^2=4.048, 5.373 BYC), and incisors (x^2=8.673, 9.358 BYC), while older adults had significantly higher frequencies than younger adults for all four tooth types.

A statistical comparison of the pre-contact Eskimo and Aleut samples by tooth type revealed no significant difference between the two samples for the molars, premolars, and canines, while the Aleut sample had a significantly higher frequency of AMTL of the incisors than the Eskimo sample (x^2=10.726, 11.207 BYC) (Table 27). A comparison of the earlier and later Eskimo samples by tooth type revealed that the later sample had a significantly higher frequency of AMTL of the premolars (x^2=14.324, 14.893 BYC) and incisors (x^2=3.891, 4.16 BYC), while there was no significant difference between the two samples with respect to the molars and canines. A comparison of the earlier and later Aleut samples by tooth type revealed that the earlier sample had significantly higher frequencies of AMTL for all four tooth types. Finally, log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between ethnicity, and time period, and antemortem tooth loss for all four tooth types (Table 28).

Periodontal Disease

Periodontal disease was not scored in the deciduous dentition in the study samples. In the permanent dentition, the frequency of the condition was relatively low in all of the samples. In the pre-contact Eskimo sample, the frequency of periodontal disease ranged from 1.05% for the maxillary incisors to 16.49% for the mandibular molars for males

Table 27 - Antemortem Tooth Loss - Statistics

Molars

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	308/1315	1007/1315	1.154*	1	.2827
PCA	118/558	440/558	1.028**	1	.3106
PCE	308/1315	1007/1315	.538	1	.4631
CE	193/777	584/777	.464	1	.496
PCA	118/558	440/558	64.273†	1	1.0000E-4
CA	100/1263	1163/1263	63.024	1	1.0000E-4

Premolars

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	114/879	765/879	2.472	1	.1159
PCA	39/395	356/395	2.188	1	.1391
PCE	114/879	765/879	14.893†	1	1.0000E-4
CE	113/547	434/547	14.324	1	2.0000E-4
PCA	39/395	356/395	17.718†	1	1.0000E-4
CA	33/849	816/849	16.637	1	1.0000E-4

* Uncorrected
** Yates Corrected
† Statistically significant

Table 27 - Antemortem Tooth Loss - Statistics - continued

Canines

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	51/438	387/438	2.044	1	.1528
PCA	16/202	186/202	1.667	1	.1967
PCE	51/438	387/438	.021	1	.8858
CE	33/275	242/275	5.889E-4	1	.9806
PCA	16/202	186/202	9.362†	1	.0022
CA	11/423	412/423	8.119	1	.0044

Incisors

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	169/870	701/870	11.207†	1	8.0000E-4
PCA	112/403	291/403	10.726	1	.0011
PCE	169/870	701/870	4.16†	1	.0414
CE	130/542	412/542	3.891	1	.0485
PCA	112/403	291/403	64.542†	1	1.0000E-4
CA	85/845	760/845	63.215	1	1.0000E-4

Table 28 - Log-Linear Analysis for Antemortem Tooth Loss (AMTL), Ethnicity (E), and Time Period (T)

Molars

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) AMTL + T + E	734.89	4	.000
One, Two-Way Interactions:			
2) T*AMTL + E	674.08	3	.000
3) AMTL*E + T	650.60	3	.000
4) T*E + AMTL	171.84	3	.000
Two, Two-Way Interactions:			
5) E*T + E*AMTL	87.56	2	.000
6) T*AMTL + E*T	111.04	2	.000
7) T*AMTL + AMTL*E	589.80	2	.000
Complete Interaction:			
8) AMTL*E + T*E + AMTL*T	59.84	1	.000

Premolars

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) AMTL + T + E	436.38	4	.000
One, Two-Way Interactions:			
2) T*AMTL + E	434.22	3	.000
3) AMTL*E + T	372.11	3	.000
4) T*E + AMTL	106.39	3	.000
Two, Two-Way Interactions:			
5) E*T + E*AMTL	42.12	2	.000
6) T*AMTL + E*T	104.22	2	.000
7) T*AMTL + AMTL*E	369.95	2	.000
Complete Interaction:			
8) AMTL*E + T*E + AMTL*T	41.39	1	.000

Table 28 - Log-Linear Analysis for Antemortem Tooth Loss (AMTL), Ethnicity (E), and Time Period (T)

Canines

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) AMTL + T + E	195.48	4	.000
One, Two-Way Interactions:			
2) T*AMTL + E	185.41	3	.000
3) AMTL*E + T	168.87	3	.000
4) T*E + AMTL	38.95	3	.000
Two, Two-Way Interactions:			
5) E*T + E*AMTL	12.34	2	.002
6) T*AMTL + E*T	28.87	2	.000
7) T*AMTL + AMTL*E	158.80	2	.000
Complete Interaction:			
8) AMTL*E + T*E + AMTL*T	8.93	1	.003

Incisors

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) AMTL + T + E	410.49	4	.000
One, Two-Way Interactions:			
2) T*AMTL + E	385.29	3	.000
3) AMTL*E + T	408.54	3	.000
4) T*E + AMTL	94.67	3	.000
Two, Two-Way Interactions:			
5) E*T + E*AMTL	92.72	2	.000
6) T*AMTL + E*T	69.47	2	.000
7) T*AMTL + AMTL*E	383.34	2	.000
Complete Interaction:			
8) AMTL*E + T*E + AMTL*T	69.47	1	.000

and females combined (Table 54, Appendix D). All four mandibular tooth types exhibited higher frequencies than the corresponding maxillary teeth. When the dentitions were combined, the frequency was highest in the molars (15.07%), followed by the canines (6.16%), the premolars (5.15%), and the incisors (3.60%). For all four tooth types, males had significantly higher frequencies than females (Tables 55 and 56, Appendix C), while older adults had significantly higher frequencies than younger adults (Tables 57 and 58, Appendix D).

The pre-contact Aleut sample exhibited frequencies of periodontal disease ranging from 4.52% for the mandibular premolars to 20.26% for the maxillary molars for males and females combined. All four maxillary tooth types had higher frequencies than the corresponding mandibular teeth. Combining the dentitions revealed that the molars had the highest frequency of periodontal disease (15.56%), followed by the incisors (7.77%), the premolars (6.73%), and the canines (6.06%). Females had significantly higher frequencies than males for the molars (x^2=3.84, 4.539 BYC) and premolars (x^2=5.34, 6.5 BYC), while older adults had significantly higher frequencies than younger adults for the molars (x^2=20.273, 21.704 BYC), premolars (x^2=10.525, 12.101 BYC), and incisors (x^2=5.038, 6.333 BYC).

In the post-contact Eskimo sample, the frequency of periodontal disease was lowest for the maxillary incisors (0.34%) and highest for the mandibular molars (18.06%) for males and females combined. All four mandibular tooth types had higher frequencies than the corresponding maxillary teeth. When the dentitions were combined, the highest frequency of the condition was noted in the molars (5.60%), followed by the canines (1.56%), the premolars (1.51%), and the incisors (0.58%). There was no significant sex or age difference within the sample.

The frequency of periodontal disease in the post-contact period Aleut sample ranged from 1.57% for the maxillary premolars to 6.53% for the maxillary molars. The

combined dentitions showed frequencies that were highest for the molars (5.32%) and lowest for the premolars (2.03%). Females had a significant higher frequency than males for the molars (x^2=4.906, 5.548 BYC), while there was no significant sex difference for the remaining three tooth types. Significantly more older adults were affected than younger adults for all four tooth types.

A statistical comparison of the pre-contact Eskimo and Aleut samples by tooth type revealed that the Aleut sample had a significantly higher frequency of periodontal disease of the incisors than the Eskimo sample (x^2=4.902, 5.813 BYC), while there was no significant difference between the two samples with respect to the remaining three tooth types (Table 29). A comparison of the earlier and later Eskimo samples by tooth type revealed significantly higher frequencies of the disease in the earlier sample for all four tooth types. A comparison of the earlier and later Aleut samples by tooth type revealed significantly higher frequencies in the earlier sample for the molars (x^2=33.831, 35.249 BYC), premolars (x^2=13.511, 14.945 BYC), and incisors (x^2=6.224, 7.267 BYC), but no significant difference for the canines. Finally, log-linear analysis resulted in a rejection of the null hypothesis of complete independence, and revealed a significant association between ethnicity, time period, and periodontal disease (Table 30). For the molars, premolars, and canines, the data is best explained by the simultaneous interaction between time period and periodontal disease, and time period and ethnicity (model #6). Of the two sets of interactions, both made a significant contribution to the likelihood ratio chi-square for the molars and premolars, while the interaction between ethnicity and time period made a significant contribution to the likelihood ratio chi-square for the canines. For the incisors, the data is best explained by the simultaneous interaction between periodontal disease and ethnicity, time period and ethnicity, and periodontal disease and time period (model #8). Each set of interactions made a significant contribution to the likelihood ratio chi-square.

Table 29 - Periodontal Disease - Statistics

Molars

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	121/803	682/803	.042*	1	.8383
PCA	49/315	266/315	.012**	1	.9113
PCE	121/803	682/803	23.471†	1	1.0000E-4
CE	28/467	439/467	22.603	1	1.0000E-4
PCA	49/315	266/315	35.249†	1	1.0000E-4
CA	54/1015	961/1015	33.831	1	1.0000E-4

Premolars

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	37/719	682/719	1.001	1	.3171
PCA	20/297	277/297	.723	1	.395
PCE	37/719	682/719	7.768†	1	.0053
CE	7/398	391/398	6.899	1	.0086
PCA	20/297	277/297	14.945†	1	1.0000E-4
CA	16/790	774/790	13.511	1	2.0000E-4

* Uncorrected
** Yates Corrected
† Statistically significant

Table 29 - Periodontal Disease - Statistics - continued

Canines

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	21/341	320/341	1.580E-3	1	.9683
PCA	8/132	124/132	.03	1	.8619
PCE	21/341	320/341	6.034†	1	.014
CE	3/192	189/192	5.012	1	.0252
PCA	8/132	124/132	1.374	1	.2411
CA	14/382	368/382	.852	1	.3561

Incisors

Sample	Present	Absent	X^2	Degrees of Freedom	Significance
PCE	22/611	589/611	5.813†	1	.0159
PCA	15/193	178/193	4.902	1	.0268
PCE	22/611	589/611	8.255†	1	.0041
CE	2/346	344/346	7.065	1	.0079
PCA	15/193	178/193	7.267†	1	.007
CA	23/692	669/692	6.224	1	.0126

Table 30 - Log-Linear Analysis for Periodontal Disease (PD), Ethnicity (E), and Time Period (T)

Molars

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) PD + T + E	689.57	4	.000
One, Two-Way Interactions:			
2) T*PD + E	599.20	3	.000
3) PD*E + T	676.31	3	.000
4) T*E + PD	90.73	3	.000
Two, Two-Way Interactions:			
5) E*T + E*PD	77.47	2	.000
6) T*PD +E*T	.36	2	.836
7) T*PD + PD*E	585.94	2	.000
Complete Interaction:			
8) PD*E + T*E + PD*T	.36	1	.550

Premolars

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) PD + T + E	459.48	4	.000
One, Two-Way Interactions:			
2) T*PD + E	431.59	3	.000
3) PD*E + T	459.22	3	.000
4) T*E + PD	29.93	3	.000
Two, Two-Way Interactions:			
5) E*T + E*PD	29.67	2	.000
6) T*PD +E*T	2.04	2	.361
7) T*PD + PD*E	431.33	2	.000
Complete Interaction:			
8) PD*E + T*E + PD*T	.08	1	.778

Table 30 - Log-Linear Analysis for Periodontal Disease (PD), Ethnicity (E), and Time Period (T)

Canines

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) PD + T + E	231.40	4	.000
One, Two-Way Interactions:			
2) T*PD + E	223.19	3	.000
3) PD*E + T	231.20	3	.000
4) T*E + PD	10.40	3	.015
Two, Two-Way Interactions:			
5) E*T + E*PD	10.20	2	.006
6) T*PD +E*T	2.19	2	.335
7) T*PD + PD*E	222.98	2	.000
Complete Interaction:			
8) PD*E + T*E + PD*T	1.77	1	.184

Incisors

Model Tested	Likelihood Ratio	D.F.	p
Complete Independence:			
1) PD + T + E	511.61	4	.000
One, Two-Way Interactions:			
2) T*PD + E	502.68	3	.000
3) PD*E + T	504.77	3	.000
4) T*E + PD	28.60	3	.000
Two, Two-Way Interactions:			
5) E*T + E*PD	21.77	2	.000
6) T*PD +E*T	19.67	2	.000
7) T*PD + PD*E	495.85	2	.000
Complete Interaction:			
8) PD*E + T*E + PD*T	1.88	1	.170

Summary of Results

The results of the statistical analyses performed on the data are summarized in Table 31. These results indicate that both cultural and temporal differences are evident in the study samples. With respect to cultural differences, most noteworthy are the significant differences between the pre-contact Eskimo and Aleut samples in cranial trauma, overall trauma (cranial and infracranial combined), infracranial infection, and overall infection (cranial and infracranial combined). With respect to temporal differences, of greatest significance is the higher frequency of cribra orbitalia and cranial infection in the later Aleut sample compared to the earlier Aleut sample, and the higher frequency of overall trauma in the earlier Eskimo and Aleut samples compared to the later samples.

Table 31 - Summary of Results

Health Indicators	Observations
Cribra Orbitalia	There was no significant difference between the pre-contact Eskimo and Aleut samples. There was no significant difference between the earlier and later Eskimo samples. **The later Aleut sample had significantly more cribra orbitalia than the earlier Aleut sample.**
Porotic Hyperostosis	There was no significant difference between the pre-contact Eskimo and Aleut samples. There was no significant difference between the earlier and later Eskimo samples. There was no significant difference between the earlier and later Aleut samples.
Cribra Orbitalia and Porotic Hyperostosis Combined	There was no significant difference between the pre-contact Eskimo and Aleut samples. There was no significant difference between the earlier and later Eskimo samples. **The later Aleut sample had significantly more cribra orbitalia and porotic hyperostosis than the earlier Aleut sample.**
Cranial Trauma	**The pre-contact Aleut sample had significantly more cranial trauma than the pre-contact Eskimo sample.** There was no significant difference between the earlier and later Eskimo samples. There was no significant difference between the earlier and later Aleut samples.
Infracranial Trauma	There was no significant difference between the pre-contact Eskimo and Aleut samples. There was no significant difference between the earlier and later Eskimo samples. There was no significant difference between the earlier and later Aleut samples.
Cranial and Infra-cranial Trauma Combined	**The pre-contact Aleut sample had significantly more trauma than the pre-contact Eskimo sample.** **The earlier Eskimo sample had significantly more trauma than the later Eskimo sample.*** **The earlier Aleut sample had significantly more trauma than the later Aleut sample.**

* Results are suspect due to small sample size

Table 31 - Summary of Results - continued

Health Indicators	Observations
Cranial Infection	There was no significant difference between the pre-contact Eskimo and Aleut samples. There was no significant difference between the earlier and later Eskimo samples. **The later Aleut sample had significantly more cranial infection than the earlier Aleut sample.**
Infracranial Infection	**The pre-contact Aleut sample had significantly more infracranial infection than the pre-contact Eskimo sample.** **The later Eskimo sample had significantly more infracranial infection than the earlier Eskimo sample.*** There was no significant difference between the earlier and later Aleut samples.
Cranial and Infracranial Infection Combined	**The pre-contact Aleut sample had significantly more infection than the pre-contact Eskimo sample.** There was no significant difference between the earlier and later Eskimo samples. There was no significant difference between the earlier and later Aleut samples.
Enamel Hypoplasia	**The pre-contact Eskimo sample had significantly more enamel hypoplasia in the canines and lateral incisors than the pre-contact Aleut sample.** **The earlier Eskimo sample had significantly more enamel hypoplasia in the canines than the later Eskimo sample.** There was no significant difference between the earlier and later Eskimo samples for the incisors. There was no significant difference between the earlier and later Aleut samples for the canines and incisors.
Dental Caries	A statistical comparison of the pre-contact Eskimo and Aleut samples, the earlier and later Eskimo samples, and the earlier and later Aleut samples was not performed since only one tooth in the study samples had caries.
Dental Abscesses	There was no significant difference between the pre-contact Eskimo and Aleut samples for the four tooth types.

Table 31 - Summary of Results - continued

Health Indicators	Observations
Dental Abscesses	**The earlier Eskimo sample had significantly more abscesses of the incisors than the later Eskimo sample.** There was no significant difference between the earlier and later Eskimo samples for the molars, premolars, and canines. **The earlier Aleut sample had significantly more abscesses of the canines than the later Aleut sample.** There was no significant difference between the earlier and later Aleut samples for the molars, premolars, and incisors.
Antemortem Tooth Loss	**The pre-contact Aleut sample had lost significantly more incisors antemortem than the pre-contact Eskimo sample.** There was no significant difference between the pre-contact Eskimo and Aleut samples for the molars, premolars, and canines. **The later Eskimo sample had lost significantly more premolars and incisors antemortem than the earlier Eskimo sample.** There was no significant difference between the earlier and later Eskimo samples for the molars and canines. **The earlier Aleut sample had significantly more antemortem loss of all four tooth types than the later Aleut sample.**
Periodontal Disease	**The pre-contact Aleut sample had significantly more periodontal disease of the incisors than the pre-contact Eskimo sample.** There was no significant difference between the pre-contact Eskimo and Aleut samples for the molars, premolars, and canines. **The earlier Eskimo sample had significantly more periodontal disease of all four tooth types than the later Eskimo sample.** **The earlier Aleut sample had significantly more periodontal disease of the molars, premolars, and incisors than the later Aleut sample.** There was no significant difference between the earlier and later Aleut samples for the canines.

CHAPTER 7

DISCUSSION AND INTERPRETATIONS

Skeletal Evidence of Health and Disease

Cribra orbitalia and porotic hyperostosis

Pre-Contact Period

Frequencies of cribra orbitalia and porotic hyperostosis previously reported for native Alaskan skeletal samples range from 6.1% (El-Najjar 1976) to 20% of Alaskan Eskimos (Nathan and Haas 1966), a difference that may reflect, in part, methodological differences and the differing proportions of subadults in the samples (Stewart 1979a: 265). In the present study, the frequencies of the two conditions combined range from 3.64% in the pre-contact Aleut sample to 11.86% in the pre-contact Eskimo sample. These findings are consistent with Scott et al.'s (1984: 70) comment that porotic hyperostosis is not uncommon in pre-contact and early contact period Alaskan Eskimo crania.

That both the Eskimos and Aleuts were susceptible to iron deficiency anemia prior to contact is contrary to what might be expected, given the primary reliance of these groups on a diet rich in iron. In fact, as Kent (1986: 625) points out, if Nathan and Haas' (1966) figure of 20% is accurate, then the northern coastal Eskimos display higher frequencies of cribra orbitalia and porotic hyperostosis than some horticultural Indian populations from the American Southwest. Many of the foods traditionally utilized by the Eskimos and Aleuts, including sea mammal meat, blood soups, bone marrow, liver, waterfowl, and certain species of fish, contain iron in sufficient quantities to prevent anemia (Morehouse 1981: 92). Only in modern native Alaskan populations has

anemia been attributed largely to an inadequate dietary intake of iron (Scott et al. 1955; Scott and Heller 1964; Sauberlich et al. 1972). Thus diet is unlikely to have been the primary cause of iron deficiency anemia in the pre-contact period, although seasonal food shortages among these groups may have contributed, in part, to the development of this condition.

According to Kent (1986: 625), parasitic, bacterial, and viral infections associated with sedentism and aggregation may account for the presence of iron deficiency anemia in Eskimo populations. Parasitic infections have been proposed as a contributing factor in the development of iron deficiency anemia in Indian populations of coastal British Columbia (Cybulski 1977) and California (Walker 1986a), and are known to have afflicted Alaskan Eskimos and Aleuts prior to contact. Palaeopathological studies of Alaskan mummies have revealed the presence of a number of parasites, some of which may have been capable of producing anemia in these individuals. Of particular relevance are fish-borne parasites such as *Cryptocotyle lingua* (Zimmerman and Smith 1975: 833) and *Diphyllobothrium latum* (Fortuine 1989: 62), and the mammal-borne parasites *Trichinella spiralis* (Zimmerman and Aufderheide 1984: 62), *Echinococcus granulosus* (Ortner and Putschar 1985: 232), and *Echinoccocus multilocularis* (Fortuine 1989: 62), usually contracted from eating raw or undercooked meat.

Also associated with sedentism and aggregation are bacterial and viral infections (Kent 1986). The occupation by the Eskimos and Aleuts of permanent winter villages, some of which were quite large, the lack of sanitation in these villages, the crowded living conditions of the Aleuts in particular, and the reliance on water supplies that may have been contaminated (Fortuine 1989: 70) undoubtedly placed these groups at an increased risk of gastrointestinal infections resulting in diarrhoea and the subsequent loss of iron. Diarrhoeal infections caused by the bacteria *Salmonella typhosa* and

Shigella flexneri are common among modern Eskimo groups, particularly among children (Fournelle et al. 1958, 1959, cited in Oswalt 1967: 77; Gordon and Babbott 1959, cited in Oswalt 1967: 76), and were likely prevalent in earlier times as well (Oswalt 1967: 77). Diarrhoea is reported to have been common among the Aleuts, who traditionally used a root extract as a remedy for the condition (Veniaminov 1984: 291, 293).

The lack of a significant difference between the pre-contact samples with respect to cribra orbitalia and porotic hyperostosis suggests that the Eskimos and Aleuts were equally at risk of developing iron deficiency anemia. Both groups traditionally consumed fish and and sea mammal meat, foods known to carry parasites, both experienced seasonal food shortages, and both were exposed to bacterial and viral infections resulting from their living conditions and lack of sanitation. While the Aleut sample does show a significantly higher frequency of infracranial infection than the Eskimo sample, suggesting that the Aleuts may have been exposed to a higher pathogen load, these infections appear to have been localized rather than systemic in nature, and none of the Aleuts with infracranial infection exhibited cribra orbitalia and/or porotic hyperostosis as well.

Post-Contact Period

The most noteworthy finding in the present study was the significantly higher frequency of cribra orbitalia in the post-contact Aleut sample compared to the pre-contact Aleut sample. Many of the affected individuals in the later sample were subadults with active lesions. Possible explanations for this difference include an increased pathogen load resulting from the introduction of new diseases, the age distribution of the samples, and a dietary shift from traditional iron-rich foods to iron-deficient foods introduced by the Russians. That infectious diseases became more prevalent following

contact is indicated by the significantly higher frequency of cranial infection in the post-contact Aleut sample compared to the pre-contact sample, and by the documented occurrence of numerous epidemics which struck the population with devastating consequences. Diarrhoeal infections continued to be a health problem in the contact period, claiming the lives of 14 Unalaska Aleuts from 1822 to 1836 (Veniaminov 1984: 488). In the post-contact sample, five individuals with cribra orbitalia and/or porotic hyperostosis also displayed systemic infracranial infections, while 18 individuals with these conditions also had cranial infections. These findings suggest that infectious diseases were an underlying cause of iron deficiency anemia during this period.

The significant increase in cribra orbitalia in the later period may also reflect, to some extent, the age distribution of the samples under comparison, specifically, the significantly higher frequency of subadults in the later sample. A statistical comparison of adults only revealed no significant difference between the two samples (x^2=1.567, 2.36 BYC). Previous studies have demonstrated higher levels of cribra orbitalia and porotic hyperostosis in subadults, particularly young children, than in adults (Nathan and Haas 1966; Cybulski 1977; Walker 1986a). This observation has been attributed to the fact that children have a higher demand for iron as a result of their rapid growth and development (El-Najjar 1976: 335; Cybulski 1977: 37), and are therefore more susceptible to iron deficiency anemia. As well, their marrow distribution is such that anemia results in hyperplasia of the marrow and consequent thinning of the outer table of the cranium (Stuart-Macadam 1985: 394). Finally, individuals with iron deficiency anemia tend to have a higher mortality than those without the condition, therefore dying before they reach adulthood (Walker 1986a: 349).

A less likely explanation for the observed difference between the two Aleut samples is a dietary shift to iron-deficient foods introduced by the Russians. As Milan (1974:

21) has noted, nutritional changes resulting from contact were minimal. Rather than replacing traditional food items, Russian foods merely supplemented the aboriginal diet (L. Milan 1974: 21). These foods tended to be given to Creoles (individuals of Russian-Aleut ancestry) rather than Aleuts (L. Milan 1974: 21), and when they were given to the latter, were often insufficient in quality and quantity (Fortuine 1989: 116).

There was no significant difference between the earlier and later Eskimo samples with respect to cribra orbitalia and porotic hyperostosis. The underrepresentation of subadults in both samples undoubtedly obscures the true prevalence of iron deficiency anemia in the pre- and post-contact periods (Larsen et al. 1992: 32). The documented occurrence of epidemics and diarrhoeal infections (Murdoch 1988: 39) among the northern coastal Eskimos during the contact period suggests that the level of infectious diseases increased following contact. This increase likely resulted in an increase in iron deficiency anemia among juveniles whose remains were either not preserved or not recovered.

Other metabolic diseases

None of the skeletal remains examined in the present study exhibited any evidence of scurvy (vitamin C deficiency) or rickets (vitamin D deficiency), providing some support for Draper's (1977: 309) remark that the Eskimos have no history of vitamin deficiency diseases. In addition to containing abundant amounts of iron, the traditional diet of both the Eskimos and Aleuts contained adequate amounts of other essential nutritional elements (Draper 1977; Morehouse 1981: 80). Consequently, any nutritional deficiencies that did occur were the result of periodic food shortages rather than the quality of the diet (Draper 1977: 315). Vitamin C was present in many of the traditional foods, including seal meat, salmon, berries (Morehouse 1981: 14), and caribou and walrus liver (Fortuine 1988: 39), and sources of the vitamin were

available throughout the year (Fortuine 1988: 39). The practice of eating raw, frozen, or undercooked meat, as well as methods of food preservation, including freezing foods or storing them in oil, also contributed to the retention of this vitamin (Draper 1977: 310, Morehouse 1981: 40).

Scurvy appears to have been primarily a health problem among Europeans, who subsisted largely on dried or salted meat, grain products, and oils, foods extremely deficient in vitamin C (Fortuine 1988: 39). Dr. Samuel J. Call commented that the disease was confined primarily to Europeans, and that of the fewer than a dozen cases he had seen in Eskimo and Aleut children aged one to six years, the diagnosis was uncertain (Call 1899: 124). Ray (1988b: lxxiii) remarked that he never saw any evidence of scurvy among the Point Barrow Eskimos, an observation he attributed to their consumption of fresh meat. Similarly, Veniaminov (1984: 291) commented that scurvy was unknown to the Aleuts prior to the arrival of Russians. Only when they were forced to rely on European foods were native Alaskans afflicted with the disease (Fortuine 1988: 36).

The absence of rickets in the study samples is consistent with previous palaeopathological studies of Alaskan populations. Traditional food items, particularly fish livers, are rich in vitamin D (Morehouse 1981: 89), although a deficiency of this vitamin probably occurred on occasion among the Eskimos and Aleuts due to the lack of sunlight during the winter months and to inadequate food resources in the spring (Morehouse 1981: 49).

Trauma

Pre-Contact Period

Traumatic injuries "were a major cause of pain, disability and death in precontact times" (Fortuine 1989: 45). According to historical accounts, some of these injuries

were accidental, while others were self-inflicted or the result of interpersonal violence (Fortuine 1989: 45). Previous palaeopathological studies of Alaskan Eskimos and Aleuts reveal that these groups suffered from a variety of injuries in the past, including fractures, dislocations, and amputations. In the present study, fractures were the most common type of trauma observed. Of particular interest was the finding that the pre-contact Aleut sample had a significantly higher frequency of cranial trauma and overall trauma (cranial and infracranial trauma combined) than the pre-contact Eskimo sample (there was no significant difference between the two samples with respect to infracranial trauma). Aleut males, in particular, exhibited significantly higher frequencies of trauma than Eskimo males, while there was no significant difference between females.

Cranial trauma has been used as an indicator of interpersonal violence in past populations (Walker 1989; Stodder and Martin 1992: 62). Based on his analysis of cranial depression fractures in a California Indian population, Walker (1989) argued that the significantly higher frequency of cranial trauma in males, the consistent size, shape, and distribution of the injuries, and the nonlethal nature of the wounds suggest that these injuries may have been a consequence of ritualized fighting or duels resulting from competition over limited food resources. According to native sources, warfare was practised by both the Eskimos and Aleuts prior to contact. In the Aleutian Islands, warfare was reported to have been a frequent occurrence, resulting in the destruction of entire settlements and a significant population reduction (Veniaminov 1984: 250). Among the northern coastal Eskimos, interpersonal violence is also believed to have been common, although its exact frequency is unknown (Burch 1974: 3). In both regions, males are reported to have been the principal participants in this activity. If warfare was largely responsible for the injuries observed in these groups, and if it played a more significant role in Aleut life, this might explain why the pre-contact Aleut sample

had significantly more cranial and overall trauma than the pre-contact Eskimo sample, and why Aleut males, in particular, had a significantly higher frequency than Eskimo males. It would also account for the significant sex difference in trauma within the Aleut sample, and the lack of a significant sex difference within the Eskimo sample.

Another possible explanation for the observed difference in trauma between the pre-contact Eskimo and Aleut samples is that the Aleuts were at greater risk of accidental injuries than the Eskimos due to the nature of their environment. As the Russian fur hunter Tolstykh notes (in Jochelson 1968: 11), the Aleuts "pass with bare feet over high rocky mountains, sometimes covered with snow". In contrast, the northern coastal Eskimos occupied an almost flat coastal plain (Spencer 1984a: 278). In addition to resulting from interpersonal violence, cranial depression fractures can result from falls or from being struck by falling rocks in coastal areas (Walker 1989: 318). Colles fractures of the radius, Potts fractures of the tibia, midshaft fractures of the clavicle, and compression fractures of the femoral neck are consistent with accidental injuries (Lovejoy and Heiple 1981: 539), and in the pre-contact Aleut sample, one individual exhibited a Colles fracture of the right radius.

Differences in subsistence pursuits may also have placed the Aleuts at greater risk of traumatic injury. As Dunn (1968: 224) notes, deaths from hunting accidents, among other factors, "have probably always weighed heavily in the population equation for Eskimos and other peoples of polar and subpolar regions". Particularly dangerous was the Aleut custom of lowering males down cliffs or of climbing cliffs in order to obtain sea birds and their eggs from coastal rookeries (Lantis 1984: 175). In addition to the difference between the Eskimos and Aleuts in the manner in which food resources were obtained, there was also a difference in the proportion of the population involved in obtaining those resources. Since the proportion of the population engaged in subsistence activities declines as one moves further north due to the difficulty of some elements of the population, namely the elderly and infirm, of participating in such activities during the winter months (Laughlin 1968: 242), the greater number of Aleuts participating in subsistence pursuits meant a greater number of individuals at risk of injury, particularly older individuals.

Finally, the age distribution of the samples, specifically the significantly higher frequency of older adults in the Aleut sample, may account for the observed difference in trauma between the two groups. That older adults tend to show higher frequencies of trauma than younger adults has been demonstrated in previous studies, and reflects their increased years at risk (Lovejoy and Heiple 1981). All but three individuals in the pre-contact Aleut sample with cranial and/or infracranial trauma were over the age of 35, and nine of the affected individuals were over the age of 50.

Admittedly, each of the above explanations by itself does not adequately account for the statistically significant difference in trauma between the pre-contact Eskimo and Aleut samples. Several factors argue against warfare as an underlying cause of this difference. First of all, only one case of cranial trauma in the Aleut sample involved the facial region, an area which might be expected to exhibit a greater frequency of traumatic injuries if interpersonal violence were the cause (Walker 1989: 319-320). Secondly, other fractures indicative of interpersonal violence, namely perimortem and parry fractures (Lahren and Berryman 1984: 19) were absent, while multiple fractures, also indicative of violence (Lahren and Berryman 1984: 19) represented only 25% of cases of trauma. Given that Aleuts were frequently killed in warfare (Veniaminov 1984: 250), one might expect to see a greater number of these types of fractures in the Aleut sample. Finally, the lack of a significant difference between the two samples with respect to infracranial trauma suggests that factors other than violence may be responsible for the observed difference in cranial and overall trauma.

Arguments can also be made against environmental differences, subsistence

pursuits, and the age distribution of the samples as explanations for the statistically significant difference in trauma between the Eskimos and Aleuts. Environmental differences do not account for the lack of a significant difference in trauma between Eskimo and Aleut females. The fact that Aleut males traditionally spent much of their time hunting sea mammals from the water does not explain why they show more trauma than Eskimo males. Finally, a statistical comparison of younger adults (<50) only revealed significantly higher frequencies of cranial trauma (x^2=7.079, 10.342 BYC) and overall trauma (x^2=10.304, 12.939 BYC) in the Aleut sample, suggesting that the observed difference in trauma between the Eskimos and Aleuts is not a reflection of the significantly higher frequency of older adults in the latter sample. Undoubtedly, the combination of a variety of factors underlies the difference between the pre-contact samples.

Post-Contact Period

With respect to temporal changes, there was no significant difference between the earlier and later Eskimo and Aleut samples in the frequency of cranial or infracranial trauma. However, when the two conditions were combined, both the Eskimos and Aleuts displayed a significant decline in traumatic injuries following contact. The lower frequency of trauma in the post-contact Eskimo sample is consistent with Murdoch's (1988: 40) observation that injuries were rare among the Point Barrow Eskimos during the period from 1881 to 1883. However, given the lack of infracranial elements in this sample, the frequency of trauma recorded in this sample may not accurately reflect the true prevalence of trauma in the contact period.

Both amputations and perimortem fractures have been documented among the Eskimos during the contact period. In one reported case, an Eskimo had lost both feet but was able to move about efficiently on his knees (Murdoch 1988: 40). In another case, a

28 year old pregnant woman at Point Barrow had lost most of both legs due to frostbite but was known to walk four or five miles a day on her knees (Call 1899: 121). A number of other Eskimos were reported to have lost one or both limbs due to frostbite but were able to accomplish extraordinary amounts of work and travel despite their condition (Call 1899: 122). One Eskimo was injured as the result of an exploding whale bomb (Call 1899: 118), while another individual was killed when ice crushed his dwelling (Spencer 1959: 51).

The lower frequency of trauma in the post-contact Aleut sample may reflect, to some extent, the age distribution of the two samples under comparison, specifically, the greater number of older adults in the earlier sample. When only younger adults were compared, there was no significant difference between the two samples with respect to trauma (x^2=.124, .359 BYC). The lower frequency of trauma in the later Aleut sample is also consistent with the lack of historical references to traumatic injuries in this group, and with reports of a decline in native warfare following the arrival of Russian fur hunters (see Chapter 4). According to Veniaminov (1984: 488), only five Aleuts sustained fatal injuries during the period from 1822 to 1836. Despite the documented abuse of the Aleuts by the Russians during the early contact period, only one individual in the post-contact Aleut sample exhibited possible evidence of such abuse, notably gunshot trauma.

One final note should be made regarding the treatment of traumatic injuries in these groups. For the most part, the injuries observed in the study samples were well-healed and remodeled, with no significant angulation or other complications. This observation suggests that the Eskimos and Aleuts had some knowledge of fracture treatment (Lovejoy and Heiple 1981: 540). Commenting on Eskimo medical care, Call (1899: 121-122) notes that

> their treatment of simple fractures is deserving of considerable credit. Placing the limb in as natural a position as their ignorance of anatomy will admit, they apply strips of thin wood or whalebone and secure them with bandages, or by tying. Dislocations fare badly, and their management is similar to that of a fracture, the result being very often a useless limb.

Unfortunately, the historical records provide little information on the treatment of fractures and dislocations by the Aleuts (Fortuine 1985: 29).

Specific and Non-Specific Infections

Pre-Contact Period

Infectious diseases believed to have been present in the New World prior to 1492 include tuberculosis and other respiratory infections, treponematosis, gastrointestinal diseases, staphylococcal, streptococcal, and fungal infections (Merbs 1992: 9). Previous palaeopathological research has revealed the presence of a variety of these infectious diseases in pre-contact Alaskan Eskimos and Aleuts, including respiratory infections such as lobar pneumonia, bronchiectasis, and emphysema (Zimmerman et al. 1971), fungal infections, parasitic diseases, and ear infections (see Chapter 2). In the present study, all affected individuals in the pre-contact samples had non-specific infections. These are most likely bacterial infections caused by streptococcal and staphylococcal bacteria. *Staphylococcus aureus* is the causal organism in almost 90% of cases of osteomyelitis (Ortner and Putschar 1985: 106), while *Streptococcus* and other coccal organisms such as pneumococcus and meningococcus are responsible for the remaining 10% (Steinbock 1976: 61).

One young adult male (#381,101) from Kugusugaruk displayed evidence of a possible respiratory infection in the form of active periostitis on the pleural surfaces of the fourth, fifth, eighth, and ninth right ribs and on the seventh left rib. Rib periostitis has been attributed to pleuritis (Schultz 1989: 175-179, cited in Wakely et al. 1991: 187), an inflammation of the pleura. One possible cause of pleuritis is pulmonary tuberculosis (Kelley and Micozzi 1984). Examinations of two well-documented skeletal collections have demonstrated an association between rib periostitis and this disease. Of the remains of individuals known to have died of tuberculosis, 8.8% in the Hamann-Todd Collection and 61% in the Terry Collection displayed rib lesions (Kelley and Micozzi 1984; Wakely et al. 1991: 187). As Wakely et al. (1991: 188) note, however, "the existence of such lesions in human osteoarchaeological specimens...[is] not pathognomonic of pulmonary tuberculosis in the affected individual." Other conditions that can produce rib lesions include trauma, pneumonia, and other non-tuberculous lung diseases (Kelley and Micozzi 1984: 383; Pfeiffer 1991: 197; Wakely et al. 1991: 187).

Certainly, the lack of conclusive evidence of tuberculosis in the pre-contact samples is consistent with previous palaeopathological studies of arctic populations, and with the general consensus that the disease was introduced to these populations by Europeans (De Laguna 1956: 86; Oswalt 1967: 75; Lantis 1984: 174). It is interesting to note, however, that environmental mycobacteria related to *Mycobacterium tuberculosis* are found in abundance in the sphagnum vegetation of the arctic tundra (Kazda et al. 1979, cited in Clark et al. 1987: 51). These mycobacteria can occasionally cause pulmonary and skeletal lesions in humans (Clark et al. 1987: 48). Therefore it is not inconceivable that tuberculosis or something closely related to it existed among the Eskimos and Aleuts prior to contact.

No evidence of treponemal infection was detected in either of the pre-contact samples. This finding is also consistent with previous palaeopathological research, and with the view that it is a post-contact health problem among arctic populations (Holcomb 1940: 189; Alexander 1949: 1036; De Laguna 1956: 60; Oswalt 1967: 75).

Of particular interest in the present study was the finding that the pre-contact Aleut sample had a significantly higher frequency of infracranial infection and overall infection (cranial and infracranial infection combined) by individual and by element than the pre-contact Eskimo sample (there was no significant difference between the two samples with respect to cranial infection). Aleut males, in particular, exhibited significantly higher frequencies of infection than Eskimo males, while there was no significant difference between females.

One possible explanation for the higher frequency of infection in the Aleut sample is that the type of housing utilized by this group prior to contact placed them at greater risk of infection. Aleuts traditionally occupied large, semi-subterranean dwellings that were used for much of the year. These dwellings are reported to have contained anywhere from 30 to several hundred individuals at one time (Levashov, cited in Masterson and Brower 1948: 58; Makarova 1975: 81). Such crowded living conditions may have facilitated the spread of infections, particularly airborne infections (Fortuine 1989: 315), between the occupants of these dwellings. In Sarawak, higher incidences of leprosy and tuberculosis have been documented in individuals living in longhouses than in those living in single family houses (Chen 1988). Similarly, Saunders et al. (1992: 121) have argued that the longhouses utilized by the Ontario Iroquoians prior to contact may have predisposed them to infections.

Compounding the increased opportunity for infection created by the crowded living conditions was the lack of sanitation within and around these houses. Numerous historical accounts attest to the lack of both personal and community hygiene in the early contact period. Both Cook (1967, 3(1): 461) and Sarychev (1807: 72) commented on the fact that garbage and human waste were dumped into the middle of these dwellings. This refuse, combined with the lack of ventilation and uncomfortably high temperatures within these houses undoubtedly provided the opportunity for potentially harmful

viruses and bacteria to thrive.

In contrast to the Aleuts, the northern coastal Eskimos traditionally occupied significantly smaller semi-subterranean houses containing an average of only eight individuals (Burch 1981: 43; Spencer 1984b: 327). These houses, utilized only during the winter months, were replaced by skin tents in the summer (Murdoch 1988: 83). Although the winter houses were reported to be poorly ventilated and hot (Maguire 1969: 376), and their entranceways filled with human and other refuse (F. Beechey 1831, 1: 367; Murdoch 1988: 421), the lack of crowding in these dwellings may have reduced the spread of infection among their occupants. This might account for the lower levels of infection in the Eskimo sample.

Another possible explanation for the significantly higher frequency of infection in the pre-contact Aleut sample is the significantly higher level of trauma in this sample, infection being a possible complication of trauma (Ortner and Putschar 1985: 64). If trauma were an underlying cause of the infectious lesions in this sample, it would account for the significantly higher frequency of infection in Aleut males compared to Eskimo males. While only two of the infected elements in the Aleut sample showed evidence of trauma, the possibility that some of the infections were the result of soft tissue trauma cannot be entirely dismissed. Bacteria can reach the skeleton by direct infection through traumatic wounds (Ortner and Putschar 1985: 105).

Post-Contact Period

A. Aleuts

A statistical comparison of the earlier and later Aleut samples revealed a significantly higher frequency of cranial infection in the later sample. One possible explanation for this observation is the introduction of new pathogens following contact. In support of this suggestion is the significantly higher frequency of cribra orbitalia in

the later sample, possibly reflecting an adaptive response to an increased pathogen load (Stuart-Macadam 1992). Of particular interest is the introduction of treponemal infection, which has a predilection for the cranium. Holcomb (1940) documented six syphilitic skulls from the Aleutian Islands, all of them dating to the contact period (note: D. J. Ortner, personal communication, 1991, has recently demonstrated that one of these skulls, #378,454, exhibits lesions that are more consistent with postmortem changes than with treponemal infection). In the present study, a number of possible cases of treponemal infection were noted in the post-contact Aleut sample.

At the time of his visit to Unalaska in 1778, Cook noted the presence of venereal diseases among the Aleuts (Cook 1967, 3(1): 468), and remarked that while the Russians claimed to have no sexual relations with the Aleut women, the English often did. Ship's surgeon David Samwell, commenting on trade between the Aleuts and the crew, noted that "we generally gave them ten times more than what they would have been satisfied with, and this well timed Generosity procured us as many fine Girls during our stay here as we wanted..."(Samwell in Cook 1967, 3(2): 1121). He later commented that several of the crewmen contracted venereal disease from the women (Samwell in Cook 1967, 3(2): 1144). Another crewman, Captain Charles Clerke, also noted the existence of venereal disease among the Aleuts, and remarked that the Russians had been spreading it among the Kamchadals for many years (Clerke in Cook 1967, 3(2): 1337). Venereal disease was reportedly the main health problem of Cook's crew during their third voyage of 1776 to 1780. Eight crewmen were afflicted with venereal disease, probably gonorrhoea (Watt 1979: 149-150). During his visit to Unalaska in 1791, Merck (1980: 176) remarked that "wounds of the venereal kind... have been known to them [the Aleuts] only since the arrival of the Russians." Veniaminov (1984: 257) cited venereal disease, which he termed "the gift of the Russians" (1984: 185), as one of the causes of population decline among the Aleuts after 1790. According to him

(1984: 258), venereal disease appeared in the Aleutians following the arrival of Russians and reached its peak around 1798, when entire families were reportedly infected. Cited as a major cause of infertility among Aleut women (Veniaminov 1984: 247), with only one out of 11 women of reproductive age giving birth (Veniaminov 1984: 186), venereal disease had almost completely disappeared by 1825, usually appearing only in the main settlements (1984: 258). From 1822 to 1836, 11 Unalaska Aleuts are reported to have died of syphilis (Veniaminov 1984: 488). In the western Aleutians, Netsvetov (1980: 173-174) reported one death from "venereal disease" during the period from 1829 to 1842. Syphilis was almost nonexistent in the Aleutians by the 1860s (Golovin 1979: 63).

The post-contact Aleut sample showed no evidence of tuberculosis or other respiratory infections with the exception of one individual, an adult male (#378,543) from Shiprock Island who exhibited active periostitis on the pleural surfaces of the third to eleventh right ribs. However, since only 3% (Ortner and Putschar 1985: 142) to 7% (Steinbock 1976: 175) of individuals with tuberculosis show skeletal involvement, the lack of evidence of the disease in this sample does not necessarily mean that the disease was absent in this population. in fact, given that the general health level of the host is an important factor in the clinical expression of the disease, and that individuals with malnutrition and other infectious diseases are most susceptible to tuberculosis (M. Powell 1992: 43), it can be argued that tuberculosis may well have been a serious health threat to the Aleuts, particularly in view of the significantly higher frequencies of cribra orbitalia and cranial infection in the post-contact sample.

Respiratory infections were probably the earliest diseases to be introduced to Alaskan Eskimos and Aleuts by Europeans (Fortuine 1986/87: 48). The earliest reference to tuberculosis among the Aleuts comes from the report of the Russian trader Afanasii Ocheredin, who spent approximately five years in the Aleutian Islands. Two

Aleuts whom he took with him to Siberia in 1770 died of the disease (Bancroft 1959: 154n), which they may have contracted from the Russians (Fortuine 1989: 256). During Cook's expedition to the Aleutian Islands, two crewman, William Anderson, surgeon of the Resolution, and Captain Clerke, died of tuberculosis (Cook 1967, 3(1): 699, 700; Samwell in Cook 1967, 3(2): 1130; Watt 1979: 149). Both men may have transmitted the disease to the native population prior to their deaths (Fortuine 1989: 256). In 1791, an outbreak among the Unalaska Aleuts of a respiratory disease characterized by "pain in the side, coughing and spitting of blood" (Merck 1980: 177) may have been tuberculosis (Fortuine 1989: 257). In the western Aleutians, Netsvetov (1980: 145, 183) reported the deaths of two Aleut women from "consumption" between 1829 and 1842, while in the eastern Islands, Veniaminov (1984: 488) recorded 55 deaths from phthisis (another term for pulmonary tuberculosis) during the period from 1822 to 1836, and an additional 116 deaths from other chest diseases, described as "hemmorhage from the throat, colic, cough, asthma, [and] oppression in the chest" (Veniaminov 1984: 488).

By the end of the nineteenth century, tuberculosis had become a serious health problem among the Aleuts. In 1881, Dr. Irving Rosse, a medical officer on the Revenue Cutter Corwin, noted that pulmonary and cutaneous diseases prevailed in the Pribilof Islands (Rosse 1883: 18). In another report, Rosse (1883: 17) stated that "pulmonary phthisis is not uncommon, and forms a large percentage of the cases of disease...". Petroff (1884: 82, cited in L. Milan 1974: 24) noted that of all the diseases, tuberculosis killed the greatest number of Aleuts.

Of all of the diseases carried to the New World after 1492, viruses "had the most immediate and profound effect on Native Americans" (Merbs 1992: 28). Of the few viral infections that affect the skeleton (Ortner and Putschar 1985: 227), smallpox is of particular relevance to the Aleuts, since epidemics of this disease are known to have

struck Alaska periodically during the contact period. In subadults, the disease has a predilection for the arms, particularly the elbow joints, and can result in destruction of the metaphyses and the formation of marked reactive periosteal bone (Ortner and Putschar 1985: 228). In the post-contact Aleut sample, one subadult male (#377,912) from Kagamil Island exhibited active osteomyelitis of the distal humeri and active periostitis of the left ulna. However, the presence of a healed inflammatory lesion on the frontal bone, uncharacteristic of smallpox (Ortner and Putschar 1985: 228), the absence of elongated medial and lateral epicondyles, and the lack of destruction of the trochlea and capitulum (Jackes 1983) suggest that bacterial osteomyelitis is a more likely cause of these lesions.

B. Eskimos

A statistical comparison the earlier and later Eskimo samples revealed no significant difference between the two samples with respect to cranial or overall infection. While the later sample did have significantly more infracranial infection than the earlier sample, given the lack of infracranial elements in the later sample, this finding may not accurately reflect the true prevalence of infracranial infection in the contact period. Therefore this result is best disregarded.

Unlike the post-contact Aleut sample, the post-contact Eskimo sample showed no evidence of treponemal infection, although four syphilitic skulls have been previously documented in skeletal collections from Point Barrow and Point Hope (Holcomb 1940), all of them dating to the contact period (note: D. J. Ortner, personal communication, 1991, considers one of these skulls, #333,441, to exhibit postmortem changes only). The lack of evidence of syphilis in the later Eskimo sample is perhaps somewhat surprising given the historical references to frequent sexual contacts between Eskimos and whalemen (Murdoch 1988: 54). Certainly, the use of sexual favours as trade items,

and the fact that native men often encouraged sexual relations between their wives and daughters and the whalemen (Bockstoce 1986: 194) undoubtedly facilitated the spread of the disease to the native population.

A number of historical accounts make specific reference to the presence of venereal diseases among the northern coastal Eskimos. In 1850, Richard Collinson, Captain of an expedition in search of the lost Franklin ships, reported seeing a Point Hope Eskimo with what he termed "the leprosy" (Collinson 1889: 75), possibly a reference to venereal disease (Foote 1965: 212). Murdoch (1988: 39) remarked that gonorrhea was common among the Point Barrow Eskimos in the 1880s, but that syphilis was absent despite frequent sexual relations between the Eskimo women and the whalemen. He suggested that the low fertility among the women may have been linked to venereal disease (Murdoch 1988: 54). Syphilis was reported to have been widespread at Point Barrow in the early 1890s, with almost every infant born showing signs of the disease (U.S. Dept. of Interior 1893: 141-143). Similarly, an examination of several hundred coastal Eskimos revealed that 85% were infected with some form of syphilis in 1890 (U.S. Census Bureau 1893: 143, cited in VanStone 1962: 129). In contrast, Dr. Samuel J. Call, who spent five months at Point Barrow in 1898, saw no cases of primary syphilis and treated only nine cases of hereditary syphilis (Call 1899: 127).

That syphilis may have been a more significant health problem for the Aleuts than for the Eskimos is suggested by Call's (1899: 124) remark that

> Among the Eskimo this disease, in the primary stage, is not met with as often as the profession and laity are led to believe...I never yet have seen, in a native of either sex, the initial lesion of this disease...The only cases of this nature were two (neither of them natives)...Those large, deep, destructive, and foul-smelling ulcers so frequently seen in the villages on the coast of the Aleutian Islands may be the result of hereditary syphilis.

If syphilis was, in fact, a greater health problem among the Aleuts during the contact period, this might explain the lack of evidence of the disease in the post-contact Eskimo sample. Alternatively, since only 10% to 20% of individuals with syphilis show skeletal involvement (Steinbock 1976: 109), the actual prevalence of the disease among the Eskimos may have been higher than the skeletal evidence suggests.

No evidence of tuberculosis or other respiratory infections was found in the post-contact Eskimo sample. As noted earlier, only a small minority of individuals with tuberculosis show skeletal involvement (Steinbock 1976: 175; Ortner and Putschar 1985: 142). As well, this disease is primarily destructive, rather than proliferative, and the bones that are most commonly affected are those less likely to be preserved in an archaeological sample (M. Powell 1992: 42). Finally, the Eskimo sample is composed primarily of crania, an element rarely affected by tuberculosis (Ortner and Putschar 1985: 162).

Historical accounts indicate that respiratory diseases were, in fact, prevalent among the northern coastal Eskimos during the contact period. Murdoch (1988: 39) reported that respiratory infections were common at Point Barrow from 1881 to 1883. Here, the Eskimos suffered from coughs and colds in late summer, pneumonia in early winter, and a few cases of "hemorrhage of the lungs" (Murdoch 1988: 39). The latter condition may be a reference to tuberculosis (Fortuine 1989: 263). In 1898, Dr. Samuel J. Call treated two cases of pneumonia among the Eskimos at Point Barrow (Call 1899: 119-120), but made no mention of tuberculosis in either the Eskimos or the whalemen. He noted that influenza struck the Point Barrow Eskimos in the spring and fall (Call 1899: 123), and treated 26 cases of the disease, in addition to seven cases of bronchitis (Call 1899: 127).

Certainly, it can be argued that social and environment conditions were conducive to the spread of tuberculosis and other respiratory infections among the northern coastal Eskimos. Whaling crews, with whom the Eskimos had frequent contact, are known to have harboured tuberculosis (Fortuine 1989: 262). The practices of overwintering and

establishing shore whaling stations likely facilitated the spread of respiratory infections to the native populations (Fortuine 1989: 262). As well, the Eskimos' lack of personal hygiene and their poorly ventilated living conditions (Fortuine 1989: 33) undoubtedly contributed to the transmission of these diseases.

Dental Pathology

Pre-Contact Period

In the pre-contact samples, the frequency of enamel hypoplasia in the anterior dentition ranges from 2.04% (3/147) in the Aleut sample to 17.22% (67/389) in the Eskimo sample. Both frequencies are significantly lower than that of 65.4% previously reported for a pre-contact Eskimo sample from St. Lawrence Island (Scott and Gillispie n.d., cited in Scott et al. 1984: 70). One possible explanation for this discrepancy is the use of different criteria for scoring enamel hypoplasia. Previous research has demonstrated that analyses of enamel hypoplasia in the same skeletal sample by different researchers can yield very different results (Pfeiffer and Fairgrieve 1992, cited in Berti 1992: 13). This observation can be attributed to the lack of a standard minimum defect size considered a hypoplasia (Goodman et al. 1980: 527; Goodman and Rose 1990: 92).

Seasonal nutritional stress has been suggested as a possible explanation for enamel hypoplasia in Eskimo remains from Kachemak Bay, Alaska (Lobdell 1980: 83). Periodic food shortages may also be an underlying cause of the defects recorded in the present study. A statistical comparison of the pre-contact Eskimo and Aleut samples by tooth type revealed a significantly higher frequency of enamel hypoplasia in the Eskimo sample for the canines and lateral incisors (there was no significant difference for the central incisors). Since increased frequencies of hypoplastic defects have been interpreted as reflecting increased stress (Goodman et al. 1980: 525), the Eskimos may

have been more susceptible to periodic food shortages than the Aleuts.

Only one tooth (.04%) out of 2647 examined in the pre-contact samples exhibited a carious lesion. This low frequency is consistent with previously reported frequencies of dental caries in pre-contact Alaskan samples (Leigh 1925; Goldstein 1932; Costa 1980a). Heavy attrition and the lack of refined sugars in their traditional diet most likely account for the rarity of tooth decay in these populations prior to contact (Goldstein 1932: 429; Costa 1980a: 501).

Previous studies of antemortem tooth loss in pre-contact Alaskan Eskimo remains have yielded frequencies ranging from 5.8% to 15% of teeth (Costa 1980b). In the present study, 18.3% of teeth had been lost antemortem in the Eskimo sample, while 18.2% had been lost in the Aleut sample. A statistical comparison of the two samples by tooth type revealed that the Aleut sample had lost significantly more incisors antemortem than the Eskimo sample, while there was no significant difference between the two samples with respect to the molars, premolars, and canines.

Antemortem tooth loss of the anterior dentition in Eskimo populations has been attributed to heavy attrition and to accidental trauma caused by the use of these teeth as tools (Merbs 1968; Costa 1980b). One possible explanation for the significantly higher frequency of antemortem loss of the incisors in the Aleut sample is that this group utilized the anterior dentition to a greater extent than the Eskimos. Also contributing to this difference may be the fact that the Aleut sample contains significantly more older adults (50+) than the Eskimo sample, antemortem tooth loss being significantly greater in older adults.

Dental abscesses were common in both pre-contact samples. In the Eskimo sample, 56.8% of individuals had abscesses, while 63.5% were affected in the Aleut sample. Consistent with Costa's (1980a) results was the finding that these groups had few abscesses per tooth and per individual. The Eskimo and Aleut samples had 1.94 and 1.79

abscesses per individual respectively. A statistical comparison of the samples by tooth type revealed no significant difference between the two for all four tooth types examined. Possible causes of dental abscesses include trauma, caries, and attrition (Hillson 1986: 317). Previous researchers have attributed abscesses in pre-contact Eskimo remains to attrition (Leigh 1925: 893; Costa 1980a: 501). Given the almost complete absence of caries and the lack of evidence of tooth trauma in the Eskimo and Aleut samples, attrition is likely the cause of the abscesses in these samples as well.

Previous palaeopathological studies have revealed widely varying frequencies of periodontal disease in Alaskan Eskimos, ranging from 8.9% of teeth (Clarke et al. 1986: 178) to 61% of crania (Leigh 1925: 896). This discrepancy is not surprising given the lack of agreement among researchers concerning the identification and quantification of periodontal disease (Hildebolt and Molnar 1991: 225). In the present study, 8.12% of teeth showed evidence of periodontal disease in the pre-contact Eskimo sample, while 9.82% of teeth had signs of the disease in the pre-contact Aleut sample. Consistent with Clarke et al.'s (1986) and Costa's (1982) results was the finding that the condition was mild in both samples. A statistical comparison of the pre-contact samples by tooth type revealed no significant differences between the two samples with respect to periodontal disease of the molars, premolars, and canines. However, the Aleut sample had significantly more periodontal disease of the incisors than the Eskimo sample. Given that the Aleut sample had also lost significantly more incisors antemortem than the Eskimo sample, the same factors underlying the loss of the anterior dentition may also be contributing to the development of periodontal disease in these teeth.

Post-Contact Period

Statistical comparisons of the earlier and later Eskimo and Aleut samples revealed little evidence of declining dental health following contact. Neither post-contact sample exhibited any evidence of dental caries. This lack of tooth decay following contact is consistent with reports of native dental health by early visitors to Alaska. Murdoch (1988) made no mention of tooth decay among the Point Barrow Eskimos, commenting only that their "teeth are naturally large, and in youth are white and generally regular, but by middle age they are generally worn down to flat-crowned stumps" (Murdoch 1988: 36). Similar observations were made by Beechey (1831, 1: 360, 2: 303) for the Cape Thompson and Kotzebue Sound Eskimos, and by Veniaminov (1984: 162) for the Aleuts, whom he noted had sound, white, heavily worn teeth that became stained yellow or black in older individuals.

This lack of evidence of declining dental health following contact is also consistent with what is known from historical accounts about dietary changes resulting from contact. Among the Aleuts, dietary changes following contact are reported to have been minimal (L. Milan 1974: 21). Bancroft (1959: 235) notes that ships sailing to the Aleutians usually carried only a small supply of food consisting of butter, flour, ham, and dried and salted fish. The main source of food for the crew came from hunting and fishing. The Russians did supply the Aleuts with food on occasion, most notably during times of famine, in order to secure furs (Bancroft 1959: 237: 580-581). However, these foods supplemented, rather than replaced the traditional native diet (L. Milan 1974: 21), and, as noted earlier in the chapter, were given primarily to Creoles rather than Aleuts (L. Milan 1974: 21). Similarly, dietary changes appear to have been minimal among the Eskimos during the 19th century. New food items such as biscuits, flour, sugar, and molasses were introduced by the whalers (Spencer 1959: 378; VanStone 1962: 23), but as Murdoch (1988: 54) notes, these foods were unavailable to the Eskimos for ten months of the year.

It is difficult to determine exactly when native Alaskans began developing caries (Morehouse 1981: 60). Dr. Henry Greist, who operated the hospital at Point Barrow

from 1921 to 1937, remarked that "When starches and sugars were introduced by the whalers and traders he [the Eskimo] at once began the development of carious teeth..." Given the results of the present study, however, significant tooth decay may not have occurred among the Eskimos and Aleuts until much later in time. Hrdlicka (1943: 311, cited in Morehouse 1981: 60) remarked that the Kuskokwim Eskimos still had good dental health as recently as 1931, while Laughlin (1980: 16) noted that among the Aleuts, a significant decline in dental health did not occur until after 1948. Mayhall's (1970) 1969 investigation of dental caries in a group of Canadian Inuit from Igloolik revealed a significant increase in caries associated with the increased consumption of non-traditional foods containing refined sugars. Four years later, the same group exhibited a 66% increase in the rate of caries (Mayhall 1975). This increase was most apparent among younger individuals, reflecting their greater consumption of processed foods. Other studies of modern Alaskan Eskimos (Russell et al. 1961; Mayhall et al. 1970) have yielded similar results, although the more acculturated Alaskan Eskimos show even higher rates of tooth decay than the Canadian Inuit (Mayhall et al. 1970).

With respect to abscesses, periodontal disease, and antemortem tooth loss, statistical comparisons of the earlier and later Eskimo and Aleut samples revealed little evidence of declining dental health following contact. The only significant increase over time was a significantly higher frequency of antemortem loss of the premolars and incisors in the post-contact Eskimo sample compared to the pre-contact Eskimo sample. The significantly higher frequencies of abscesses of the incisors and periodontal disease of the molars, premolars, canines, and incisors in the earlier Eskimo sample compared to the later Eskimc sample, and the significantly higher frequencies of abscesses of the canines, antemortem loss of all four tooth types, and periodontal disease of the molars, premolars, and incisors in the earlier Aleut sample compared to the later Aleut sample are likely attributed to the significantly higher frequency of older adults in the earlier

samples.

Finally, a statistical comparison of the pre- and post-contact Eskimo samples revealed a significantly lower frequency of enamel hypoplasia of the canines in the later sample compared to the earlier sample (there was no significant difference between the two samples for the incisors). While the lower frequency of defects in the post-contact sample suggests decreased stress, this frequency may be a reflection of small sample size or statistical error. Certainly the documented occurrence of epidemics among the northern coastal Eskimos during the contact period suggests increased stress.

Other Skeletal Pathology

In addition to trauma, infection, dental pathology, cribra orbitalia and porotic hyperostosis, other types of skeletal pathology recorded in the Eskimo and Aleut samples provide some insight into the health of these groups prior to, and following contact. Several cases of skeletal malformation were recorded in the study samples. One child (#378,509) from Shiprock Island exhibited craniosynostosis of the sagittal suture. An adult female (#378,484), also from Shiprock, displayed an unusual facial morphology characterized by a narrow, abnormally shaped nasal aperture and flattened nasal bones. Possible diagnoses include a congenital or developmental defect (D. J. Ortner, personal communication, 1991). The most interesting case of skeletal malformation was the left foot of a young adult female (#346,196) from Tigara. Characterized by ectrodactyly of the phalanges, synostosis of the second to fifth metatarsals, and hypoplasia of the calcaneus, this condition has been interpreted as a congenital malformation resulting from a defect in the embryonic sensory nerves (Keenleyside and Mann 1991).

Congenital deformities were commonly reported in early historical narratives. A young Aleut male from Atka was said to have been born with only one arm (Veniaminov 1984: 372), while other individuals were observed with supernumerary digits (Rosse

1883: 26), webbed fingers (Lerrigo 1901: 106), clubfoot (Dall 1870: 195), and congenital arthrogryposis, or Kuskokwim disease, a condition characterized by severe joint contractures, particularly of the knees (Fortuine 1989: 81).

In the post-contact Eskimo sample, the cranium of a middle-aged female (#332,638) from Point Barrow displayed four lytic lesions similar in appearance to those characteristic of metastatic carcinoma. Previously considered to have affected arctic populations only after contact (Stefansson 1960), cancer has more recently been diagnosed in three pre-contact Alaskan Eskimo skeletons (see Chapter 2). With respect to the Point Barrow specimen, postmortem weathering of the margins of the lesions prevents an accurate diagnosis, and an infectious disease may be a more likely cause of these lesions. Unfortunately, the historical accounts provide no information on the incidence of cancer among the Eskimos or Aleuts during the contact period.

Epidemics and Population Decline

Aleuts

Evaluating the magnitude of the impact of acute epidemic diseases from skeletal remains is hindered by the fact that these diseases leave no evidence in bone (Ortner 1992: 5). However, data on epidemics and population size derived from historical sources clearly illustrate the negative impact of introduced pathogens on the Aleuts. Estimates of the Aleut population from 1741 to 1880 are listed in Table 32. Some of these estimates represent firsthand observations by early visitors to Alaska, while others are derived from secondary sources. The accuracy of some of these counts, particularly the early ones, is suspect for a number of reasons (Levin 1991: 1). Some figures represent secondhand estimates by individuals who never saw any Aleuts themselves (Levin 1991: 1). Some counts do not include all islands in the chain (Hrdlicka 1945: 33), while others include the Pacific Eskimos (Lantis 1984: 162).

Table 32 - Population Estimates of the Aleutian Islands, 1741-1880

Date	Location	Population Estimate	Source
1741	all islands	12,000-15,000	Veniaminov 1984: 246
1750	eastern islands	8000	Veniaminov 1984: 246
1768	Unalaska Is.	>1000	Levashov, cited in Masterson and Brower 1948: 58
1779	all islands	3796	Polonskii 1850, in Fedorova 1973: 160
1781	all islands	1900	Petroff 1884: 33, in Hrdlicka 1945: 33
1792	all islands	>2500	Sarychev 1802, in Hrdlicka1945: 33
1806	eastern islands	1942	Veniaminov 1984: 245
1818	all islands	1469	Petroff 1884: 33, in Hrdlicka 1945: 33
1819	all islands	1748	Petroff 1884: 33, in Hrdlicka 1945: 33
1819	eastern islands	1402	Tikhmenev 1978: 161
1822	eastern islands	1474	Veniaminov 1984: 246
1825	all islands	1851	Petroff 1884: 33, in Hrdlicka 1945: 33
1834	eastern islands	1485	Veniaminov 1984: 259-260
1840	eastern islands	1400	Blaschke 1845: 95, in Hrdlicka 1945: 33
1845	all islands	1842	Documents 4: 61, in Lantis 1970: 177

Table 32 - Population Estimates of the Aleutian Islands - continued

Date	Location	Population Estimate	Source
1862	all islands	2331	Petroff 1884: 40, in Hrdlicka 1945: 33
1863	all islands	2293	Tikhmenev 1978: 372-373
1871	all islands	1913	U.S. Census, Dall 1872: 287, in Hrdlicka 1945: 33
1880	all islands	1890	U.S. Census, Petroff 1881: 26

Some estimates do not take into account the frequent movement of families from one island to another (Jochelson 1968: 7). Some pertain only to certain segments of the population, for example, adult males (Lantis 1970: 173; Lantis 1984: 163). Some were exaggerated by Russian merchants in order to gain financial assistance for their expeditions (L. Black 1984: 78), while others were underestimated by the Aleuts in an attempt to avoid being forced into labour by the Russians (Lantis 1970: 174). Finally, the Aleut population had already declined dramatically by the time census counts were made (Hrdlicka 1945: 32; Lantis 1984: 163).

According to native sources, the Aleut population had begun to decline long before the arrival of Russians (Veniaminov 1984: 248). This decline was attributed largely to warfare, which reportedly resulted in the destruction of entire settlements on occasion (Veniaminov 1984: 248). Native estimates place the Aleut population prior to contact at 25,000, ten times the size recorded in 1792 (Veniaminov 1984: 246). However, given that the Aleuts may have exaggerated their pre-contact number in order to emphasize their former strength (Lantis 1970: 179), a figure of 12,000 to 15,000, estimated by Veniaminov (1984: 246), is considered to be more realistic (Lantis 1970: 174; Laughlin 1980: 15; Lantis 1984: 163).

Most early sources agree that in the first two generations of contact, the Aleut population experienced a significant decline (Lantis 1970: 172), falling by as much as 80% to an estimated 2500 by the early 1790s (Sarychev 1802, cited in Hrdlicka 1945: 33; Sarychev 1807: 72). As much as 50% of this decline may have taken place in the first decade of contact, particularly between the years 1764 and 1768, when many Aleuts were murdered at the hands of Russian fur hunters (Laughlin 1980: 15; Veniaminov 1984: 251-256). The Aleut population continued to decline during the first forty years of operation of the Russian American Company (Fedorova 1973: 161). The Company itself attributed this decline to epidemics (Fedorova 1973: 161) which

reduced the eastern population to approximately 1400 by 1840 (Blaschke 1845: 95, cited in Hrdlicka 1945: 33). Of particular significance were respiratory and intestinal infections which resulted in high mortality (Table 33). The already compromised health of the Aleuts, as indicated by the increased frequencies of cranial infection and cribra orbitalia in the post-contact sample, may have made them even more susceptible to such epidemics. Syphilis, for example, can lower one's resistance to acute infectious diseases (Walker and Johnson 1992: 137). Other factors contributing to the high mortality rate included famine (Veniaminov 1984: 257), suicides and hunting accidents (Lantis 1984: 163), and the fact that approximately 20% of the population was over the age of 60 (Laughlin 1980: 16). By the 1830s and 1840s, disease was probably the predominant cause of population decline among the Aleuts (Lantis 1970: 177). Of particular significance in this later period were smallpox, measles, and influenza.

Vital statistics on the Aleuts are absent for the early contact period. Therefore, information on mortality must be derived from other sources, namely, the skeletal data. Demographic profiles previously constructed from Aleut skeletal remains indicate that of 194 skeletons recovered from Kagamil Island, 54 (27.8%) were children aged newborn to 5 years (Laughlin 1980: 97). In the present study, 22 (13.8%) individuals in the Kagamil Island sample and 46 (20.3%) individuals in the post-contact Aleut sample were newborn to 5 years of age. According to Laughlin (1980: 11), the infant mortality rate among the Aleuts was lower than that reported for some Canadian Eskimo populations, an observation he attributed to the Aleuts' good nutrition, close supervision of children, avoidance of inbreeding, and good knowledge of medical treatment, particularly as it pertains to childbirth. A statistical comparison of the frequency of subadults in the pre- and post-contact Aleut samples revealed significantly more subadults in the later sample. While this suggests an increase in the rate of infant and childhood mortality following contact, subadults may be underrepresented in the

Table 33 - Epidemics in the Aleutian Islands, 1791-1863

Date	Location	Disease	Mortality	Source
1791-92	Unalaska Is.	"chest diseases"	high	Merck 1980: 177
1802	Atka Is.	"contagious fever"	high	Davydov1977: 105
1806-7	eastern islands	"high fever and chest congestion"	>350	L. Black 1984: 97
1807-8	western islands	"high fever and chest congestion"	high	Vasiliev 1823, cited in L. Black 1981a: 141; L. Black 1984: 97-98
1807-8	eastern islands	dysentery	high	Veniaminov 1984: 257
1830-31	eastern islands	"cough and chest congestions"	>30	Veniaminov 1984: 258
1831-32	Amlia Is., Atka Is., Near Islands	"coughing sickness"	high	Netsvetov 1980: 55, 74
1831-32	western islands	intestinal infection	high	Netsvetov, cited in L. Black 1981a: 141
1838	eastern islands	smallpox	85	Veniaminov 1984: 245
1848	eastern islands	measles	300	Tikhmenev 1978: 371; footnote in Bancroft 1959: 580
1863	Atka and Amlia Islands	influenza	55	L. Black 1984: 105

pre-contact sample, a common problem in archaeological samples (Wood et al. 1992: 347).

Veniaminov (1984), who recorded the earliest vital statistics on Alaskan natives (F. Milan 1974/75: 49), documented the deaths of 92 children aged one to four years in the eastern Aleutian Islands between 1822 and 1836, representing 18.7% of the total number of deaths (491) during this time period (Veniaminov 1984: 489). Of the total number of adult deaths during this period, the majority (103) were concentrated in the 25 to 45 year age category (Veniaminov 1984: 489). Two epidemics in particular are reported to have resulted in high mortality among young adults, the 1807 epidemic of dysentery in the eastern Aleutians and the 1830 respiratory epidemic (Veniaminov 1984: 257-258). Of the 103 deaths, 70 (68%) were males who may have died from drowning and other hunting accidents (Veniaminov 1984, cited in Levin 1991: 3). Similarly, more males (115/218) than females died in the western Aleutians between 1829 and 1842 (Netsvetov 1980).

As Herring (1992: 159) points out, mortality data alone is insufficient for estimating depopulation since it does not take into account the possibility of population recovery following epidemics. Other data that must be examined in order to assess post-epidemic population responses include fertility, nuptiality and migration (Herring 1992: 159). Unfortunately, few fertility statistics on the Alaskan natives are available for the contact period. Only 53 births were recorded in the eastern Aleutians between 1822 and 1836 (Veniaminov 1984: 490), compared to 240 births in the western Aleutians between 1829 and 1842 (Netsvetov 1980), suggesting greater population recovery in the western islands.

Another useful measure of the degree to which past populations successfully adapted to their environment is longevity (Laughlin 1980: 10). The Aleuts are reported to have enjoyed a long lifespan both prior to, and following contact. Merck (1980: 176)

commented that "formerly the years of their lives are supposed to have reached into the hundreds." Some historical accounts document encounters with Aleuts estimated to have been over 100 years of age (Laughlin 1980: 10). Veniaminov (1984), who recorded the age of 491 individuals who died between 1822 and 1836, reported that two Aleuts (.41%) were over 90 at the time of their death, 20 (4.1%) were 80 to 90 years of age, 34 (6.9%) were 70 to 80 years, and 46 (9.4%) were 60 to 70 years of age (Veniaminov 1984: 489).

With respect to skeletal data, the difficulty of accurately estimating the age at death of individuals over 50 is well recognized by physical anthropologists (Saunders et al. 1992: 113). Previous analyses of skeletal remains recovered from Kagamil Island indicate that a number of individuals in this sample lived to an advanced age. Of 194 skeletons examined, 1 (.5%) was estimated to have been over 80 at the time of death, 4 (2.1%) were estimated to be 70 to 80, 7 (3.6%) were 60 to 70, and 21 (10.8%) were 50 to 60 years of age (Laughlin 1980: 97). While no attempt was made in the present study to estimate more precisely the age at death of individuals over 50, a statistical comparison of the pre- and post-contact Aleut samples revealed significantly more older adults in the earlier sample, suggesting that fewer individuals were living to an advanced age during the contact period.

Eskimos

Population estimates of the northern coastal Eskimos from 1800 to 1908 are listed in Table 34. Some of these estimates represent firsthand observations by early visitors to the coast, while others are derived from secondary sources. The accuracy of some of these figures is questionable. Jackson (1891), for example, is known to have inflated his population estimates in order to emphasize the deleterious effects of European contact on the native population and thereby gain support for his proposed government

Table 34 - Population Estimates of Northern Coastal Eskimos, 1800-1910

Date	Location	Population Estimate	Source
Point Hope			
ca. 1800	Tigara	1000	Larsen and Rainey 1948: 25
ca. 1800	Tigara	600	Burch 1981: 44
end of 18th century	Tigara	2000	Wells and Kelly 1890: 10, in Burch 1981: 43
early 19th century	Tigara	>1000	Rainey 1947: 236
1828	Point Hope	2000	Jackson 1891: 5, in Jenness 1962: 7
1850	Point Hope	854	Foote 1965, 2: 245
1880	Point Hope	276	U.S. Census Bureau 1884: 4, in VanStone 1962: 18
1880	Point Hope	400	Burch 1981: 44
1880	Point Hope	250	Spencer 1959: 17
1890	Point Hope	295	U.S. Census Bureau 1893: 8, in VanStone 1962: 18
1890	Point Hope	350	Jackson 1891: 5, in Jenness 1962: 7
1908	Point Hope	168	St Thomas' Mission Records, in VanStone 1962: 18
1910	Point Hope	200	Burch 1981: 44
Point Barrow			
1828	Point Barrow	1000	Jackson 1891: 5, in Jenness 1962: 7
1850	Point Barrow	350	Oswalt 1967: 99

Table 34 - Population Estimates of Northern Coastal Eskimos - continued

Date	Location	Population Estimate	Source
1852-53	Nuvuk	309	Simpson 1875: 237, in Murdoch 1988: 43
1852-53	Utkiavik	250	Simpson 1875, in Spencer 1959, 16
1854	Utkiavik	>200	Simpson, in P. Ray 1988c: xcix
1854	Nuvuk	286	Simpson, in P. Ray 1988c: xcix
1863	Point Barrow	309	Jackson 1891: 5, in Jenness 1962: 7
1881-83	Utkiavik	150	J. Powell 1988: lviii
1881-83	Utkiavik	140	Murdoch 1988: 43
1881-83	Nuvuk	150-160	Murdoch 1988: 43
1881-83	Utkiavik	130	P. Ray 1988c: xcix
1881-83	Nuvuk	<150	P. Ray 1988c: xcix
1890	Point Barrow	100	Jackson 1891: 5, in Jenness 1962: 7

programs (D. Ray 1975: 110). Government census figures may also be inaccurate due to the constant movement of people to and from coastal settlements (VanStone 1962: 18).

Pre-contact estimates for the Point Hope and Point Barrow settlements are large, ranging from 600 to 2000 for the former, and 1000 for the latter (Table 34). Given Jackson's (1891) reputation for inflating his population figures, his estimates must be considered suspect. Rainey (1947: 236) suggested that the Point Hope population may have numbered at least 1000 individuals in the early nineteenth century based on the archaeological evidence at the site, while Burch (1981: 44) concluded that a figure of 600, derived from the number of houses in the settlement, is more reasonable. In 1826, Frederick Beechey, who made the first population estimate of northwestern Alaska (D. Ray 1975: 109), concluded that the native population between Point Barrow and Cape Rodney numbered approximately 2500 individuals, although he admitted that this figure may not be accurate given the dispersed settlement pattern during the summer months (F. Beechey 1831, 2: 300).

Nearly 60 years later, these figures had been reduced to 276 for Point Hope (U. S. Census Bureau 1884: 4, in VanStone 1962: 18), and 280 to 300 for Point Barrow (Nuvuk and Utkiavik combined) (Murdoch 1988: 43; P. Ray 1988c: xcix), indicating a significant reduction from the pre-contact period. Many coastal villages were reported to have lost as much as half of their population within a few years (VanStone 1962: 24). This dramatic reduction is perhaps best conveyed by Ray (1988c: xcix), who writes:

> That the race is rapidly decreasing is shown by the fact that during the two years we were on the coast, in the village of Uglaamie alone, there were eighteen deaths and only two births in a population of one hundred and thirty souls; and Dr. Simpson states that in 1854 the village had a population of over 200. He also reports forty iglus, while we found only twenty-six. At Nuwuk, he reports forty-eight iglus, and two hundred and eighty-six people. We found this village had dwindled to thirty iglus, and less than one hundred and fifty people; and the freshly

> cached bodies and numerous half-ruined iglus bore silent testimony to the fact that famine and disease had quite recently been at work.

In a U.S. government report published in 1891, the decline of the northern coastal population was attributed to famine caused by overhunting (Jenness 1962: 7). Most researchers agree, however, that of equal, if not greater significance, were diseases introduced by the whalemen into a population that had no immunity to them (Spencer 1959: 18; Jenness 1962: 7; VanStone 1962: 18, 24; Foote 1964: 19; Chance 1966: 15; Oswalt 1967: 75; Burch 1981: 15-16, 21; P. Ray 1988c: xcix). By the end of the whaling period, diseases such as influenza, measles, mumps, whooping cough, and smallpox (VanStone 1962: 129; Chance 1966: 15; Oswalt 1967: 81) had reduced the northern coastal population by as much as 50% (Spencer 1959: 18; VanStone 1962: 129). Among those that had the greatest impact on the Eskimo population were influenza, the first recorded epidemic among the northern coastal Eskimos (Table 35), and measles. A number of these epidemics have been linked directly to the arrival of European vessels to the coast, including ships involved in the search for the lost Franklin expedition (J. Simpson 1855: 920), whalers (Driggs 1903, cited in VanStone 1962: 24; Brower 1942: 187-188; Gubser 1965: 8), and trading schooners. Mortality rates from these epidemics were high, ranging from 40 deaths during the 1851 influenza epidemic (J. Simpson 1855: 920) to over 400 deaths from the 1865 measles epidemic (Burch 1981: 20). The 1902 measles epidemic reportedly claimed 12% of the Point Hope population (Driggs 1903, cited in VanStone 1962: 24) and over 120 Point Barrow Eskimos (Brower 1942: 190-192).

By the 1880s, the number of deaths among the northern coastal Eskimos exceded the number of births. From 1881 to 1883, 15 deaths are reported to have occurred in the village of Utkiavik, while of the total number of births, only two survived (Murdoch 1988: 43). Deaths also outnumbered births at Point Hope during the whaling period.

Table 35 - Epidemics Among Northern Coastal Eskimos, 1851 to 1902

Date	Location	Disease	Mortality	Source
1851-52	Utkiavik	influenza	40	Simpson 1855: 920
1865	Point Hope	measles	>400	Burch 1981: 15-16, 20
1894	Point Hope	broncho-pneumonia	1/6	Jackson 1896: 1467
1896	Point Hope	influenza	?	Driggs 1897: 608
1900	Point Barrow	influenza	200	Gubser 1965: 8; Brower 1942: 187-188
1902	northern coast	measles	high	Brower 1942: 190-192; Driggs 1903, in VanStone 1962: 24

From 1891 to 1900, 123 deaths were recorded by the St. Thomas' Mission, compared to only 93 births. More than half of these deaths were individuals under the age of 18 (VanStone 1962: 130). Unfortunately, the skeletal data provides no information on infant and childhood mortality during the contact period. A statistical comparison of the pre- and post-contact Eskimo samples revealed no significant difference between the two samples in the frequency of subadults; however, this age cohort is likely underrepresented in both samples.

References to Eskimo longevity in the historical narratives suggest that extreme longevity is not unknown among this population, although the Eskimos apparently enjoyed a shorter lifespan than the Aleuts (Laughlin 1980: 11). Most Point Barrow Eskimos reportedly died by the age of 40 (P. Ray 1885: 45), and individuals over the age of 60 were rare (Murdoch 1988: 39). Both Murdoch (1988: 39) and Simpson (1855: 924) note, however, that a few Eskimos lived to an advanced age, and Stefansson (1958: 19) is of the opinion that "extreme longevity was not unknown in pre-white times or in the transition stage of Europeanization". A statistical comparison of the pre- and post-contact Eskimo samples revealed significantly more older adults in the earlier sample, suggesting that fewer individuals were living to an advanced age during the contact period.

Skeletal Remains as Evidence of Health and Disease

It is well-recognized by physical anthropologists that making inferences about the health status of past populations from skeletal remains is no easy task. Hindering the interpretation of health from skeletal evidence is the fact that many diseases, particularly acute infections, leave no trace in bone (Ortner 1992: 5), and different diseases may produce similar bone changes, making accurate diagnoses difficult, if not

impossible (Ortner 1992: 7). As well, skeletal samples are made up of individuals who failed to survive. Therefore, they are not representative of the populations from which they were derived. Consequently, frequencies of skeletal lesions in a sample may not accurately reflect the true prevalence of pathological conditions in the general population (Wood et al. 1992). Nevertheless, palaeopathological data can provide some insight into patterns of health and disease in past populations, particularly when multiple indicators of stress are employed (Goodman 1993: 283), and when the data is used in conjunction with other sources of information on health, such as ethnohistory and epidemiology (Herring 1992: 161; Goodman 1993: 285).

The skeletal samples examined in the present study reveal that the Alaskan Eskimos and Aleuts were by no means disease-free prior to contact. Rather, they suffered from a variety of health problems, including iron deficiency anemia, fractures, non-specific infections, dental pathology, and congenital malformations. The data also suggest that the Eskimos and Aleuts had different patterns of health and disease prior to contact. Specifically, the Aleuts had significantly higher frequencies of cranial and overall trauma, and infracranial and overall infection than the Eskimos, while the Eskimos had a significantly higher frequency of enamel hypoplasia of the canines and lateral incisors than the Aleuts.

Finally, the skeletal data provide some evidence of declining health following contact, at least among the Aleuts. The introduction of new pathogens, in particular treponemal infection, likely contributed to the significantly higher frequencies of cribra orbitalia and cranial infection in the post-contact Aleut sample compared to the pre-contact sample. In contrast, the post-contact Eskimo sample shows little evidence of declining health. It is conceivable that individuals were dying rapidly of introduced diseases before lesions could develop. Certainly, the historical accounts of epidemics and population decline among the northern coastal Eskimos attest to the negative impact of

contact on this population.

CHAPTER 8
CONCLUSIONS

The problems of making inferences about the health of past populations from skeletal evidence are well recognized (Wood et al. 1992). Limitations of the palaeopathological data include the fact that 1) many diseases, particularly acute infectious diseases, leave no evidence in bone; 2) different diseases may produce similar skeletal changes, making an accurate diagnosis difficult; and 3) skeletal samples are not representative of the populations from which they were derived, hindering the determination of "population prevalences of pathological conditions from skeletal lesion frequencies" (Wood et al. 1992: 345).

Despite these limitations, however, the palaeopathological data obtained in the present study reveals that the Alaskan Eskimos and Aleuts were by no means disease-free prior to contact. Rather, they suffered from a variety of health problems, including iron deficiency anemia, fractures, non-specific infections, dental pathology, and congenital malformations. Thus the data substantiates Fortuine's (1989) reconstruction of the health of these groups at the time of contact. It is also consistent with previous studies of skeletal populations from elsewhere in North and South America, which indicate a substantial disease load prior to contact (Aufderheide 1992: 166; Ubelaker and Verano 1992: 279).

The data also suggest that the Eskimos and Aleuts had different patterns of health and disease prior to contact. Most notably, the Aleuts had significantly higher frequencies of cranial and overall trauma, and infracranial and overall infection than the Eskimos, while the Eskimos had a significantly higher frequency of enamel hypoplasia of the canines and lateral incisors than the Aleuts. This difference is consistent with previous studies of skeletal samples from other regions of the New World which have demonstrated "considerable geographic variability" in disease patterns "in response to varying cultural factors" (Ubelaker and Verano 1992: 280) and "differences in the timing and intensity of European contact" (Verano 1992: 21). Differences between the Eskimos and Aleuts in their environment, warfare practices, housing, and subsistence pursuits may underlie this variability. The differing disease patterns between these groups is also consistent with observations of modern-day hunter-gatherer populations. The latter have revealed interpopulation differences in the rates of accidents, infection, and other causes of death, emphasizing the danger of making generalizations about patterns of health and disease in hunter-gatherers, and of viewing them "as though they were some kind of homogeneous, cultural-genetic-ecological unity" (Dunn 1968: 228).

The skeletal data provide some evidence of declining health following contact, at least among the Aleuts. The introduction of new pathogens, in particular, treponemal infection, likely contributed to the significantly higher frequency of cranial infection and cribra orbitalia in the post-contact Aleut sample compared to the pre-contact sample. Aleuts already stressed by disease in the pre-contact period may have been even more susceptible to new diseases introduced during the contact period. This point illustrates the importance of understanding pre-contact disease loads before assessing the impact of introduced pathogens (Herring 1992: 153). The post-contact Eskimo sample showed little evidence of declining health over time; however, the small size of this sample and the possibility of a statistical error may account for this observation.

Significantly higher frequencies of some forms of dental pathology in the pre-contact Eskimo and Aleut samples appear to be a reflection of the significantly higher frequency of older adults in these samples compared to the post-contact samples. Both populations displayed little evidence of declining dental health following contact, most

likely reflecting the fact that dietary changes resulting from the introduction of new food items containing refined sugars and carbohydrates were minimal, at least for the early contact period. Significant dental decay may not have become a problem until the 20th century.

While the present study illustrates the value of palaeopathology in providing insight into the health of the Alaskan Eskimos and Aleuts both prior to, and following contact, it is clear that to rely only on one source of data, namely the skeletal evidence, is to ignore the potentially valuable contributions of other sources of information such as ethnohistory and epidemiology. An examination of the "socioecological context of human disease" (Herring 1992: 155) within the Eskimo and Aleut populations has revealed that social conditions clearly provided the opportunity for disease-causing microorganisms to thrive and flourish among these groups before and after contact. Historical accounts highlight the significant impact of the introduction of acute epidemic diseases on both groups, and the dramatic population reduction that occurred as a result of these diseases.

APPENDIX A - GLOSSARY*

Acute tubular necrosis: a condition characterized by the destruction of tubular epithelial cells. It is the most common cause of acute kidney failure.

Ankylosing spondylitis: a progressive inflammatory disease characterized by fusion of the vertebrae.

Craniosynostosis: premature fusion of the sutures of the skull.

Cribra orbitalia: porosity and/or expansion of the orbital roof.

Ectrodactyly: congenital absence of all or part of a digit.

Emphysema: an abnormal accumulation of air in tissues or organs, especially the lungs.

Enamel hypoplasia: incomplete or defective development of the enamel of the teeth.

Granuloma: a tumor-like mass of granulation tissue.

Harris lines (also termed "growth arrest" or "transverse" lines): lines visible radiographically in bone. They represent periods of renewed growth following inhibited growth of bone due to disease or nutritional deficiency.

Hydrocephaly: a congenital or acquired condition characterized by an accumulation of fluid within the skull, causing enlargement of the head.

Hypoplasia: incomplete development or underdevelopment of an organ or tissue.

Mastoiditis: inflammation of the mastoid.

Mesenchyme: embryonic connective tissue.

Osteomyelitis: infection of bone by pus-producing organisms.

Osteophytosis: the formation of bony projections at the vertebral margins, commonly associated with aging.

Otitis media: infection of the middle ear.

Parry fracture: fracture of the forearm that results from raising the arm to prevent being struck in the face or head.

*definitions are taken from Steinbock (1976), Dorland (1982), Ortner and Putschar (1985), Cotran (1987), and Mann and Murphy (1990)

APPENDIX A - CONTINUED

Pleural adhesion: adhesion of the pleura, the membrane enclosing the lungs.

Porotic hyperostosis: porosity and thickening of the outer layer of the cranial vault.

Scoliosis: lateral curvature of the vertebral column.

Septicemia: blood poisoning.

Spina bifida: a congenital malformation characterized by incomplete closure of the vertebral arches.

Synostosis: union between adjacent bones or parts of a single bone.

Treponemal infection: infection caused by an organism of the genus *Treponema* . One type is venereal syphilis, caused by the organism *Treponema pallidum* .

Visceral abscesses: abscesses of the internal organs.

APPENDIX B - DESCRIPTION OF COMINGLED REMAINS

Specimen	Description	Age	MNI*
Umnak Island I			
378,458	4 femora	A** and SA***	3
378,459	4 tibiae	A	2
378,460	partial infracranial	A	2
378,661	partial cranial	A and SA	10
378,662	partial cranial	A	3
378,668	11 humeri	A	7
378,669	5 radii	A	3
378,670	3 ulnae	A	2
378,671	3 clavicles	A	2
378,672	6 pelvic bones and 11 sacra	A and SA	11
378,673	10 femora	A	8
378,674	8 tibiae	A	5
378,675	3 fibulae	A	2
378,676	29 assorted vertebrae	A	3
378,677	partial infracranial	A and SA	5
378,678	partial infracranial	SA	4
Nixerak			
365,852	13 mandibles	A and SA	13
Utkiavik			
365,883	3 mandibles	A	3
Shiprock Island			
378,488	partial cranial	A	3
378,497	partial cranial and infracranial	SA	3
378,522	partial cranial	SA	2
378,524a	39 femora	SA	20
378,524b	29 tibiae	SA	15
378,524c	23 humeri	SA	14
378,524d	16 radii	SA	8
378,524e	19 scapulae	SA	12

*Minimum number of individuals
**Adult
***Subadult

APPENDIX B - CONTINUED

Specimen	Description	Age	MNI
378,524f	30 ilia, plus pubes and ischia	SA	15
	17 fibulae	SA	?
	17 ulnae	SA	9
	10 clavicles	SA	5
	142 ribs	SA	?
	assorted vertebrae	SA	?
	assorted carpals, tarsals, metacarpals, metatarsals, phalanges	SA	?
378,525	16 humeri	A and SA	7
378,526	19 radii	A and SA	10
378,527	12 ulnae	A and SA	7
378,528	15 scapulae	A and SA	9
378,529	6 clavicles	A	4
378,530	35 femora	A and SA	21
378,531	28 tibiae	A and SA	16
378,532	13 fibulae	A and SA	7
378,533	25 pelvic bones and 13 sacra	A and SA	14
378,534	6 sterna and 5 manubria	A and SA	6
378,535	18 ribs	A	?
378,536	83 assorted vertebrae	A and SA	5
378,537	6 patellae	A	4
378,538	10 tali	A	7
378,539	9 calcanei	A	5
378,540	44 assorted carpals, tarsals, metacarpals, metatarsals, phalanges	A and SA?	3
Kagamil Island			
377,773	81 femora	A	44
377,774	64 humeri	A	32
377,775	66 tibiae	A	36
377,776	44 fibulae	A	26
377,777	38 ulnae	A	20
377,778	33 radii	A	19
377,779	18 clavicles	A	10
377,780	53 scapulae	A	28
377,781	130 assorted vertebrae	A and SA	?
377,782	56 assorted vertebrae	SA	?
377,783	4 atlases and 5 axes	A	5
377,784	10 sacra	A and SA	10
377,785	24 pelvic bones and 12 sacra	A	12
377,786	38 pelvic bones	A and SA	24
377,787	9 ilia, 1 pubis, 2 ischia	SA	5

APPENDIX B - CONTINUED

Specimen	Description	Age	MNI
377,788	11 patellae	A and SA	7
377,789	20 calcanei	A and SA	13
377,790	18 tali	A and SA	10
377,791	238 assorted carpals, tarsals, metacarpals, metatarsals, phalanges	A	8
377,792	30 femora	SA	17
377,793	19 tibiae	SA	11
377,794	10 humeri	SA	6
377,795	16 fibulae	SA	?
377,796	10 ulnae	SA	7
377,797	5 radii	SA	3
377,798	5 clavicles	SA	3
377,799	12 scapulae	SA	8
377,800	98 ribs	A and SA	?
377,801	55 ribs	SA	?
377,802	5 sterna and 6 manubria	A and SA?	6
377,805	partial cranial	SA	11
377,806	partial cranial	A	2
377,813	partial infracranial	A	2
377,928	partial infracranial	A and SA	3
378,432	partial cranial	A	2
378,435	partial infracranial	A	2
378,436	39 humeri	A and SA	22
378,437	13 humeri	A and SA	7
378,438	45 radii	A and SA	23
378,439	55 ulnae	A and SA	29
378,440	33 clavicles	A and SA	18
378,441	48 scapulae	A and SA	26
378,442	85 femora	A	46
378,443	32 femora	A and SA	19
378,444	54 tibiae	A	28
378,445	25 tibiae	SA	13
378,446	54 fibulae	A and SA	31
378,447	70 pelvic bones and 34 sacra	A and SA	35
378,448	141 assorted vertebrae	A and SA	15
378,449	38 calcanei	A and SA	20
378,450	33 tali	A and SA	18
378,451	33 patellae	A and SA	18
378,452	87 assorted carpals, tarsals, metacarpals, metatarsals, phalanges	A and SA	5
378,453	13 sterna and 7 manubria	A and SA	13
378,733	partial infracranial	A and SA	4

APPENDIX C - DATA RECORDING FORMS

SKELETAL INVENTORY

Collection___________Location_____________Time Period______________

Catalogue #__________ Age________Sex_________Date______________

Cranial:

Frontal______Occipital______Ethmoid______Sphenoid______Mandible_______

Left	Right	
_______	_______	Parietal
_______	_______	Temporal
_______	_______	Zygomatic
_______	_______	Palatine
_______	_______	Maxilla
_______	_______	Nasal
_______	_______	Lacrimal

Postcranial:

Manubrium______Sternum______Xiphoid______Sacrum______Coccyx______

Vertebrae:

C1______C2______C3______C4______C5______C6______C7______

T1_____T2_____T3_____T4_____T5_____T6_____T7_____T8______

T9______T10______T11______T12______

L1______L2______L3______L4______L5______

Innominate: Left________Right________

SKELETAL INVENTORY - CONTINUED

Left	Right	
______	______	Clavicle
______	______	Scapula
______	______	Humerus
______	______	Radius
______	______	Ulna

Hand:

Left	Right		Left	Right	
______	______	Scaphoid	______	______	Phalanges (P)
______	______	Lunate	______	______	Phalanges (M)
______	______	Triquetral	______	______	Phalanges (D)
______	______	Pisiform	______	______	Metacarpal 1
______	______	Trapezium	______	______	Metacarpal 2
______	______	Trapezoid	______	______	Metacarpal 3
______	______	Capitate	______	______	Metacarpal 4
______	______	Hamate	______	______	Metacarpal 5

Ribs:

Left	Right		Left	Right	
______	______	Rib 1	______	______	Rib 7
______	______	Rib 2	______	______	Rib 8
______	______	Rib 3	______	______	Rib 9
______	______	Rib 4	______	______	Rib 10
______	______	Rib 5	______	______	Rib 11
______	______	Rib 6	______	______	Rib 12

Lower Limb:

Left	Right		Left	Right	
______	______	Patella	______	______	Tibia
______	______	Femur	______	______	Fibula

SKELETAL INVENTORY - CONTINUED

Foot:

Left	Right		Left	Right	
______	______	Calcaneus	______	______	Phalanges (P)
______	______	Talus	______	______	Phalanges (M)
______	______	Navicular	______	______	Phalanges (D)
______	______	Cuboid	______	______	Metatarsal 1
______	______	Cuneiform 1	______	______	Metatarsal 2
______	______	Cuneiform 2	______	______	Metatarsal 3
______	______	Cuneiform 3	______	______	Metatarsal 4
			______	______	Metatarsal 5

STRESS INDICATORS

Collection__________ Location__________ Time Period__________

Catalogue #__________ Age______ Sex______ Date__________

State of Preservation:
Excellent________ Good________ Fair________ Poor________

Infection:
Osteomyelitis__________ Bones Involved__________
Periostitis__________
Syphilis__________
Tuberculosis__________ Location__________
Other__________

Trauma:
Fracture__________ Bones Involved__________
Dislocation__________
Deformation__________
Amputation__________ Location__________
Other__________

Porotic Hyperostosis: Left__________ Right__________

Cribra Orbitalia: Left__________ Right__________

Additional Comments:

ENAMEL HYPOPLASIA*

Collection__________ Location__________ Time Period__________

Catalogue #__________ Age______ Sex______ Date__________

Maxilla

	Left C	I2	I1	I1	I2	C Right
General						
Pitting/Grooving						
Amount						
Pitting - Amount						
Grooves - Number						
Severity						
Hght to Lowest Line						
Hght to Highest Line						

Mandible

	Left C	I2	I1	I1	I2	C Right
General						
Pitting/Grooving						
Amount						
Pitting - Amount						
Grooves - Number						
Severity						
Hght to Lowest Line						
Hght to Highest Line						

*scoring method based on Patterson (1984)

DENTAL PATHOLOGY*

Tooth Condition

1 Present
2 Lost postmortem
4 Lost antemortem
5 Congenitally absent
9 Indeterminate

Caries - General

0 Absent
1 Crown caries
2 Root caries
3 Crown and root caries
4 Roots only
9 Indeterminate

Coronal Caries - Location

0 Absent
1 Mesial
2 Distal
3 Buccal
4 Lingual
5 Occlusal
9 Indeterminate

Coronal Caries - Size

0 Absent
1 Small - affecting only the enamel
2 Medium - extending to the dentine-enamel junction
3 Large - involving destruction of one half or more of the surface and endangering the pulp
4 Massive - complete destruction of surface, exposing pulp
5 Roots only - complete destruction of crown
9 Indeterminate

Coronal Caries - Number Per Tooth

*Scoring method based on Patterson (1984) and Costa (1980a, 1980b, 1982)

DENTAL PATHOLOGY - CONTINUED

Root Caries - Location

0 Absent
1 Mesial
2 Distal
3 Buccal
4 Lingual
9 Indeterminate

Root Caries - Size

0 Absent
1 Small
2 Medium
3 Large
4 Massive
5 Roots only
9 Indeterminate

Root Caries - Number Per Tooth

Abscesses - General

0 Absent
1 Present
9 Indeterminate

Abscesses - Number Per Tooth

Abscesses - Etiology

0 Absent
1 Attrition
2 Caries
3 Antemortem fracture
4 Periodontal disease
9 Indeterminate

Abscesses - Location

0 Absent
1 Facial
2 Lingual
3 Facial and lingual
9 Indeterminate

DENTAL PATHOLOGY - CONTINUED

Abscesses - Size

0 Absent
1 Small - up to 3mm in diameter
2 Medium - from 3 to 10mm in diameter
3 Large - from 10 to 20mm in diameter
4 Massive - greater than 20mm in diameter
9 Indeterminate

Periodontal Disease - General

0 Absent
1 Present
9 Indeterminate

Infrabony Pockets - General

0 Absent
1 Present
9 Indeterminate

Infrabony Pockets - Size

0 Absent
1 Small
2 Large

Infrabony Pockets - Location

0 Absent
1 Mesial
2 Distal
3 Buccal
4 Lingual

Alveolar Resorption

Measured to the nearest 0.1mm using a needle-pointed Helios Dial Caliper. The measurement is taken from the cemento-enamel junction to the height of the alveolar margin on the facial aspect over the midline of the root. For the molars, the measurement is taken on the mesial root.

Involvement of the Interdental Septa - Shape

1 Convex
2 Flat
3 Concave
9 Indeterminate

DENTAL PATHOLOGY - CONTINUED

Involvement of the Interdental Septa - Osteoporosis

0 Absent
1 Present

DENTAL PATHOLOGY FORM

Collection__________Location____________Time Period______________

Catalogue #__________Age_______Sex_________Date______________

	Left						Maxilla								Right	
	M3	M2	M1	P2	P1	C	I2.	I1	I1	I2	C	P1	P2	M1	M2	M3
Condition																
Caries-Gen.																
Cor-Location																
Cor-Size																
Cor-Number																
Root-Location																
Root-Size																
Root-Number																
Abscess-Gen.																
Number																
Etiology																
Location																
Size																
Per. Dis. Gen.																
Infra. Poc. Gen.																
Infra. Poc. Size																
Infra. Poc. Loc.																
Alv. Res. Meas.																
Int. Sep. Shape																
Int. Sep. Ost.																
Attrition																

DENTAL PATHOLOGY FORM

Collection__________Location____________Time Period______________

Catalogue #__________Age_______Sex_________Date______________

	Left						Mandible								Right	
	M3	M2	M1	P2	P1	C	I2	I1	I1	I2	C	P1	P2	M1	M2	M3
Condition																
Caries-Gen.																
Cor-Location																
Cor-Size																
Cor-Number																
Root-Location																
Root-Size																
Root-Number																
Abscess-Gen.																
Number																
Etiology																
Location																
Size																
Per. Dis. Gen.																
Infra. Poc. Gen.																
Infra. Poc. Size																
Infra. Poc. Loc.																
Alv. Res. Meas.																
Int. Sep. Shape																
Int. Sep. Ost.																
Attrition																

APPENDIX D - DATA

Table 1 - Age and Sex Distribution

Adult Males	Age	Adult Females	Age	Subadults	Age
Pre-Contact Period Eskimos					
Kugusugaruk (MNI=42)					
381,089	36-50	381,091	21-35	381,105(I)	7-12
381,090	36-50	381,092	36-50	381,108(I)	7-12
381,093	21-35	381,095	21-35		
381,094	36-50	381,098	21-35		
381,096	36-50	381,100	50+		
381,097	50+	381,111	36-50		
381,099	50+	381,114	36-50		
381,101	21-35	381,115	21-35		
381,102	21-35	381,120	21-35		
381,103	36-50	381,121	21-35		
381,104	50+	381,124	21-35		
381,106	21-35	381,127*	36-50		
381,107	21-35	381,129*	21-35		
381,109	21-35				
381,110	36-50				
381,112	36-50				
381,113	36-50				
381,116	36-50				
381,117	21-35				
381,118	21-35				
381,119	36-50				
381,122	36-50				
381,123	50+				
381,125	21-35				
381,126	36-50				

* Skull and/or mandible only
(I) = Indeterminate
(M) = Male
(F) = Female
(M?) = Probable Male
(F?) = Probable Female
(MNI) = Minimum number of individuals

Table 1 - continued

Adult Males	Age	Adult Females	Age	Subadults	Age
381,128*	36-50				
381,130*	36-50				
Kugok (MNI=11)					
365,887*	36-50	365,889*	36-50	365,888(I)	7-12
365,894	36-50	365,895	36-50	365,900(M)	17-18
365,896	36-50	365,898*	21-35		
365,597*	36-50				
365,899	36-50				
365,911	21-35				
Piginik (MNI=9)					
365,903	21-35	365,902	36-50	365,901(I)	7-12
365,904	36-50	365,905	21-35	365,907(F?)*	13-17
		365,906*	36-50	365,908(I)*	7-12
		365,909*	18-20		
Tigara (MNI=66)					
346,143	50+	346,146	18-20	346,148(I)	7-12
346,144	50+	346,147	50+	346,186(I)	2-4
346,145	50+	346,151	36-50	346,193(I)	7-12
346,149	50+	346,156	50+	346,195(I)	2-4
346,150	21-35	346,158	21-35	346,200(F?)	13-17
346,152	36-50	346,172	50+	346,298(I)	13-17
346,157	21-35	346,179	50+		
346,170*	36-50	346,180	50+		

Table 1 - continued

Adult Males	Age	Adult Females	Age	Subadults	Age
346,171*	36-50	346,181	21-35		
346,177	36-50	346,183	50+		
346,178	21-35	346,189	21-35		
346,182	50+	346,194	21-35		
346,184	21-35	346,196	21-35		
346,185	50+	346,197	21-35		
346,187*	21-35	346,207	21-35		
346,188	50+	346,208	50+		
346,190	21-35	346,209	21-35		
346,191	50+	346,243*	21-35		
346,192	50+	346,283	21-35		
346,206	50+	346,286	50+		
346,210	50+	346,288	36-50		
346,211	50+	346,293	50+		
346,280	21-35	346,294	36-50		
346,281	50+	346,296	21-35		
346,282	36-50	346,300	21-35		
346,284	21-35				
346,285	50+				
346,287	36-50				
346,289	50+				
346,290	36-50				
346,292	21-35				
346,295	50+				
346,297	50+				
346,299	50+				
346,301	50+				

Table 1 - continued

Pre-Contact Period Aleuts

Umnak Island I (MNI=65)

Adult Males	Age	Adult Females	Age	Subadults	Age
378,602	36-50	378,456	50+	378,650(I)	13-17
378,603	50+	378,601	21-35	378,660(I)	0-2
378,605	50+	378,604	50+	378,665(M)	13-17
378,607	50+	378,608	21-35	378,666(I)	7-12
378,609	21-35	378,613	50+	378,667(I)	7-12
378,610	36-50	378,616	21-35		
378,612	50+	378,617	50+		
378,614	50+	378,619	50+		
378,615	50+	378,621	50+		
378,618	36-50	378,623	50+		
378,620	50+	378,628	50+		
378,622	50+	378,630	21-35		
378,624	36-50	378,632	50+		
378,625	50+	378,634	50+		
378,626	50+	378,636	50+		
378,627	36-50	378,637	50+		
378,629	36-50	378,639	50+		
378,631	50+	378,640	36-50		
378,633	50+	378,642	50+		
378,635	50+	378,646	50+		
378,638	21-35	378,647	50+		
378,641	36-50	378,648	50+		
378,643	36-50	378,652*	50+		
378,644	50+	378,653*	36-50		
378,645	50+	378,654	36-50		
378,649	50+	378,655*	50+		

Table 1 - continued

Adult Males	Age	Adult Females	Age	Subadults	Age
378,651*	50+	378,6[illegible]	50+		
378,656*	21-35	378,65[illegible]*	36-50		
378,664	21-35	378,659*	50+		
		378,663	50+		
		378,680*	50+		

Late Pre-Contact/Contact Period Eskimos

Barrow (MNI=37)

Adult Males	Age	Adult Females	Age	Subadults	Age
332,632*	36-50	332,631*	21-35	332,657(F)	17-18
332,636*	36-50	332,633*	36-50		
332,639*	36-50	332,634*	21-35		
332,643*	21-35	332,635*	21-35		
332,644*	36-50	332,637*	36-50		
332,649*	36-50	332,638*	36-50		
332,651*	36-50	332,640*	21-35		
332,653*	36-50	332,641*	21-35		
332,654*	50+	332,642*	21-35		
332,656*	21-35	332,645*	50+		
332,658*	36-50	332,646*	36-50		
332,659*	50+	332,647*	21-35		
332,660*	36-50	332,648*	36-50		
332,663*	36-50	332,650*	36-50		
332,664*	36-50	332,652*	36-50		
332,666*	36-50	332,655*	21-35		
332,667*	50+	332,661*	36-50		
		332,662*	36-50		
		332,665*	36-50		

Table 1 - continued

Nixerak (MNI=62)

Adult Males	Age	Adult Females	Age	Subadults	Age
365,790*	21-35	365,815*	36-50	365,849(I)*	7-12
365,791*	36-50	365,816*	36-50	365,850(I)*	4-6
365,792*	36-50	365,817*	50+	365,882(F?)*	13-17
365,793*	36-50	365,818*	36-50		
365,794*	21-35	365,820*	36-50		
365,795*	36-50	365,821*	36-50		
365,796*	36-50	365,822*	21-35		
365,797*	50+	365,823*	36-50		
365,798*	36-50	365,824*	36-50		
365,799*	36-50	365,825*	36-50		
365,800*	36-50	365,827*	36-50		
365,801*	36-50	365,828*	36-50		
365,802*	21-35	365,829*	36-50		
365,803*	36-50	365,830*	36-50		
365,804*	50+	365,831*	36-50		
365,805*	50+	365,832*	36-50		
365,806*	36-50	365,833*	36-50		
365,807*	36-50	365,834*	36-50		
365,808*	50+	365,835*	36-50		
365,809*	50+	365,836*	50+		
365,810*	36-50	365,837*	36-50		
365,811*	36-50	365,838*	18-20		
365,812	50+	365,839*	36-50		
365,813	50+	365,840*	36-50		
365,814*	36-50	365,841*	21-35		
365,819*	36-50	365,842*	36-50		
365,826*	50+	365,843*	36-50		
365,844*	50+	365,845*	50+		

Table 1 - continued

Adult Males	Age	Adult Females	Age	Subadults	Age
		365,846*	36-50		
		365,847*	21-35		
		365,848*	18-20		
Utkiavik (MNI=33)					
365,853*	50+	365,860*	21-35	365,890(I)	4-6
365,854*	36-50	365,861*	36-50		
365,855*	36-50	365,862*	21-35		
365,856*	36-50	365,863*	36-50		
365,857*	36-50	365,865*	50+		
365,858*	36-50	365,866*	36-50		
365,859*	36-50	365,867*	21-35		
365,864*	36-50	365,868*	36-50		
365,871*	36-50	365,869*	36-50		
365,877*	50+	365,870*	36-50		
365,879*	36-50	365,872*	36-50		
365,891*	50+	365,873*	36-50		
		365,874*	36-50		
		365,875*	36-50		
		365,876*	21-35		
		365,878*	50+		
		365,880*	36-50		
		365,881*	36-50		
		365,892	21-35		
		365,893	21-35		

Table 1 - continued

Adult Males	Age	Adult Females	Age	Subadults	Age
Point Hope (MNI=40)					
242,895*	36-50	242,921*	36-50	332,589(F)*	13-17
242,923*	21-35	332,586*	36-50		
242,947*	36-50	332,587*	21-35		
332,585*	21-35	332,588*	21-35		
332,590*	21-35	332,592*	21-35		
332,591*	36-50	332,594*	36-50		
332,593*	21-35	332,595*	36-50		
332,596*	36-50	332,597*	36-50		
332,599*	21-35	332,598*	36-50		
332,600*	21-35	332,603*	21-35		
332,601*	21-35	332,605*	36-50		
332,602*	36-50	333,439*	21-35		
332,604*	36-50	333,440*	36-50		
333,437*	50+	333,443*	50+		
333,438*	36-50	333,447*	36-50		
333,441*	36-50	333,451*	21-35		
333,442*	36-50				
333,444*	50+				
333,445*	50+				
333,446*	50+				
333,448*	36-50				
333,449*	21-35				
333,450*	50+				

Table 1 - continued

Adult Males	Age	Adult Females	Age	Subadults	Age
Late Pre-Contact/Contact Period Aleuts					
Umnak Island II (MNI=6)					
378,455	36-50	378,454	50+		
378,457*	21-35	378,606	50+		
378,611	50+				
378,679*	50+				
Shiprock Island (MNI=62)					
378,461	21-35	378,466	50+	378,479(M)*	13-17
378,462	50+	378,467	50+	378,489(M)	13-17
378,463	50+	378,468	50+	378,491(F)	13-17
378,464	21-35	378,470	36-50	378,492(I)	2-4
378,465	36-50	378,473	50+	378,493(I)	2-4
378,469	21-35	378,482*	50+	378,494(I)	2-4
378,471	21-35	378,483*	21-35	378,495(I)	4-6
378,472	36-50	378,484*	21-35?	378,496(I)	2-4
378,474	21-35	378,490*	18-20	378,498(I)*	?(Child)
378,475*	36-50			378,499(I)*	2-4
378,476*	50+			378,500(I)*	2-4
378,477*	21-35			378,501(I)*	2-4
378,478*	36-50			378,502(I)*	7-12
378,480	18-20			378,503(I)*	2-4
378,481*	50+			378,504(I)*	7-12
378,485*	36-50?			378,505(I)*	2-4
378,486*	36-50?			378,506(I)*	1-2
378,542	21-35			378,507(I)*	2-4

Table 1 - continued

Adult Males	Age	Adult Females	Age	Subadults	Age
378,543	36-50			378,508(I)*	7-12
378,544	50+			378,509(I)*	?(Child)
				378,510(I)*	0-2
				378,511(I)*	0-2
				378,512(I)*	0-2
				378,513(I)*	0-2
				378,514(I)*	0-2
				378,515(I)*	1-2
				378,516(I)*	0-2
				378,517(I)*	0-2
				378,518(I)*	0-1
				378,519(I)*	0-2
				378,520(I)*	2-4
				378,521(I)*	1-2
				378,541(I)	13-17
Kagamil Island (MNI=159)					
377,806A*	36-50	377,808	50+	377,822(I)	4-6
377,807	50+	377,809	36-50	377,823(I)	4-6
377,812	36-50	377,810	50+	377,824(I)	4-6
377,816	50+	377,811	36-50	377,825(I)	0-2
377,817	21-35	377,814	50+	377,826(I)	0-1
377,820	36-50	377,815	50+	377,827(I)	0-2
377,833*	36-50	377,818	50+	377,828(I)	0-1
377,834*	21-35	377,819	50+	377,829(I)	Fetus
377,835	36-50	377,821	50+	377,830(I)	0-2
377,837	36-50	377,836	21-35	377,831(I)	0-1
377,838*	50+	377,861*	21-35	377,832(I)	0-2
377,839*	36-50	377,862*	50+	377,863(F)*	13-17

Table 1 - continued

Adult Males	Age	Adult Females	Age	Subadults	Age
377,840	21-35	377,864*	21-35	377,866(M)*	13-17
377,841*	21-35	377,865*	18-20	377,868(F)*	13-17
377,842*	21-35	377,867	21-35	377,877(F?)*	13-17
377,843*	36-50	377,869*	21-35	377,878(I)*	7-12
377,844*	36-50	377,870*	36-50	377,879(I)*	7-12
377,845*	36-50	377,871*	21-35	377,880(I)*	7-12
377,846*	21-35	377,872*	21-35	377,881(I)*	7-12
377,847*	36-50	377,873*	21-35	377,882(I)*	7-12
377,848*	21-35	377,874	21-35	377,883(I)*	7-12
377,849	21-35	377,875*	21-35	377,884(I)*	4-6
377,850*	50+	377,875A*	21-35	377,885(I)*	7-12
377,851*	21-35	377,897*	21-35	377,886(I)*	7-12
377,852*	21-35	377,904	50+	377,887(I)*	2-4
377,853*	36-50	377,905	36-50	377,888(I)*	7-12
377,854*	36-50	377,908	36-50	377,889(I)*	2-4
377,855*	18-20	377,911	50+	377,890(I)*	7-12
377,856*	36-50	377,914	50+	377,891(I)*	1-2
377,857	36-50	377,915	50+	377,892(I)*	1-2
377,858*	18-20	377,920	50+	377,893(I)*	4-6
377,859*	36-50	377,924	21-35	377,894(I)*	0-2
377,860*	36-50	377,926	50+	377,895(I)*	1-2
377,876*	50+	378,399	50+	377,896(I)*	0-1
377,900	21-35	378,400	50+	377,898(I)*	4-6
377,901	36-50	378,402*	50+	377,912(M?)	13-17
377,902	21-35	378,403*	36-50	377,918(F)	13-17
377,903	21-35	378,405*	50+	377,923(M)	13-17
377,906	50+	378,407*	36-50	378,427(F?)*	17-18
377,907	50+	378,411*	21-35	378,428(F?)*	17-18
377,909	21-35	378,412*	21-35	378,429(F?)*	13-17

Table 1 - continued

Adult Males	Age	Adult Females	Age	Subadults	Age
377,910	36-50	378,413*	21-35	378,430(I)*	7-12
377,913	36-50	378,414*	21-35	378,431(F?)*	13-17
377,916	50+	378,415*	50+	378,434(I)	1-2
377,917	50+	378,416*	50+	378,728(I)*	7-12
377,919	21-35	378,417*	21-35		
377,921	36-50	378,419*	21-35		
377,922	36-50	378,420*	21-35		
377,925	21-35	378,421*	50+		
377,927	21-35	378,422*	50+		
378,401*	50+	378,423*	50+		
378,408*	36-50	378,424*	21-35		
378,409*	36-50	378,425*	36-50		
378,410*	50+	378,426*	21-35		
378,418*	50+	378,727*	36-50		
378,729*	36-50	378,730*	21-35		
378,731*	36-50				
379,253*	21-35?				

Table 2 - Sex Distribution

	Adults				Subadults							
	Males		Females		Males		Females		Indeterminate		Total	
Sample	N	%	N	%	N	%	N	%	N	%	N	%
Pre-Contact Period												
Eskimos												
Kugusug.	27	64.29	13	30.95	0	0.00	0	0.00	2	4.76	42	100.00
Kugok	6	54.55	3	27.27	1	9.09	0	0.00	1	9.09	11	100.00
Piginik	2	22.22	4	44.44	0	0.00	1	11.11	2	22.22	9	100.00
Tigara	35	53.03	25	37.88	0	0.00	1	1.52	5	7.58	66	100.00
Total	70	54.69	45	35.16	1	0.78	2	1.56	10	7.81	128	100.00
Aleuts												
Umnak I	29	44.62	31	47.69	1	1.54	0	0.00	4	6.15	65	100.00
Total	29	44.62	31	47.69	1	1.54	0	0.00	4	6.15	65	100.00
Late Pre-Contact/Contact Period												
Eskimos												
Barrow	17	45.95	19	51.35	0	0.00	1	2.70	0	0.00	37	100.00
Nixerak	28	45.16	31	50.00	0	0.00	1	1.61	2	3.23	62	100.00
Utkiavik	12	36.36	20	60.61	0	0.00	0	0.00	1	3.03	33	100.00
Pt. Hope	23	57.50	16	40.00	0	0.00	1	2.50	0	0.00	40	100.00
Total	80	46.51	86	50.00	0	0.00	3	1.74	3	1.74	172	100.00
Aleuts												
Umnak II	4	66.67	2	33.33	0	0.00	0	0.00	0	0.00	6	100.00
Shiprock Is.	20	32.26	9	14.52	2	3.23	1	1.61	30	48.39	62	100.00
Kagamil Is.	58	36.48	56	35.22	3	1.89	8	5.03	34	21.38	159	100.00
Total	82	36.12	67	29.52	5	2.20	9	3.96	64	28.19	227	100.00

Table 3 - Age Distribution of Adults

	18-20		21-35		36-50		50+		
Sample	N	%	N	%	N	%	N	%	Total
Pre-Contact Period									
Eskimos									
Kugusugaruk	0	0.00	17	42.50	18	45.00	5	12.50	40
Kugok	0	0.00	2	22.22	7	77.78	0	0.00	9
Piginik	1	16.67	2	33.33	3	50.00	0	0.00	6
Tigara	1	1.67	21	35.00	10	16.67	28	46.67	60
Total	2	1.74	42	36.52	38	33.04	33	28.70	115
Aleuts									
Umnak Island I	0	0.00	8	13.33	12	20.00	40	66.67	60
Total	0	0.00	8	13.33	12	20.00	40	66.67	60
Late Pre-Contact/Contact Period									
Eskimos									
Barrow	0	0.00	10	27.78	22	61.11	4	11.11	36
Nixerak	2	3.39	6	10.17	39	66.10	12	20.34	59
Utkiavik	0	0.00	6	18.75	21	65.63	5	15.63	32
Point Hope	0	0.00	14	35.90	19	48.72	6	15.38	39
Total	2	1.20	36	21.69	101	60.84	27	16.27	166
Aleuts									
Umnak Island II	0	0.00	1	16.67	1	16.67	4	66.67	6
Shiprock Island	2	6.90	9	31.03	8	27.59	10	34.48	29
Kagamil Island	3	2.63	41	35.96	35	30.70	35	30.70	114
Total	5	3.36	51	34.23	44	29.53	49	32.89	149

Table 4 - Age Distribution of Subadults

Sample	Fetus (<NB) N	%	Infant (0-2) N	%	Child (2-7) N	%	Juvenile (7-12) N	%	Early Adol. (13-17) N	%	Late Adol. (17-18) N	%	Total
Pre-Contact Period													
Eskimos													
Kugusugaruk	0	0.00	0	0.00	0	0.00	2	100.00	0	0.00	0	0.00	2
Kugok	0	0.00	0	0.00	0	0.00	1	50.00	0	0.00	1	50.00	2
Piginik	0	0.00	0	0.00	0	0.00	2	66.67	1	33.33	0	0.00	3
Tigara	0	0.00	0	0.00	2	33.33	2	33.33	2	33.33	0	0.00	6
Total	0	0.00	0	0.00	2	15.38	7	53.85	3	23.08	1	7.69	13
Aleuts													
Umnak Is. I	0	0.00	1	20.00	0	0.00	2	40.00	2	40.00	0	0.00	5
Total	0	0.00	1	20.00	0	0.00	2	40.00	2	40.00	0	0.00	5
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00	1
Nixerak	0	0.00	0	0.00	1	33.33	1	33.33	1	33.33	0	0.00	3
Utkiavik	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	1
Pt. Hope	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00	1
Total	0	0.00	0	0.00	2	33.33	1	16.67	2	33.33	1	16.67	6
Aleuts													
Umnak Is. II	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0
Shiprock Is.	0	0.00	12	36.36	14	42.42	3	9.09	4	12.12	0	0.00	33
Kagamil Is.	1	2.22	13	28.89	8	17.78	12	26.67	9	20.00	2	4.44	45
Total	1	1.28	25	32.05	22	28.21	15	19.23	13	16.67	2	2.56	78

Table 5 - Cribra Orbitalia - Age and Sex Distribution

Sample	N*	CO**	%	Adults Males N	%	Adults Females N	%	Subadults Males N	%	Subadults Females N	%	Indeterminate N	%
Pre-Contact Period													
Eskimos													
Kugusug.	41	3	7.32	1/26	3.85	2/13	15.38	0/0	0.00	0/0	0.00	0/2	0.00
Kugok	7	0	0.00	0/4	0.00	0/3	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Piginik	7	1	14.29	0/1	0.00	0/4	0.00	0/0	0.00	1/1	100.00	0/1	0.00
Tigara	63	6	9.52	0/35	0.00	4/23	17.39	0/0	0.00	1/1	100.00	1/4	25.00
Total	118	10	8.47	1/66	1.52	6/43	13.95	0/0	0.00	2/2	100.00	1/7	14.29
Aleuts													
Umnak I	54	2	3.70	1/27	3.70	1/25	4.00	0/0	0.00	0/0	0.00	0/2	0.00
Total	54	2	3.70	1/27	3.70	1/25	4.00	0/0	0.00	0/0	0.00	0/2	0.00
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	27	4	14.81	0/14	0.00	3/12	25.00	0/0	0.00	1/1	100.00	0/0	0.00
Nixerak	57	8	14.04	5/27	18.52	0/27	0.00	0/0	0.00	1/1	100.00	2/2	100.00
Utkiavik	31	4	12.90	1/12	8.33	2/18	11.11	0/0	0.00	0/0	0.00	1/1	100.00
Pt. Hope	40	4	10.00	1/23	4.35	2/16	12.50	0/0	0.00	1/1	100.00	0/0	0.00
Total	155	20	12.90	7/76	9.21	7/73	9.59	0/0	0.00	3/3	100.00	3/3	100.00
Aleuts													
Umnak II	6	0	0.00	0/4	0.00	0/2	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Shiprock	59	21	35.59	3/17	17.65	2/9	22.22	1/2	50.00	0/0	0.00	15/31	48.39
Kagamil	156	30	19.23	4/49	8.16	6/55	10.91	2/3	66.67	4/8	50.00	14/41	34.15
Total	221	51	23.08	7/70	10.00	8/66	12.12	3/5	60.00	4/8	50.00	29/72	40.28

* Number of crania with one or more observable orbits
** Number of crania with cribra orbitalia in one or both orbits

Table 6 - Cribra Orbitalia - Degree of Healing

Sample	N*	CO**	%	Adult Males Active N	%	Adult Males Healed N	%	Adult Females Active N	%	Adult Females Healed N	%	Subadults Active N	%	Subadults Healed N	%
Pre-Contact Period															
Eskimos															
Kugusugaruk	41	3	7.32	0	00.00	1	33.33	1	33.33	1	33.33	0	00.00	0	00.00
Kugok	7	0	0.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00
Piginik	7	1	14.29	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	1	100.00
Tigara	63	6	9.52	0	00.00	0	00.00	0	00.00	4	66.67	0	00.00	2	33.33
Total	118	10	8.47	0	00.00	1	10.00	1	10.00	5	50.00	0	00.00	3	30.00
Aleuts															
Umnak Island I	54	2	3.70	0	00.00	1	50.00	0	00.00	1	50.00	0	00.00	0	00.00
Total	54	2	3.70	0	00.00	1	50.00	0	00.00	1	50.00	0	00.00	0	00.00
Late Pre-Contact/Contact Period															
Eskimos															
Barrow	27	4	14.81	0	00.00	0	00.00	0	00.00	3	75.00	0	00.00	1	25.00
Nixerak	57	8	14.04	0	00.00	5	62.50	0	00.00	0	00.00	2	25.00	1	12.50
Utkiavik	31	4	12.90	0	00.00	1	25.00	0	00.00	2	50.00	1	25.00	0	00.00
Point Hope	40	4	10.00	0	00.00	1	25.00	0	00.00	2	50.00	0	00.00	1	25.00
Total	155	20	12.90	0	00.00	7	35.00	0	00.00	7	35.00	3	15.00	3	15.00
Aleuts															
Umnak Island II	6	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00
Shiprock Island	59	21	35.59	0	00.00	3	14.29	0	00.00	2	9.52	13	61.90	3	14.29
Kagamil Island	156	30	19.23	0	00.00	4	13.33	1	3.33	5	16.67	10	33.33	10	33.33
Total	221	51	23.08	0	00.00	7	13.73	1	1.96	7	13.73	23	45.10	13	25.49

* Number of crania with one or more observable orbits
** Number of crania with cribra orbitalia in one or both orbits

Table 7 - Porotic Hyperostosis - Age and Sex Distribution

Sample	N*	PH**	%	Adults Males N	%	Adults Females N	%	Subadults Males N	%	Subadults Females N	%	Indeterminate N	%
Pre-Contact Period													
Eskimos													
Kugusug.	36	2	5.56	2/24	8.33	0/11	0.00	0/0	0.00	0/0	0.00	0/1	0.00
Kugok	3	0	0.00	0/3	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Piginik	6	1	16.67	1/1	100.00	0/3	0.00	0/0	0.00	0/1	0.00	0/1	0.00
Tigara	58	1	1.72	1/32	3.13	0/22	0.00	0/0	0.00	0/1	0.00	0/3	0.00
Total	103	4	3.88	4/60	6.67	0/36	0.00	0/0	0.00	0/2	0.00	0/5	0.00
Aleuts													
Umnak I	52	0	0.00	0/24	0.00	0/26	0.00	0/0	0.00	0/0	0.00	0/2	0.00
Total	52	0	0.00	0/24	0.00	0/26	0.00	0/0	0.00	0/0	0.00	0/2	0.00
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	28	2	7.14	2/15	13.33	0/12	0.00	0/0	0.00	0/1	0.00	0/0	0.00
Nixerak	45	1	2.22	1/25	4.00	0/18	0.00	0/0	0.00	0/1	0.00	0/1	0.00
Utkiavik	33	0	0.00	0/12	0.00	0/20	0.00	0/0	0.00	0/0	0.00	0/1	0.00
Pt. Hope	32	0	0.00	0/16	0.00	0/15	0.00	0/0	0.00	0/1	0.00	0/0	0.00
Total	138	3	2.17	3/68	4.41	0/65	0.00	0/0	0.00	0/3	0.00	0/2	0.00
Aleuts													
Umnak II	5	0	0.00	0/3	0.00	0/2	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Shiprock	58	6	10.34	3/19	15.79	0/7	0.00	0/2	0.00	0/0	0.00	3/30	10.00
Kagamil	135	2	1.48	0/44	0.00	1/52	1.92	1/3	33.33	0/8	0.00	0/28	0.00
Total	198	8	4.04	3/66	4.55	1/61	1.64	1/5	20.00	0/8	0.00	3/58	5.17

* Number of observable crania
** Number of crania with porotic hyperostosis

Table 8 - Porotic Hyperostosis - Degree of Healing

Sample	N*	PH**	%	Adult Males Active N	%	Adult Males Healed N	%	Adult Females Active N	%	Adult Females Healed N	%	Subadults Active N	%	Subadults Healed N	%
Pre-Contact Period															
Eskimos															
Kugusugaruk	36	2	5.56	0	00.00	2	100.00	0	00.00	0	00.00	0	00.00	0	00.00
Kugok	3	0	0.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00
Piginik	6	1	16.67	0	00.00	1	100.00	0	00.00	0	00.00	0	00.00	0	00.00
Tigara	58	1	1.72	0	00.00	1	100.00	0	00.00	0	00.00	0	00.00	0	00.00
Total	103	4	3.88	0	00.00	4	100.00	0	00.00	0	00.00	0	00.00	0	00.00
Aleuts															
Umnak Island I	52	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00
Total	52	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00
Late Pre-Contact/Contact Period															
Eskimos															
Barrow	28	2	7.14	0	00.00	2	100.00	0	00.00	0	00.00	0	00.00	0	00.00
Nixerak	45	1	2.22	0	00.00	1	100.00	0	00.00	0	00.00	0	00.00	0	00.00
Utkiavik	33	0	0.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00
Point Hope	32	0	0.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00
Total	138	3	2.17	0	00.00	3	100.00	0	00.00	0	00.00	0	00.00	0	00.00
Aleuts															
Umnak Island II	5	0	0.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00	0	00.00
Shiprock Island	58	6	10.34	0	00.00	3	50.00	0	00.00	0	00.00	3	50.00	0	00.00
Kagamil Island	135	2	1.48	0	00.00	0	00.00	0	00.00	1	50.00	1	50.00	0	00.00
Total	198	8	4.04	0	00.00	3	37.50	0	00.00	1	12.50	4	50.00	0	00.00

* Number of observable crania
** Number of crania with porotic hyperostosis

Table 9 - Cribra Orbitalia and Porotic Hyperostosis Combined- Age and Sex Distribution

Sample	N*	CO/PH**	%	Adults Males N	%	Adults Females N	%	Subadults Males N	%	Subadults Females N	%	Indeterminate N	%
Pre-Contact Period													
Eskimos													
Kugusug.	41	5	12.20	3/26	11.54	2/13	15.38	0/0	0.00	0/0	0.00	0/2	0.00
Kugok	7	0	0.00	0/4	0.00	0/3	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Piginik	7	2	28.57	1/1	100.00	0/4	0.00	0/0	0.00	1/1	100.00	0/1	0.00
Tigara	63	7	11.11	1/35	2.86	4/23	17.39	0/0	0.00	1/1	100.00	1/4	25.00
Total	118	14	11.86	5/66	7.58	6/43	13.95	0/0	0.00	2/2	100.00	1/7	14.29
Aleuts													
Umnak I	55	2	3.64	1/27	3.70	1/25	4.00	0/0	0.00	0/0	0.00	0/3	0.00
Total	55	2	3.64	1/27	3.70	1/25	4.00	0/0	0.00	0/0	0.00	0/3	0.00
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	28	6	21.43	2/15	13.33	3/12	25.00	0/0	0.00	1/1	100.00	0/0	0.00
Nixerak	57	8	14.04	5/27	18.52	0/27	0.00	0/0	0.00	1/1	100.00	2/2	100.00
Utkiavik	33	4	12.12	1/12	8.33	2/20	10.00	0/0	0.00	0/0	0.00	1/1	100.00
Pt. Hope	40	4	10.00	1/23	4.35	2/16	12.50	0/0	0.00	1/1	100.00	0/0	0.00
Total	158	22	13.92	9/77	11.69	7/75	9.33	0/0	0.00	3/3	100.00	3/3	100.00
Aleuts													
Umnak II	6	0	0.00	0/4	0.00	0/2	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Shiprock	62	25	40.32	6/19	31.58	2/9	22.22	1/2	50.00	0/0	0.00	16/32	50.00
Kagamil	160	31	19.38	4/51	7.84	6/57	10.53	3/3	100.00	4/8	50.00	14/41	34.15
Total	228	56	24.56	10/74	13.51	8/68	11.76	4/5	80.00	4/8	50.00	30/73	41.10

* Number of individuals with observable vaults and/or orbits
** Number of individuals with cribra orbitalia and/or porotic hyperostosis

Table 10 - Cribra Orbitalia and Porotic Hyperostosis Combined- Degree of Healing

Sample	N*	CO/PH**	%	Adult Males Active N	%	Adult Males Healed N	%	Adult Females Active N	%	Adult Females Healed N	%	Subadults Active N	%	Subadults Healed N	%
Pre-Contact Period															
Eskimos															
Kugusug.	41	5	12.20	0	0.00	3	60.00	1	20.00	1	20.00	0	0.00	0	0.00
Kugok	7	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Piginik	7	2	28.57	0	0.00	1	50.00	0	0.00	0	0.00	0	0.00	1	50.00
Tigara	63	7	11.11	0	0.00	1	14.29	0	0.00	4	57.14	0	0.00	2	28.57
Total	118	14	11.86	0	0.00	5	35.71	1	7.14	5	35.71	0	0.00	3	21.43
Aleuts															
Umnak I	55	2	3.64	0	0.00	1	50.00	0	0.00	1	50.00	0	0.00	0	0.00
Total	55	2	3.64	0	0.00	1	50.00	0	0.00	1	50.00	0	0.00	0	0.00
Late Pre-Contact/Contact Period															
Eskimos															
Barrow	28	6	21.43	0	0.00	2	33.33	0	0.00	3	50.00	0	0.00	1	16.67
Nixerak	57	8	14.04	0	0.00	5	62.50	0	0.00	0	0.00	2	25.00	1	12.50
Utkiavik	33	4	12.12	0	0.00	1	25.00	0	0.00	2	50.00	1	25.00	0	0.00
Pt. Hope	40	4	10.00	0	0.00	1	25.00	0	0.00	2	50.00	0	0.00	1	25.00
Total	158	22	13.92	0	0.00	9	40.91	0	0.00	7	31.82	3	13.64	3	13.64
Aleuts															
Umnak II	6	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Shiprock	62	25	40.32	0	0.00	6	24.00	0	0.00	2	8.00	14	56.00	3	12.00
Kagamil	160	31	19.38	0	0.00	4	12.90	1	3.23	5	16.13	11	35.48	10	32.26
Total	228	56	24.56	0	0.00	10	17.86	1	1.79	7	12.50	25	44.64	13	23.21

* Number of individuals with observable vaults and/or orbits
** Number of individuals with cribra orbitalia and/or porotic hyperostosis

Table 11 - Cribra Orbitalia and Porotic Hyperostosis Combined - Subadult Age Distribution

Sample	N*	CO/PH**	%	0-2 N	%	2-4 N	%	4-6 N	%	7-12 N	%	13-17 N	%	17-18 N	%
Pre-Contact Period															
Eskimos															
Kugusug.	2	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kugok	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Piginik	2	1	50.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00
Tigara	5	2	40.00	0	0.00	0	0.00	0	0.00	0	0.00	2	100.00	0	0.00
Total	9	3	33.33	0	0.00	0	0.00	0	0.00	0	0.00	3	100.00	0	0.00
Aleuts															
Umnak I	3	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	3	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Late Pre-Contact/Contact Period															
Eskimos															
Barrow	1	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00
Nixerak	3	3	100.00	0	0.00	0	0.00	1	33.33	1	33.33	1	33.33	0	0.00
Utkiavik	1	1	100.00	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00
Pt. Hope	1	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00
Total	6	6	100.00	0	0.00	0	0.00	2	33.33	1	16.67	2	33.33	1	16.67
Aleuts															
Umnak II	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Shiprock	34	17	50.00	9	52.94	5	29.41	1	5.88	1	5.88	1	5.88	0	0.00
Kagamil	52	21	40.38	6	28.57	2	9.52	1	4.76	5	23.81	5	23.81	2	9.52
Total	86	38	44.19	15	39.47	8	21.05	1	2.63	6	15.79	6	15.79	2	5.26

* Number of individuals with observable vaults and/or orbits
** Number of individuals with cribra orbitalia and/or porotic hyperostosis

Table 12 - Cribra Orbitalia and Porotic Hyperostosis Combined
Distribution of Active vs. Healed Lesions in Subadults

Age	N*	CO/PH**	%	Active N	Active %	Healed N	Healed %
Pre-Contact Period Eskimos							
0-2	0	0	0.00	0	0.00	0	0.00
2-4	1	0	0.00	0	0.00	0	0.00
4-6	0	0	0.00	0	0.00	0	0.00
7-12	5	0	0.00	0	0.00	0	0.00
13-17	3	3	100.00	0	0.00	3	100.00
17-18	0	0	0.00	0	0.00	0	0.00
Total	9	3	33.33	0	0.00	3	100.00
Pre-Contact Period Aleuts							
0-2	1	0	0.00	0	0.00	0	0.00
2-4	0	0	0.00	0	0.00	0	0.00
4-6	1	0	0.00	0	0.00	0	0.00
7-12	0	0	0.00	0	0.00	0	0.00
13-17	1	0	0.00	0	0.00	0	0.00
17-18	0	0	0.00	0	0.00	0	0.00
Total	3	0	0.00	0	0.00	0	0.00
Late Pre-Contact/Contact Period Eskimos							
0-2	0	0	0.00	0	0.00	0	0.00
2-4	0	0	0.00	0	0.00	0	0.00
4-6	2	2	100.00	2	100.00	0	0.00
7-12	1	1	100.00	1	100.00	0	0.00
13-17	2	2	100.00	0	0.00	2	100.00
17-18	1	1	100.00	0	0.00	1	100.00
Total	6	6	100.00	3	50.00	3	50.00
Late Pre-Contact/Contact Period Aleuts							
0-2	36	15	41.67	14	93.33	1	6.67
2-4	12	8	66.67	8	100.00	0	0.00
4-6	8	1	12.50	0	0.00	1	100.00
7-12	15	6	40.00	2	33.33	4	66.67
13-17	11	6	54.55	1	16.67	5	83.33
17-18	2	2	100.00	0	0.00	2	100.00
Total	84***	38	45.24	25	65.79	13	34.21

* Number of individuals with observable vaults and/or orbits
** Number of individuals with cribra orbitalia and/or porotic hyperostosis
*** Two subadults were omitted as their age at death could not be estimated

Table 13 - Specimens with Cranial Trauma

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
Pre-Contact Period					
Eskimos					
346,208	Tigara	F	50+	nasals, right zygomatic bone and mandible	healed
346,296	Tigara	F	21-35	left zygomatic, temporal and maxillary bones, mandible	healed
346,297	Tigara	M	50+	mandible	healed
Aleuts					
378,614*	Umnak Island I	M	50+	frontal	healed
378,616	Umnak Island I	F	21-35	left parietal	healed
378,618	Umnak Island I	M	36-50	right parietal	healed
378,622	Umnak Island I	M	50+	frontal and left parietal	healed
378,641	Umnak Island I	M	36-50	occipital	healed
378,643	Umnak Island I	M	36-50	frontal	healed
378,644	Umnak Island I	M	50+	frontal	healed
378,652	Umnak Island I	F	50+	mandible	healed
Late Pre-Contact/Contact Period					
Eskimos					
332,633	Barrow	F	36-50	right parietal and occipital bones	healed
332,641	Barrow	F	21-35	frontal and left parietal	healed
332,650	Barrow	F	36-50	frontal	healed
365,809	Nixerak	M	50+	frontal	healed
365,810	Nixerak	M	36-50	left temporal bone	healed
365,831	Nixerak	F	36-50	left parietal and left nasal bones	healed
365,875	Utkiavik	F	36-50	frontal and right parietal bones	healed
332,597	Point Hope	F	36-50	frontal	healed
333,441	Point Hope	M	36-50	right parietal and left temporal bones	unhealed
Aleuts					
378,466*	Shiprock Island	F	50+	nasal bones	healed

* these individuals also have infracranial trauma

Table 13 - Specimens with Cranial Trauma - continued

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
377,817	Kagamil Island	M	21-35	right frontal, parietal, temporal, zygomatic and maxillary bones	unhealed
377,819	Kagamil Island	F	50+	left temporal and zygomatic bones, nasal bones (?) and mandible	healed
377,834	Kagamil Island	M	21-35	frontal	healed
377,847	Kagamil Island	M	36-50	left parietal	healed
377,849	Kagamil Island	M	21-35	left parietal	healed
377,852	Kagamil Island	M	21-35	frontal	healed
377,858	Kagamil Island	M	18-20	frontal, occipital and parietal bones	unhealed
377,860	Kagamil Island	M	36-50	frontal	healed
377,870	Kagamil Island	F	36-50	left parietal bone	healed
377,877	Kagamil Island	F?	13-17	frontal	healed
377,900*	Kagamil Island	M	21-35	nasal bones	healed
377,904*	Kagamil Island	F	50+	right parietal	healed
377,908	Kagamil Island	F	36-50	frontal	healed
377,914*	Kagamil Island	F	50+	right parietal	healed
377,923*	Kagamil Island	M	13-17	frontal	healed
377,924	Kagamil Island	F	21-35	mandible	healed
378,426	Kagamil Island	F	21-35	frontal	healed

Table 14 - Specimens with Infracranial Trauma*

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
Pre-Contact Period					
Eskimos					
381,103	Kugusugaruk	M	36-50	right 1st rib	partly hld
381,115	Kugusugaruk	F	21-35	left 7th or 8th rib	healed
346,143	Tigara	M	50+	right 5th metatarsal	healed
346,145	Tigara	M	50+	a right rib	healed
346,149	Tigara	M	50+	right tibia	healed
346,156	Tigara	F	50+	left fibula and left radius	healed
346,182	Tigara	M	50+	two left ribs	partly hld
346,192	Tigara	M	50+	right 8th rib	healed
346,211	Tigara	M	50+	left clavicle	healed
346,281	Tigara	M	50+	right scapula	partly hld
346,282	Tigara	M	36-50	left tibia and left clavicle	healed
346,287	Tigara	M	36-50	a proximal phalanx of the foot	healed
				first and second thoracic vertebrae	healed
346,293	Tigara	F	50+	left scapula	healed
				three left ribs	partly hld
Aleuts					
378,456	Umnak Island I	F	50+	right radius	healed
378,602	Umnak Island I	M	36-50	a right rib	healed
378,603	Umnak Island I	M	50+	a proximal phalanx of the hand	healed
378,607	Umnak Island I	M	50+	right fibula	healed
378,609	Umnak Island I	M	21-35	left scapula and humerus	healed
378,614**	Umnak Island I	M	50+	left 4th metacarpal	healed
378,617	Umnak Island I	F	50+	right pelvic bone and right femur	healed
378,625	Umnak Island I	M	50+	left 1st metatarsal	healed
				a rib	partly hld
378,664	Umnak Island I	M	21-35	right 4th metacarpal	healed

* vertebral compression fractures and spondylolysis are not included
** these individuals also have cranial trauma

Table 14 - Specimens with Infracranial Trauma - continued

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
Late Pre-Contact/Contact Period					
Aleuts					
378,466**	Shiprock Island	F	50+	left radius	healed
378,535***	Shiprock Island	?	Adult	right second rib	healed
377,791***	Kagamil Island	?	Adult	left 5th metatarsal	healed
377,801***	Kagamil Island	?	Subadult	left rib	healed
377,808	Kagamil Island	F	50+	left clavicle	healed
377,813***	Kagamil Island	F	50+	loft radius	healed
377,814	Kagamil Island	F	50+	right 3rd rib	healed
377,821****	Kagamil Island	?	Subadult	left rib	healed
377,900**	Kagamil Island	M	21-35	left 4th rib	unhealed
377,901	Kagamil Island	M	36-50	right fibula	healed
377,902	Kagamil Island	M	21-35	right scapula and clavicle	healed
				5 left ribs	partly hld
377,904**	Kagamil Island	F	50+	right 10th rib	healed
377,913	Kagamil Island	M	36-50	right 2nd rib	healed
377,914**	Kagamil Island	F	50+	left fibula	healed
377,923**	Kagamil Island	M	13-17	left 2nd rib	healed
378,399	Kagamil Island	F	50+	left 3rd rib	partly hld
				left 5th rib	healed
378,446***	Kagamil Island	?	Adult	right fibula	healed
378,447***	Kagamil Island	M	21-35?	left pelvic bone	partly hld

*** comingled remains (see Appendix A)
**** a number of subadult ribs were included with the remains of this adult female

Table 15 - Cranial Trauma - Age and Sex Distribution

Sample	N*	CT**	%	Adults Males N	Adults Males %	Adults Females N	Adults Females %	Subadults Males N	Subadults Males %	Subadults Females N	Subadults Females %	Indeterminate N	Indeterminate %
Pre-Contact Period													
Eskimos													
Kugusug.	36	0	0.00	0/24	0.00	0/11	0.00	0/0	0.00	0/0	0.00	0/1	0.00
Kugok	3	0	0.00	0/3	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Piginik	6	0	0.00	0/1	0.00	0/3	0.00	0/0	0.00	0/0	0.00	0/2	0.00
Tigara	58	3	5.17	1/31	3.23	2/23	8.70	0/0	0.00	0/0	0.00	0/4	0.00
Total	103	3	2.91	1/59	1.69	2/37	5.41	0/0	0.00	0/0	0.00	0/7	0.00
Aleuts													
Umnak I	53	8	15.09	6/25	24.00	2/26	7.69	0/0	0.00	0/0	0.00	0/2	0.00
Total	53	8	15.09	6/25	24.00	2/26	7.69	0/0	0.00	0/0	0.00	0/2	0.00
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	29	3	10.34	0/15	0.00	3/13	23.08	0/0	0.00	0/1	0.00	0/0	0.00
Nixerak	46	3	6.52	2/26	7.69	1/18	5.56	0/0	0.00	0/0	0.00	0/2	0.00
Utkiavik	33	1	3.03	0/12	0.00	1/20	5.00	0/0	0.00	0/0	0.00	0/1	0.00
Pt. Hope	33	2	6.06	1/17	5.88	1/15	6.67	0/0	0.00	0/1	0.00	0/0	0.00
Total	141	9	6.38	3/70	4.29	6/66	9.09	0/0	0.00	0/2	0.00	0/3	0.00
Aleuts													
Umnak II	5	0	0.00	0/3	0.00	0/2	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Shiprock	58	1	1.72	0/19	0.00	1/7	14.29	0/2	0.00	0/0	0.00	0/30	0.00
Kagamil	137	17	12.41	8/45	17.78	7/53	13.21	1/2	50.00	1/8	12.50	0/29	0.00
Total	200	18	9.00	8/67	11.94	8/62	12.90	1/4	25.00	1/8	12.50	0/59	0.00

* Number of observable crania
** Number of crania with trauma

Table 16 - Cranial Trauma - Age Distribution

Sample	N*	CT**	%	<18 N	<18 %	18-20 N	18-20 %	21-35 N	21-35 %	36-50 N	36-50 %	50+ N	50+ %
Pre-Contact Period													
Eskimos													
Kugusug.	36	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kugok	3	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Piginik	6	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Tigara	58	3	5.17	0	0.00	0	0.00	1	33.33	0	0.00	2	66.67
Total	103	3	2.91	0	0.00	0	0.00	1	33.33	0	0.00	2	66.67
Aleuts													
Umnak I	53	8	15.09	0	0.00	0	0.00	1	12.50	3	37.50	4	50.00
Total	53	8	15.09	0	0.00	0	0.00	1	12.50	3	37.50	4	50.00
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	29	3	10.34	0	0.00	0	0.00	1	33.33	2	66.67	0	0.00
Nixerak	46	3	6.52	0	0.00	0	0.00	0	0.00	2	66.67	1	33.33
Utkiavik	33	1	3.03	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00
Pt. Hope	33	2	6.06	0	0.00	0	0.00	0	0.00	2	100.00	0	0.00
Total	141	9	6.38	0	0.00	0	0.00	1	11.11	7	77.78	1	11.11
Aleuts													
Umnak II	5	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Shiprock Is.	58	1	1.72	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00
Kagamil Is.	137	17	12.41	2	11.76	1	5.88	7	41.18	4	23.53	3	17.65
Total	200	18	9.00	2	11.11	1	5.56	7	38.89	4	22.22	4	22.22

* Number of observable crania
** Number of crania with trauma

Table 17 - Cranial Trauma - Degree of Healing

Sample	N*	CT**	%	Adult Males Unhealed N	Adult Males Unhealed %	Adult Males Healed N	Adult Males Healed %	Adult Females Unhealed N	Adult Females Unhealed %	Adult Females Healed N	Adult Females Healed %	Subadults Unhealed N	Subadults Unhealed %	Subadults Healed N	Subadults Healed %
Pre-Contact Period															
Eskimos															
Kugusug.	36	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kugok	3	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Piginik	6	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Tigara	58	3	5.17	0	0.00	1	33.33	0	0.00	2	66.67	0	0.00	0	0.00
Total	103	3	2.91	0	0.00	1	33.33	0	0.00	2	66.67	0	0.00	0	0.00
Aleuts															
Umnak I	53	8	15.09	0	0.00	6	75.00	0	0.00	2	25.00	0	0.00	0	0.00
Total	53	8	15.09	0	0.00	6	75.00	0	0.00	2	25.00	0	0.00	0	0.00
Late Pre-Contact/Contact Period															
Eskimos															
Barrow	29	3	10.34	0	0.00	0	0.00	0	0.00	3	100.00	0	0.00	0	0.00
Nixerak	46	3	6.52	0	0.00	2	66.67	0	0.00	1	33.33	0	0.00	0	0.00
Utkiavik	33	1	3.03	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00
Pt. Hope	33	2	6.06	1	50.00	0	0.00	0	0.00	1	50.00	0	0.00	0	0.00
Total	141	9	6.38	1	11.11	2	22.22	0	0.00	6	66.67	0	0.00	0	0.00
Aleuts															
Umnak II	5	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Shiprock Is.	58	1	1.72	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00
Kagamil Is.	137	17	12.41	2	11.76	6	35.29	0	0.00	7	41.18	0	0.00	2	11.76
Total	200	18	9.00	2	11.11	6	33.33	0	0.00	8	44.44	0	0.00	2	11.11

* Number of observable crania
** Number of crania with trauma

Table 18 - Infracranial Trauma - Age and Sex Distribution

				Adults				Subadults					
				Males		Females		Males		Females		Indeterminate	
Sample	N*	IT**	%	N	%	N	%	N	%	N	%	N	%
Pre-Contact Period													
Eskimos													
Kugusug.	38	2	5.26	1/25	4.00	1/11	9.09	0/0	0.00	0/0	0.00	0/2	0.00
Kugok	7	0	0.00	0/4	0.00	0/1	0.00	0/1	0.00	0/0	0.00	0/1	0.00
Piginik	5	0	0.00	0/2	0.00	0/2	0.00	0/0	0.00	0/0	0.00	0/1	0.00
Tigara	62	11	17.74	8/31	25.81	3/25	12.00	0/0	0.00	0/0	0.00	0/6	0.00
Total	112	13	11.61	9/62	14.52	4/39	10.26	0/1	0.00	0/0	0.00	0/10	0.00
Aleuts													
Umnak I	57	9	15.79	7/27	25.93	2/25	8.00	0/1	0.00	0/0	0.00	0/4	0.00
Total	57	9	15.79	7/27	25.93	2/25	8.00	0/1	0.00	0/0	0.00	0/4	0.00
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	1	0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/1	0.00	0/0	0.00
Nixerak	2	0	0.00	0/2	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Utkiavik	3	0	0.00	0/0	0.00	0/2	0.00	0/0	0.00	0/0	0.00	0/1	0.00
Pt. Hope	0	0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Total	6	0	0.00	0/2	0.00	0/2	0.00	0/0	0.00	0/1	0.00	0/1	0.00
Aleuts													
Umnak II	4	0	0.00	0/2	0.00	0/2	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Shiprock	26	1	3.85	0/13	0.00	1/5	20.00	0/1	0.00	0/1	0.00	0/6	0.00
Kagamil	64	13	20.31	5/26	19.23	6/23	26.09	1/1	100.00	0/1	0.00	1/13	7.69
Total	94	14	14.89	5/41	12.20	7/30	23.33	1/2	50.00	0/2	0.00	1/19	5.26

* Number of individuals with infracranial remains
** Minimum number of individuals with infracranial trauma

Table 19 - Infracranial Trauma - Age Distribution

				<18		18-20		21-35		36-50		50+	
Sample	N*	IT**	%	N	%	N	%	N	%	N	%	N	%
Pre-Contact Period													
Eskimos													
Kugusug.	38	2	5.26	0	0.00	0	0.00	1	50.00	1	50.00	0	0.00
Kugok	7	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Piginik	5	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Tigara	62	11	17.74	0	0.00	0	0.00	0	0.00	2	18.18	9	81.82
Total	112	13	11.61	0	0.00	0	0.00	1	7.69	3	23.08	9	69.23
Aleuts													
Umnak Is. I	57	9	15.79	0	0.00	0	0.00	2	22.22	1	11.11	6	66.67
Total	57	9	15.79	0	0.00	0	0.00	2	22.22	1	11.11	6	66.67
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Nixerak	2	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Utkiavik	3	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Pt. Hope	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	6	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Aleuts													
Umnak Is. II	4	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Shiprock Is.	26	1	3.85	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00
Kagamil Is.	64	13	20.31	2	15.38	0	0.00	3	23.08	2	15.38	6	46.15
Total	94	14	14.89	2	14.29	0	0.00	3	21.43	2	14.29	7	50.00

* Number of individuals with infracranial remains
** Minimum number of individuals with infracranial trauma

Table 20 - Infracranial Trauma by Element (All Individuals)

				Humerus		Radius		Ulna		Femur		Tibia		Fibula	
Sample	N*	IT**	%	N	%	N	%	N	%	N	%	N	%	N	%
Pre-Contact Period															
Eskimos															
Kugusug.	311	0	0.00	0/56	0.00	0/52	0.00	0/53	0.00	0/52	0.00	0/54	0.00	0/44	0.00
Kugok	13	0	0.00	0/3	0.00	0/0	0.00	0/2	0.00	0/4	0.00	0/1	0.00	0/3	0.00
Piginik	17	0	0.00	0/3	0.00	0/3	0.00	0/2	0.00	0/2	0.00	0/4	0.00	0/3	0.00
Tigara	623	4	0.64	0/103	0.00	1/99	1.01	0/106	0.00	0/111	0.00	2/104	1.92	1/100	1.00
Total	964	4	0.41	0/165	0.00	1/154	0.65	0/163	0.00	0/169	0.00	2/163	1.23	1/150	0.67
Aleuts															
Umnak I	544	4	0.74	1/99	1.01	1/81	1.23	0/88	0.00	1/102	0.98	0/97	0.00	1/77	1.30
Total	544	4	0.74	1/99	1.01	1/81	1.23	0/88	0.00	1/102	0.98	0/97	0.00	1/77	1.30
Late Pre-Contact/Contact Period															
Eskimos															
Barrow	0	0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Nixerak	0	0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Utkiavik	24	0	0.00	0/4	0.00	0/4	0.00	0/4	0.00	0/4	0.00	0/4	0.00	0/4	0.00
Pt. Hope	0	0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Total	24	0	0.00	0/4	0.00	0/4	0.00	0/4	0.00	0/4	0.00	0/4	0.00	0/4	0.00
Aleuts															
Umnak II	38	0	0.00	0/5	0.00	0/6	0.00	0/6	0.00	0/8	0.00	0/7	0.00	0/6	0.00
Shiprock	513	1	0.19	0/84	0.00	1/75	1.33	0/69	0.00	0/118	0.00	0/99	0.00	0/68	0.00
Kagamil	1296	4	0.31	0/213	0.00	1/158	0.63	0/181	0.00	0/316	0.00	0/241	0.00	3/187	1.60
Total	1847	5	0.27	0/302	0.00	2/239	0.84	0/256	0.00	0/442	0.00	0/347	0.00	3/261	1.15

* Total number of elements
** Number of elements with trauma

Table 21 - Infracranial Trauma - Degree of Healing - Upper Limb Bones (All Individuals)

				Humerus				Radius				Ulna			
				Unhealed		Healed		Unhealed		Healed		Unhealed		Healed	
Sample	N*	IT**	%	N	%	N	%	N	%	N	%	N	%	N	%
Pre-Contact Period															
Eskimos															
Kugusug.	161	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kugok	5	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Piginik	8	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Tigara	308	1	0.32	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00
Total	482	1	0.21	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00
Aleuts															
Umnak I	268	2	0.75	0	0.00	1	50.00	0	0.00	1	50.00	0	0.00	0	0.00
Total	268	2	0.75	0	0.00	1	50.00	0	0.00	1	50.00	0	0.00	0	0.00
Late Pre-Contact/Contact Period															
Eskimos															
Barrow	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Nixerak	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Utkiavik	12	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Pt. Hope	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	12	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Aleuts															
Umnak II	17	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Shiprock	228	1	0.44	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00
Kagamil	552	1	0.18	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00
Total	797	2	0.25	0	0.00	0	0.00	0	0.00	2	100.00	0	0.00	0	0.00

* Total number of upper limb bones
** Number of upper limb bones with trauma

Table 22 - Infracranial Trauma - Degree of Healing - Lower Limb Bones (All Individuals)

				Femur				Tibia				Fibula			
				Unhealed		Healed		Unhealed		Healed		Unhealed		Healed	
Sample	N*	IT**	%	N	%	N	%	N	%	N	%	N	%	N	%
Pre-Contact Period															
Eskimos															
Kugusug.	150	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kugok	8	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Piginik	9	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Tigara	315	3	0.95	0	0.00	0	0.00	0	0.00	2	66.67	0	0.00	1	33.33
Total	482	3	0.62	0	0.00	0	0.00	0	0.00	2	66.67	0	0.00	1	33.33
Aleuts															
Umnak I	276	2	0.72	0	0.00	1	50.00	0	0.00	0	0.00	0	0.00	1	50.00
Total	276	2	0.72	0	0.00	1	50.00	0	0.00	0	0.00	0	0.00	1	50.00
Late Pre-Contact/Contact Period															
Eskimos															
Barrow	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Nixerak	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Utkiavik	12	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Pt. Hope	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	12	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Aleuts															
Umnak II	21	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Shiprock	285	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kagamil	744	3	0.40	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	100.00
Total	1050	3	0.29	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	100.00

* Total number of lower limb bones
** Number of lower limb bones with trauma

Table 23 - Cranial and Infracranial Trauma Combined - Age and Sex Distribution

				Adults						Subadults			
				Males		Females		Males		Females		Subadults	
Sample	N*	T**	%	N	%	N	%	N	%	N	%	N	%
Pre-Contact Period													
Eskimos													
Kugusug.	42	2	4.76	1/27	3.70	1/13	7.69	0/0	0.00	0/0	0.00	0/2	0.00
Kugok	11	0	0.00	0/6	0.00	0/3	0.00	0/1	0.00	0/0	0.00	0/1	0.00
Piginik	9	0	0.00	0/2	0.00	0/4	0.00	0/0	0.00	0/0	0.00	0/3	0.00
Tigara	66	14	21.21	9/34	26.47	5/26	19.23	0/0	0.00	0/0	0.00	0/6	0.00
Total	128	16	12.50	10/69	14.49	6/46	13.04	0/1	0.00	0/0	0.00	0/12	0.00
Aleuts													
Umnak I	65	16	24.62	12/29	41.38	4/31	12.90	0/1	0.00	0/0	0.00	0/4	0.00
Total	65	16	24.62	12/29	41.38	4/31	12.90	0/1	0.00	0/0	0.00	0/4	0.00
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	37	3	8.11	0/17	0.00	3/19	15.79	0/0	0.00	0/1	0.00	0/0	0.00
Nixerak	62	3	4.84	2/28	7.14	1/31	3.23	0/0	0.00	0/0	0.00	0/3	0.00
Utkiavik	33	1	3.03	0/12	0.00	1/20	5.00	0/0	0.00	0/0	0.00	0/1	0.00
Pt. Hope	40	2	5.00	1/23	4.35	1/16	6.25	0/0	0.00	0/0	0.00	0/0	0.00
Total	172	9	5.23	3/80	3.75	6/86	6.98	0/0	0.00	0/2	0.00	0/4	0.00
Aleuts													
Umnak II	6	0	0.00	0/4	0.00	0/2	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Shiprock	62	1	1.61	0/20	0.00	1/9	11.11	0/2	0.00	0/1	0.00	0/30	0.00
Kagamil	159	26	16.35	12/58	20.69	11/56	19.64	1/2	50.00	1/8	12.50	1/35	2.86
Total	227	27	11.89	12/82	14.63	12/67	17.91	1/4	25.00	1/9	11.11	1/65	1.54

* Minimum number of individuals with cranial and/or infracranial remains
** Minimum number of individuals with cranial and/or infracranial trauma

Table 24 - Specimens with Cranial Infection

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
Pre-Contact Period					
Eskimos					
381,104	Kugusugaruk	M	50+	mandible	active
346,285	Tigara	M	50+	zygomatics	active
346,288*	Tigara	F	36-50	right maxillary and temporal bones, sphenoid, mandible	active
346,296**	Tigara	F	21-35	left zygomatic, maxillary and temporal bones, mandible	active
Late Pre-Contact/Contact Period					
Eskimos					
332,638	Barrow	F	36-50	frontal and parietals	active
365,790	Nixerak	M	21-35	frontal	healed
365,823	Nixerak	F	36-50	frontal	healed
365,840	Nixerak	F	36-50	frontal and parietals	healed
365,857	Utkiavik	M	36-50	parietals	healed
365,874	Utkiavik	F	36-50	parietals	healed
Aleuts					
378,606*	Umnak Island II	F	50+	frontal and parietal bones, mandible	partly hld
378,679	Umnak Island II	M	50+	right zygomatic and frontal bones	partly hld
378,462*	Shiprock Island	M	50+	frontal, nasal, parietal, and occipital bones	healed
378,463*	Shiprock Island	M	50+	frontal and parietals	healed
378,464	Shiprock Island	M	21-35	right maxillary and zygomatic bones, sphenoid, mandible	active
378,465	Shiprock Island	M	36-50	frontal	healed
378,466	Shiprock Island	F	50+	frontal	healed
378,467	Shiprock Island	F	50+	frontal, zygomatic, maxillary, temporal, and nasal bones, mandible	partly hld

* these individuals also have infracranial infection
** infection is secondary to trauma

Table 24 - Specimens with Cranial Infection - continued

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
378,469	Shiprock Island	M	21-35	maxillary bones	healed?
378,470*	Shiprock Island	F	36-50	frontal and left zygomatic bones	healed
378,471	Shiprock Island	M	21-35	left zygomatic bone	healed
378,476	Shiprock Island	M	50+	frontal and parietals	healed
378,481	Shiprock Island	M	50+	occipital	active
				frontal and right parietal bones	healed
378,483	Shiprock Island	F	21-35	parietal bones	healed
378,484	Shiprock Island	F	21-35?	frontal	healed
378,485	Shiprock Island	M	36-50?	frontal and parietals	healed
378,501	Shiprock Island	I	2-4	frontal, parietal, maxillary, temporal, and sphenoid bones	partly hld
378,510	Shiprock Island	I	0-2	frontal, occipital, temporal, and left parietal bones	active
378,512	Shiprock Island	I	0-2	parietals	active
378,513	Shiprock Island	I	0-2	frontal and parietals	active
378,515	Shiprock Island	I	1-2	frontal, parietal, and occipital bones	active
378,516	Shiprock Island	I	0-2	frontal, parietal, and occipital bones	active
378,517	Shiprock Island	I	0-2	occipital	active
378,518	Shiprock Island	I	0-1	occipital	active
378,520	Shiprock Island	I	2-3	frontal and occipital	active
378,521	Shiprock Island	I	1-2	frontal, occipital and right parietal bones	partly hld
377,808*	Kagamil Island	F	50+	frontal	partly hld
377,816*	Kagamil Island	M	50+	frontal	active
377,819*	Kagamil Island	F	50+	frontal and maxillary bones	partly hld
377,826	Kagamil Island	I	0-1	frontal, occipital, and left parietal bones	active
377,828	Kagamil Island	I	0-1	frontal	healed?
377,836	Kagamil Island	F	21-35	frontal and parietals	healed
377,838	Kagamil Island	M	50+	frontal	healed
377,848	Kagamil Island	M	21-35	frontal and left parietal bones	healed
377,857	Kagamil Island	M	36-50	frontal	active
377,860	Kagamil Island	M	36-50	frontal and parietals	healed
377,863	Kagamil Island	F	13-17	frontal	active
377,875A	Kagamil Island	F	21-35	parietals	healed
377,878	Kagamil Island	I	7-12	frontal and parietals	healed

Table 24 - Specimens with Cranial Infection - continued

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
377,879	Kagamil Island	I	7-12	frontal, parietal and occipital bones	active
377,887	Kagamil Island	I	2-3	frontal, parietal and occipital bones	partly hld
377,889	Kagamil Island	I	2-4	occipital, right parietal and right temporal bones	partly hld
377,892	Kagamil Island	I	1-2	occipital	active
377,896	Kagamil Island	I	0-1	parietal and occipital bones	healed?
377,912*	Kagamil Island	M?	13-17	frontal, right maxillary and zygomatic bones	healed
377,920	Kagamil Island	F	50+	right zygomatic and right maxillary bones	active
377,926*	Kagamil Island	F	50+	frontal	active
378,412	Kagamil Island	F	21-35	right nasal and right maxillary bones	active
378,413	Kagamil Island	F	21-35	maxillary bones	healed?
378,432	Kagamil Island	M?	36-50?	frontal and parietals	healed
378,434	Kagamil Island	I	1-2	occipital and parietals	partly hld

Table 25 - Specimens with Infracranial Infection

Pre-Contact Period

Eskimos

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
381,101	Kugusugaruk	M	21-35	4th, 5th, 8th and 9th right ribs, 7th left rib	active
381,111	Kugusugaruk	F	36-50	right tibia	healed
346,182*	Tigara	M	50+	two left ribs	active
346,288**	Tigara	F	36-50	left scapula, left humerus, sternum, pelvic bones, ribs, vertebrae, femora, left tibia, fibulae	active
346,293*	Tigara	F	50+	three left ribs	active

Aleuts

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
378,456*	Umnak Island I	F	50+	right radius	healed
378,603	Umnak Island I	M	50+	right radius, tibiae	active
378,604	Umnak Island I	F	50+	right femur	active?
378,607	Umnak Island I	M	50+	left femur	active
378,608	Umnak Island I	F	21-35	left femur	partly hld
378,609	Umnak Island I	M	21-35	tibiae	healed
378,612	Umnak Island I	M	50+	scapulae, radii, pelvic bones, left 10th-12th ribs, femora, tibiae, fibulae, 3 metacarpals, 7 metatarsals, calcanei, proximal phalanges	active
378,613	Umnak Island I	F	50+	tibiae	healed
378,617*	Umnak Island I	F	50+	right pelvic bone, right femur	healed
378,618	Umnak Island I	M	36-50	scapulae, humeri, radii, ulnae, pelvic bones, femora, tibiae, right calcaneus	active
378,628	Umnak Island I	F	50+	right femur	partly hld
378,635	Umnak Island I	M	50+	tibiae	active

* the infection is secondary to trauma
** these individuals also have cranial infection
*** an adult calcaneus was mixed in with the remains of this subadult
**** comingled remains (see Appendix A)

Table 25 - Specimens with Infracranial Infection - continued

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
378,642	Umnak Island I	F	50+	right femur	active
378,665***	Umnak Island I	?	Adult	right calcaneus	active
378,671****	Umnak Island I	?	Adult	left clavicle	active

Late Pre-Contact/Contact Period

Eskimos

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
365,892	Utkiavik	F	21-35	right 12th rib	healed?
365,893	Utkiavik	F	21-35	left femur	partly hld

Aleuts

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
378,455	Umnak Island II	M	36-50	scapulae, left radius left pelvic bone, femora, right tibia	active
378,606**	Umnak Island II	F	50+	clavicles, left humerus 4 right ribs, 3 left ribs, 3 rib fragments	partly hld
378,462**	Shiprock Island	M	50+	right fibula	healed
378,463**	Shiprock Island	M	50+	scapulae, humeri, ulnae, femora, tibiae, fibulae	healed
378,470**	Shiprock Island	F	36-50	clavicles, tibiae	active
378,524a****	Shiprock Island	?	Subadult	right femur	active
378,526****	Shiprock Island	?	Adult	left radius	healed?
			Adult	right radius	active
			Adult	right radius	healed?
378,527****	Shiprock Island	?	Adult	left ulna	active
			Adult	right ulna	active
378,528****	Shiprock Island	?	Adult	right scapula	healed
378,531****	Shiprock Island	?	Adult	left tibia	active
			Adult	left tibia	healed
			Adult	left tibia	active
			Adult	right tibia	active
			Adult	right tibia	healed
			Adult	right tibia	healed
378,532****	Shiprock Island	?	Adult	left fibula	active
			Adult	right fibula	active
378,538****	Shiprock Island	?	Adult	left talus	partly hld
378,543	Shiprock Island	M	36-50	right 3rd-11th ribs	active

Table 25 - Specimens with Infracranial Infection - continued

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
378,544	Shiprock Island	M	50+	scapulae, right clavicle	active
377,773****	Kagamil Island	?	Adult	right femur	active
377,774****	Kagamil Island	?	Adult	left humerus	active
377,775****	Kagamil Island	?	Adult	left tibia	healed
			Adult	left tibia	partly hld
			Adult	right tibia	partly hld
			Adult	right tibia	healed
			Adult	right tibia	healed
			Adult	right tibia	partly hld
			Adult	right tibia	healed
377,776****	Kagamil Island	?	Adult	left fibula	active
			Adult	left fibula	partly hld
			Adult	left fibula	active
			Adult	right fibula	active
377,777****	Kagamil Island	?	Adult	left ulna	active
377,780****	Kagamil Island	?	Adult	left scapula	active
			Adult	left scapula	active
			Adult	left scapula	active
377,793****	Kagamil Island	?	Subadult	left tibia	active
			Subadult	left tibia	healed
377,795****	Kagamil Island	?	Subadult	fibula	active
377,799****	Kagamil Island	?	Subadult	right scapula	active?
377,800****	Kagamil Island	?	Adult	a left rib and two right ribs	active
377,807	Kagamil Island	M	50+	tibiae	healed
377,808**	Kagamil Island	F	50+	scapulae, left ulna, right humerus, manubrium, right tibia and femur	partly hld
377,815	Kagamil Island	F	50+	right 5th metatarsal	active
377,816**	Kagamil Island	M	50+	left ulna	active
377,819**	Kagamil Island	F	50+	right humerus, radius and ulna	partly hld
377,901	Kagamil Island	M	36-50	fibulae, tibiae	partly hld
377,902*	Kagamil Island	M	21-35	right scapula, 8 left ribs	partly hld
377,904	Kagamil Island	F	50+	femora, right tibia	active
377,905*****	Kagamil Island	F	36-50	left radius	healed
377,909	Kagamil Island	M	21-35	tibiae	healed
377,912**	Kagamil Island	M?	13-17	humeri, right ulna	active

***** an extra radius was mixed in with the remains of this individual

Table 25 - Specimens with Infracranial Infection - continued

Specimen	Sample	Sex	Age	Elements Affected	Degree of Healing
377,913	Kagamil Island	M	36-50	femora, tibiae, fibulae, left calcaneus	active
377,915	Kagamil Island	F	50+	scapulae, clavicles, ulnae, femora	active
377,921	Kagamil Island	M	36-50	right femur	active
377,924	Kagamil Island	F	21-35	right scapula	partly hld
377,926**	Kagamil Island	F	50+	right scapula, clavicles, left tibia	active
378,436****	Kagamil Island	?	Subadult	left humerus	active
			Adult	right humerus	active
378,439****	Kagamil Island	?	Adult	right ulna	active
			Adult	right ulna	partly hld
378,440****	Kagamil Island	?	Adult	left clavicle	active?
			Adult	right clavicle	active?
			Adult	right clavicle	active?
378,441****	Kagamil Island	?	Adult	right scapula	active?
			Adult	left scapula	active?
			Adult	left scapula	active?
			Adult	left scapula	active?
378,443****	Kagamil Island	?	Subadult	left femur	active
			Subadult	right femur	active
			Subadult	right femur	active
			Subadult	right femur	active
			Subadult	right femur	active
378,444****	Kagamil Island	?	Adult	left tibia	active
			Adult	left tibia	partly hld
			Adult	left tibia	healed
			Adult	left tibia	healed
			Adult	left tibia	healed
			Adult	left tibia	healed
			Adult	right tibia	healed
			Adult	right tibia	healed
378,445****	Kagamil Island	?	Subadult	left tibia	active
			Subadult	left tibia	active
			Subadult	right tibia	healed
			Subadult	right tibia	healed
378,446****	Kagamil Island	?	Adult	left fibula	healed
		?	Adult	right fibula	healed
378,449****	Kagamil Island	?	Adult	right calcaneus	partly hld
378,733****	Kagamil Island	?	Adult	right clavicle	active

Table 26 - Cranial Infection - Age and Sex Distribution

Sample	N*	CI**	%	Adults Males N	Adults Males %	Adults Females N	Adults Females %	Subadults Males N	Subadults Males %	Subadults Females N	Subadults Females %	Indeterminate N	Indeterminate %
Pre-Contact Period													
Eskimos													
Kugusugaruk	36	1	2.78	1/24	4.17	0/11	0.00	0/0	0.00	0/0	0.00	0/1	0.00
Kugok	3	0	0.00	0/3	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Piginik	6	0	0.00	0/1	0.00	0/3	0.00	0/0	0.00	0/0	0.00	0/2	0.00
Tigara	59	2	3.39	1/32	3.13	1/23	4.35	0/0	0.00	0/0	0.00	0/4	0.00
Total	104	3	2.88	2/60	3.33	1/37	2.70	0/0	0.00	0/0	0.00	0/7	0.00
Aleuts													
Umnak Is. I	52	0	0.00	0/24	0.00	0/26	0.00	0/0	0.00	0/0	0.00	0/2	0.00
Total	52	0	0.00	0/24	0.00	0/26	0.00	0/0	0.00	0/0	0.00	0/2	0.00
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	28	1	3.57	0/15	0.00	1/12	8.33	0/0	0.00	0/1	0.00	0/0	0.00
Nixerak	47	3	6.38	1/25	4.00	2/20	10.00	0/0	0.00	0/0	0.00	0/2	0.00
Utkiavik	33	2	6.06	1/12	8.33	1/20	5.00	0/0	0.00	0/0	0.00	0/1	0.00
Pt. Hope	32	0	0.00	0/16	0.00	0/15	0.00	0/0	0.00	0/1	0.00	0/0	0.00
Total	140	6	4.29	2/68	2.94	4/67	5.97	0/0	0.00	0/2	0.00	0/3	0.00
Aleuts													
Umnak Is. II	5	2	40.00	1/3	33.33	1/2	50.00	0/0	0.00	0/0	0.00	0/0	0.00
Shiprock Is.	60	24	40.00	9/19	47.37	5/9	55.56	0/2	0.00	0/0	0.00	10/30	33.33
Kagamil Is.	139	25	17.99	6/45	13.33	8/53	15.09	1/2	50.00	1/8	12.50	9/31	29.03
Total	204	51	25.00	16/67	23.88	14/64	21.88	1/4	25.00	1/8	12.50	19/61	31.15

* Number of observable crania
** Number of crania with infection (excluding those with infection secondary to trauma)

Table 27 - Cranial Infection - Age Distribution

Sample	N*	CI**	%	<18 N	<18 %	18-20 N	18-20 %	21-35 N	21-35 %	36-50 N	36-50 %	50+ N	50+ %
Pre-Contact Period													
Eskimos													
Kugusug.	36	1	2.78	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00
Kugok	3	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Piginik	6	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Tigara	59	2	3.39	0	0.00	0	0.00	0	0.00	1	50.00	1	50.00
Total	104	3	2.88	0	0.00	0	0.00	0	0.00	1	33.33	2	66.67
Aleuts													
Umnak I	52	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	52	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	28	1	3.57	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00
Nixerak	47	3	6.38	0	0.00	0	0.00	1	33.33	2	66.67	0	0.00
Utkiavik	33	2	6.06	0	0.00	0	0.00	0	0.00	2	100.00	0	0.00
Pt. Hope	32	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	140	6	4.29	0	0.00	0	0.00	1	16.67	5	83.33	0	0.00
Aleuts													
Umnak II	5	2	40.00	0	0.00	0	0.00	0	0.00	0	0.00	2	100.00
Shiprock Is.	60	24	40.00	10	41.67	0	0.00	5	20.83	3	12.50	6	25.00
Kagamil Is.	139	25	17.99	11	44.00	0	0.00	5	20.00	3	12.00	6	24.00
Total	204	51	25.00	21	41.18	0	0.00	10	19.61	6	11.76	14	27.45

* Number of observable crania
** Number of crania with infection (excluding those with infection secondary to trauma)

Table 28 - Cranial Infection - Degree of Healing

Sample	N*	CI**	%	Adult Males Active N	Adult Males Active %	Adult Males Healed N	Adult Males Healed %	Adult Females Active N	Adult Females Active %	Adult Females Healed N	Adult Females Healed %	Subadults Active N	Subadults Active %	Subadults Healed N	Subadults Healed %
Pre-Contact Period															
Eskimos															
Kugusug.	36	1	2.78	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kugok	3	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Piginik	6	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Tigara	59	2	3.39	1	50.00	0	0.00	1	50.00	0	0.00	0	0.00	0	0.00
Total	104	3	2.88	2	66.67	0	0.00	1	33.33	0	0.00	0	0.00	0	0.00
Aleuts															
Umnak I	52	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	52	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Late Pre-Contact/Contact Period															
Eskimos															
Barrow	28	1	3.57	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00
Nixerak	47	3	6.38	0	0.00	1	33.33	0	0.00	2	66.67	0	0.00	0	0.00
Utkiavik	33	2	6.06	0	0.00	1	50.00	0	0.00	1	50.00	0	0.00	0	0.00
Pt. Hope	32	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	140	6	4.29	0	0.00	2	33.33	1	16.67	3	50.00	0	0.00	0	0.00
Aleuts															
Umnak II	5	2	40.00	0	0.00	1	50.00	0	0.00	1	50.00	0	0.00	0	0.00
Shiprock	60	24	40.00	2	8.33	7	29.17	0	0.00	5	20.83	8	33.33	2	8.33
Kagamil	139	25	17.99	2	8.00	4	16.00	3	12.00	5	20.00	4	16.00	7	28.00
Total	204	51	25.00	4	7.84	12	23.53	3	5.88	11	21.57	12	23.53	9	17.65

* Number of observable crania
** Number of crania with infection (excluding those crania with infection secondary to trauma)

Table 29 - Infracranial Infection - Age and Sex Distribution

Sample	N*	II**	%	Adults: Males N	%	Adults: Females N	%	Subadults: Males N	%	Subadults: Females N	%	Indeterminate N	%
Pre-Contact Period													
Eskimos													
Kugusug.	38	2	5.26	1/25	4.00	1/11	9.09	0/0	0.00	0/0	0.00	0/2	0.00
Kugok	7	0	0.00	0/4	0.00	0/1	0.00	0/1	0.00	0/0	0.00	0/1	0.00
Piginik	5	0	0.00	0/2	0.00	0/2	0.00	0/0	0.00	0/0	0.00	0/1	0.00
Tigara	62	1	1.61	0/31	0.00	1/25	4.00	0/0	0.00	0/0	0.00	0/6	0.00
Total	112	3	2.68	1/62	1.61	2/39	5.13	0/1	0.00	0/0	0.00	0/10	0.00
Aleuts													
Umnak I	57	11	19.30	6/27	22.22	5/25	20.00	0/1	0.00	0/0	0.00	0/4	0.00
Total	57	11	19.30	6/27	22.22	5/25	20.00	0/1	0.00	0/0	0.00	0/4	0.00
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	1	0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/1	0.00	0/0	0.00
Nixerak	2	0	0.00	0/2	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Utkiavik	3	2	66.67	0/0	0.00	2/2	100.00	0/0	0.00	0/0	0.00	0/1	0.00
Pt. Hope	0	0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Total	6	2	33.33	0/2	0.00	2/2	100.00	0/0	0.00	0/1	0.00	0/1	0.00
Aleuts													
Umnak II	4	2	50.00	1/2	50.00	1/2	50.00	0/0	0.00	0/0	0.00	0/0	0.00
Shiprock	26	5	19.23	4/13	30.77	1/5	20.00	0/1	0.00	0/1	0.00	0/6	0.00
Kagamil	64	14	21.88	6/26	23.08	7/23	30.43	1/1	100.00	0/1	0.00	0/13	0.00
Total	94	21	22.34	11/41	26.83	9/30	30.00	1/2	50.00	0/2	0.00	0/19	0.00

* Number of individuals with infracranial remains
** Minimum number of individuals with infracranial infection (excluding those individuals with infection secondary to trauma)

Table 30 - Infracranial Infection - Age Distribution

Sample	N*	II**	%	<18 N	%	18-20 N	%	21-35 N	%	36-50 N	%	50+ N	%
Pre-Contact Period													
Eskimos													
Kugusug.	38	2	5.26	0	0.00	0	0.00	1	50.00	1	50.00	0	0.00
Kugok	7	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Piginik	5	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Tigara	62	1	1.61	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00
Total	112	3	2.68	0	0.00	0	0.00	1	33.33	2	66.67	0	0.00
Aleuts													
Umnak I	57	11	19.30	0	0.00	0	0.00	2	15.38	1	7.69	8	72.73
Total	57	11	19.30	0	0.00	0	0.00	2	15.38	1	7.69	8	72.73
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Nixerak	2	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Utkiavik	3	2	66.67	0	0.00	0	0.00	2	100.00	0	0.00	0	0.00
Pt. Hope	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	6	2	33.33	0	0.00	0	0.00	2	100.00	0	0.00	0	0.00
Aleuts													
Umnak II	4	2	50.00	0	0.00	0	0.00	0	0.00	1	50.00	1	50.00
Shiprock	26	5	19.23	0	0.00	0	0.00	0	0.00	2	40.00	3	60.00
Kagamil	64	14	21.88	1	7.14	0	0.00	2	14.29	3	21.43	8	57.14
Total	94	21	22.34	1	4.76	0	0.00	2	9.52	6	28.57	12	57.14

* Number of individuals with infracranial remains
** Minimum number of individuals with infracranial infection (excluding those individuals with infection secondary to trauma)

Table 31 - Infracranial Infection - Degree of Healing by Individual

Sample	N*	I**	%	Adult Males: Active N	%	Adult Males: Healed N	%	Adult Females: Active N	%	Adult Females: Healed N	%	Subadults: Active N	%	Subadults: Healed N	%
Pre-Contact Period															
Eskimos															
Kugusug.	38	2	5.26	1	50.00	0	0.00	0	0.00	1	50.00	0	0.00	0	0.00
Kugok	7	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Piginik	5	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Tigara	62	1	1.61	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00
Total	112	3	2.68	1	33.33	0	0.00	1	33.33	1	33.33	0	0.00	0	0.00
Aleuts															
Umnak I	57	11	19.30	5	45.45	1	9.09	2	18.18	3	27.27	0	0.00	0	0.00
Total	57	11	19.30	5	45.45	1	9.09	2	18.18	3	27.27	0	0.00	0	0.00
Late Pre-Contact/Contact Period															
Eskimos															
Barrow	1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Nixerak	2	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Utkiavik	3	2	66.67	0	0.00	0	0.00	0	0.00	2	100.00	0	0.00	0	0.00
Pt. Hope	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	6	2	33.33	0	0.00	0	0.00	0	0.00	2	100.00	0	0.00	0	0.00
Aleuts															
Umnak II	4	2	50.00	1	50.00	0	0.00	0	0.00	1	50.00	0	0.00	0	0.00
Shiprock	26	5	19.23	2	40.00	2	40.00	1	20.00	0	0.00	0	0.00	0	0.00
Kagamil	64	14	21.88	3	21.43	3	21.43	4	28.57	3	21.43	1	7.14	0	0.00
Total	94	21	22.34	6	28.57	5	23.81	5	23.81	4	19.05	1	4.76	0	0.00

* Number of individuals with infracranial remains
** Minimum number of individuals with infracranial infection (excluding those individuals with infection secondary to trauma)

Table 32 - Infracranial Infection by Element (All Individuals)

Sample	N*	II**	%	Humerus N	%	Radius N	%	Ulna N	%	Femur N	%	Tibia N	%	Fibula N	%
Pre-Contact Period															
Eskimos															
Kugusug.	311	1	0.32	0/56	0.00	0/52	0.00	0/53	0.00	0/52	0.00	1/54	1.85	0/44	0.00
Kugok	13	0	0.00	0/3	0.00	0/0	0.00	0/2	0.00	0/4	0.00	0/1	0.00	0/3	0.00
Piginik	17	0	0.00	0/3	0.00	0/3	0.00	0/2	0.00	0/2	0.00	0/4	0.00	0/3	0.00
Tigara	623	7	1.12	1/103	0.97	0/99	0.00	0/106	0.00	2/111	1.80	2/104	1.92	2/100	2.00
Total	964	8	0.83	1/165	0.61	0/154	0.00	0/163	0.00	2/169	1.18	3/163	1.84	2/150	1.33
Aleuts															
Umnak I	544	32	5.88	2/99	2.02	5/81	6.17	2/88	2.27	9/102	8.82	12/97	12.37	2/77	2.60
Total	544	32	5.88	2/99	2.02	5/81	6.17	2/88	2.27	9/102	8.82	12/97	12.37	2/77	2.60
Late Pre-Contact/Contact Period															
Eskimos															
Barrow	0	0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Nixerak	0	0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Utkiavik	24	1	4.17	0/4	0.00	0/4	0.00	0/4	0.00	1/4	25.00	0/4	0.00	0/4	0.00
Pt. Hope	0	0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00	0/0	0.00
Total	24	1	4.17	0/4	0.00	0/4	0.00	0/4	0.00	1/4	25.00	0/4	0.00	0/4	0.00
Aleuts															
Umnak II	38	5	13.16	1/5	20.00	1/6	16.67	0/6	0.00	2/8	25.00	1/7	14.29	0/6	0.00
Shiprock Is.	513	27	5.26	2/84	2.38	3/75	40.00	4/69	5.80	3/118	2.54	10/99	10.10	5/68	7.35
Kagamil Is.	1296	74	5.71	7/213	3.29	2/158	1.27	9/181	4.97	13/316	4.11	32/241	13.28	11/187	5.88
Total	1847	106	5.74	10/302	3.31	6/239	2.51	13/256	5.08	18/442	4.07	43/347	12.39	16/261	6.13

* Total number of limb bones
** Number of limb bones with infection (excluding those with infection secondary to trauma)

Table 33 - Infracranial Infection - Degree of Healing - Upper Limb Bones (All Individuals)

				Humerus				Radius				Ulna			
				Active		Healed		Active		Healed		Active		Healed	
Sample	N*	II**	%	N	%	N	%	N	%	N	%	N	%	N	%
Pre-Contact Period															
Eskimos															
Kugusug.	161	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kugok	5	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Piginik	8	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Tigara	308	1	0.32	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	482	1	0.21	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Aleuts															
Umnak I	268	9	3.36	2	20.00	0	0.00	5	50.00	0	0.00	2	20.00	0	0.00
Total	268	9	3.36	2	20.00	0	0.00	5	50.00	0	0.00	2	20.00	0	0.00
Late Pre-Contact/Contact Period															
Eskimos															
Barrow	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Nixerak	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Utkiavik	12	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Pt. Hope	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	12	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Aleuts															
Umnak II	17	2	11.76	1	50.00	0	0.00	1	50.00	0	0.00	0	0.00	0	0.00
Shiprock	228	9	3.95	0	0.00	2	22.22	1	11.11	2	22.22	2	22.22	2	22.22
Kagamil	552	18	3.26	6	33.33	1	5.56	0	0.00	2	11.11	7	38.89	2	11.11
Total	797	29	3.64	7	24.14	3	10.34	2	6.90	4	13.79	9	31.03	4	13.79

* Total number of upper limb bones
** Number of upper limb bones with infection (excluding those with infection secondary to trauma)

Table 34 - Infracranial Infection - Degree of Healing - Lower Limb Bones (All Individuals)

				Femur				Tibia				Fibula			
				Active		Healed		Active		Healed		Active		Healed	
Sample	N*	II**	%	N	%	N	%	N	%	N	%	N	%	N	%
Pre-Contact Period															
Eskimos															
Kugusug.	150	1	0.67	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00
Kugok	8	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Piginik	9	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Tigara	315	6	1.90	2	33.33	0	0.00	2	33.33	0	0.00	2	33.33	0	0.00
Total	482	7	1.45	2	28.57	0	0.00	2	28.57	1	14.29	2	28.57	0	0.00
Aleuts															
Umnak I	276	23	8.33	7	30.43	2	8.70	8	34.78	4	17.39	2	8.70	0	0.00
Total	276	23	8.33	7	30.43	2	8.70	8	34.78	4	17.39	2	8.70	0	0.00
Late Pre-Contact/Contact Period															
Eskimos															
Barrow	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Nixerak	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Utkiavik	12	1	8.33	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Pt. Hope	0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	12	1	8.33	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Aleuts															
Umnak II	21	3	14.29	2	66.67	0	0.00	1	33.33	0	0.00	0	0.00	0	0.00
Shiprock	285	18	6.32	1	5.56	2	11.11	5	27.78	5	27.78	2	11.11	3	16.67
Kagamil	744	56	7.53	13	23.21	0	0.00	8	14.29	24	42.86	6	10.71	5	8.93
Total	1050	77	7.33	16	20.78	2	2.60	14	18.18	29	37.66	8	10.39	8	10.39

* Total number of lower limb bones
** Number of lower limb bones with infection (excluding those with infection secondary to trauma)

Table 35 - Cranial and Infracranial Infection Combined - Age and Sex Distribution

				Adults				Subadults					
				Males		Females		Males		Females		Indeterminate	
Sample	N*	I**	%	N	%	N	%	N	%	N	%	N	%
Pre-Contact Period													
Eskimos													
Kugusug.	42	3	7.14	2/27	7.41	1/13	7.69	0/0	0.00	0/0	0.00	0/2	0.00
Kugok	11	0	0.00	0/6	0.00	0/3	0.00	0/1	0.00	0/0	0.00	0/1	0.00
Piginik	9	0	0.00	0/2	0.00	0/4	0.00	0/0	0.00	0/0	0.00	0/3	0.00
Tigara	66	2	3.03	1/34	2.94	1/26	3.85	0/0	0.00	0/0	0.00	0/6	0.00
Total	128	5	3.91	3/69	4.35	2/46	4.35	0/1	0.00	0/0	0.00	0/12	0.00
Aleuts													
Umnak I	65	11	16.92	6/29	20.69	5/31	16.13	0/1	0.00	0/0	0.00	0/4	0.00
Total	65	11	16.92	6/29	20.69	5/31	16.13	0/1	0.00	0/0	0.00	0/4	0.00
Late Pre-Contact/Contact Period													
Eskimos													
Barrow	37	1	2.70	0/17	0.00	1/19	5.26	0/0	0.00	0/1	0.00	0/0	0.00
Nixerak	62	3	4.84	1/28	3.57	2/31	6.45	0/0	0.00	0/0	0.00	0/3	0.00
Utkiavik	33	4	12.12	1/12	8.33	3/20	15.00	0/0	0.00	0/0	0.00	0/1	0.00
Pt. Hope	40	0	0.00	0/23	0.00	0/16	0.00	0/0	0.00	0/1	0.00	0/0	0.00
Total	172	8	4.65	2/80	2.50	6/86	6.98	0/0	0.00	0/2	0.00	0/4	0.00
Aleuts													
Umnak II	6	3	50.00	2/4	50.00	1/2	50.00	0/0	0.00	0/0	0.00	0/0	0.00
Shiprock	62	26	41.94	11/20	55.00	5/9	55.56	0/2	0.00	0/1	0.00	10/30	33.33
Kagamil	159	34	21.38	12/58	20.69	13/56	23.21	0/2	0.00	0/8	0.00	9/35	25.71
Total	227	63	27.75	25/82	30.49	19/67	28.36	0/4	0.00	0/9	0.00	19/65	29.23

* Number of individuals with cranial and/or infracranial remains
** Minimum number of individuals with infection (excluding those with infection secondary to trauma)

Table 36 - Enamel Hypoplasia By Tooth Type (Deciduous Teeth)

	Maxillary Teeth			Mandibular Teeth			Dentitions Combined		
Sample	m	c	i	m	c	i	m	c	i
Pre-Contact Period									
Eskimos									
Kugusugaruk	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Kugok	0/1	0/0	0/0	0/0	0/0	0/0	0/1	0/0	0/0
Piginik	0/4	0/1	0/0	0/4	0/0	0/0	0/8	0/1	0/0
Tigara	0/11	0/0	0/0	0/14	0/2	0/2	0/25	0/2	0/2
Total	0/16	0/1	0/0	0/18	0/2	0/2	0/34	0/3	0/2
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aleuts									
Umnak I	0/8	0/0	0/0	0/11	0/0	0/0	0/19	0/0	0/0
Total	0/8	0/0	0/0	0/11	0/0	0/0	0/19	0/0	0/0
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Late Pre-Contact/Contact Period									
Eskimos									
Barrow	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Nixerak	0/2	0/0	0/0	0/0	0/0	0/0	0/2	0/0	0/0
Utkiavik	0/4	0/1	0/2	0/4	0/2	0/4	0/8	0/3	0/6
Pt. Hope	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Total	0/6	0/1	0/2	0/4	0/2	0/4	0/10	0/3	0/6
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aleuts									
Umnak II	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Shiprock	0/54	0/10	0/14	0/52	0/17	0/18	0/106	0/27	0/32
Kagamil	0/57	0/5	0/10	0/20	0/2	0/5	0/77	0/7	0/15
Total	0/111	0/15	0/24	0/72	0/19	0/23	0/183	0/34	0/47
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 37 - Enamel Hypoplasia By Tooth Type (Males and Females Combined)

Sample	Maxillary Teeth C	Maxillary Teeth I2	Maxillary Teeth I1	Mandibular Teeth C	Mandibular Teeth I2	Mandibular Teeth I1	Dentitions Combined C	Dentitions Combined I2	Dentitions Combined I1
Pre-Contact Period									
Eskimos									
Kugusugaruk	0/17 (0.00)	0/4 (0.00)	0/6 (0.00)	9/25 (36.00)	0/8 (0.00)	0/7 (0.00)	9/42 (21.43)	0/12 (0.00)	0/13 (0.00)
Kugok	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/1 (0.00)	0/0 (0.00)	0/0 (0.00)	0/1 (0.00)	0/0 (0.00)	0/0 (0.00)
Piginik	0/5 (0.00)	0/5 (0.00)	0/4 (0.00)	0/3 (0.00)	0/1 (0.00)	0/1 (0.00)	0/8 (0.00)	0/6 (0.00)	0/5 (0.00)
Tigara	5/62 (8.06)	4/41 (9.76)	4/43 (9.30)	27/67 (40.30)	9/52 (17.31)	9/37 (24.32)	32/129 (24.81)	13/93 (13.98)	13/80 (16.25)
Total	5/84 (5.95)	4/50 (8.00)	4/53 (7.55)	36/96 (37.50)	9/61 (14.75)	9/45 (20.00)	41/180 (22.78)	13/111 (11.71)	13/98 (13.27)
Aleuts									
Umnak I	1/40 (2.50)	0/14 (0.00)	0/12 (0.00)	2/43 (4.65)	0/26 (0.00)	0/12 (0.00)	3/83 (3.61)	0/40 (0.00)	0/24 (0.00)

Table 37 - Enamel Hypoplasia By Tooth Type (Males and Females Combined)

Sample	Maxillary Teeth C	Maxillary Teeth I2	Maxillary Teeth I1	Mandibular Teeth C	Mandibular Teeth I2	Mandibular Teeth I1	Dentitions Combined C	Dentitions Combined I2	Dentitions Combined I1
Late Pre-Contact/Contact Period									
Eskimos									
Barrow	0/2 (0.00)	0/0 (0.00)	0/0 (0.00)	0/2 (0.00)	0/0 (0.00)	0/0 (0.00)	0/4 (0.00)	0/0 (0.00)	0/0 (0.00)
Nixerak	0/20 (0.00)	0/2 (0.00)	0/4 (0.00)	0/3 (0.00)	0/2 (0.00)	0/2 (0.00)	0/23 (0.00)	0/4 (0.00)	0/6 (0.00)
Utkiavik	0/6 (0.00)	0/3 (0.00)	0/2 (0.00)	0/4 (0.00)	0/3 (0.00)	0/2 (0.00)	0/10 (0.00)	0/6 (0.00)	0/4 (0.00)
Pt. Hope	0/6 (0.00)	0/2 (0.00)	2/2 (100.00)	0/3 (0.00)	0/2 (0.00)	0/2 (0.00)	0/9 (0.00)	0/4 (0.00)	2/4 (50.00)
Total	0/34 (0.00)	0/7 (0.00)	2/8 (25.00)	0/12 (0.00)	0/7 (0.00)	0/6 (0.00)	0/46 (0.00)	0/14 (0.00)	2/14 (14.29)
Aleuts									
Umnak II	0/5 (0.00)	0/2 (0.00)	0/0 (0.00)	0/1 (0.00)	0/3 (0.00)	0/2 (0.00)	0/6 (0.00)	0/5 (0.00)	0/2 (0.00)
Shiprock	2/24 (8.33)	0/11 (0.00)	0/17 (0.00)	1/22 (4.55)	0/13 (0.00)	0/15 (0.00)	3/46 (6.52)	0/24 (0.00)	0/32 (0.00)
Kagamil	3/83 (3.61)	0/46 (0.00)	1/35 (2.86)	2/51 (3.92)	0/35 (0.00)	0/26 (0.00)	5/134 (3.73)	0/81 (0.00)	1/61 (1.64)
Total	5/112 (4.46)	0/59 (0.00)	1/52 (1.92)	3/74 (4.05)	0/51 (0.00)	0/43 (0.00)	8/186 (4.30)	0/110 (0.00)	1/95 (1.05)

Table 38 - Enamel Hypoplasia By Tooth Type - Males Only

Sample	Maxillary Teeth C	Maxillary Teeth I2	Maxillary Teeth I1	Mandibular Teeth C	Mandibular Teeth I2	Mandibular Teeth I1	Dentitions Combined C	Dentitions Combined I2	Dentitions Combined I1
Pre-Contact Period									
Eskimos									
Kugusugaruk	0/14 (0.00)	0/4 (0.00)	0/5 (0.00)	6/17 (35.29)	0/4 (0.00)	0/4 (0.00)	6/31 (19.35)	0/8 (0.00)	0/9 (0.00)
Kugok	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/1 (0.00)	0/0 (0.00)	0/0 (0.00)	0/1 (0.00)	0/0 (0.00)	0/0 (0.00)
Piginik	0/2 (0.00)	0/2 (0.00)	0/2 (0.00)	0/2 (0.00)	0/0 (0.00)	0/0 (0.00)	0/4 (0.00)	0/2 (0.00)	0/2 (0.00)
Tigara	3/29 (10.34)	2/17 (11.76)	2/17 (11.76)	11/28 (39.29)	5/22 (22.73)	5/14 (35.71)	14/57 (24.56)	7/39 (17.95)	7/31 (22.58)
Total	3/45 (6.67)	2/23 (8.70)	2/24 (8.33)	17/48 (35.42)	5/26 (19.23)	5/18 (27.78)	20/93 (21.51)	7/49 (14.29)	7/42 (16.67)
Aleuts									
Umnak I	0/24 (0.00)	0/10 (0.00)	0/8 (0.00)	2/25 (8.00)	0/19 (0.00)	0/7 (0.00)	2/49 (4.08)	0/29 (0.00)	0/15 (0.00)

Table 38 - Enamel Hypoplasia By Tooth Type - Males Only

Sample	Maxillary Teeth C	Maxillary Teeth I2	Maxillary Teeth I1	Mandibular Teeth C	Mandibular Teeth I2	Mandibular Teeth I1	Dentitions Combined C	Dentitions Combined I2	Dentitions Combined I1
Late Pre-Contact/Contact Period									
Eskimos									
Barrow	0/2 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/2 (0.00)	0/0 (0.00)	0/0 (0.00)
Nixerak	0/10 (0.00)	0/1 (0.00)	0/4 (0.00)	0/2 (0.00)	0/2 (0.00)	0/2 (0.00)	0/12 (0.00)	0/3 (0.00)	0/6 (0.00)
Utkiavik	0/1 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/1 (0.00)	0/0 (0.00)	0/0 (0.00)
Pt. Hope	0/3 (0.00)	0/2 (0.00)	2/2 (100.00)	0/3 (0.00)	0/2 (0.00)	0/2 (0.00)	0/6 (0.00)	0/4 (0.00)	2/4 (50.00)
Total	0/16 (0.00)	0/3 (0.00)	2/6 (33.33)	0/5 (0.00)	0/4 (0.00)	0/4 (0.00)	0/21 (0.00)	0/7 (0.00)	2/10 (20.00)
Aleuts									
Umnak II	0/5 (0.00)	0/2 (0.00)	0/0 (0.00)	0/1 (0.00)	0/3 (0.00)	0/2 (0.00)	0/6 (0.00)	0/5 (0.00)	0/2 (0.00)
Shiprock	2/19 (10.53)	0/10 (0.00)	0/15 (0.00)	1/15 (6.67)	0/10 (0.00)	0/13 (0.00)	3/34 (8.82)	0/20 (0.00)	0/28 (0.00)
Kagamil	2/43 (4.65)	0/27 (0.00)	0/23 (0.00)	2/24 (8.33)	0/13 (0.00)	0/13 (0.00)	4/67 (5.97)	0/40 (0.00)	0/36 (0.00)
Total	4/67 (5.97)	0/39 (0.00)	0/38 (0.00)	3/40 (7.5)	0/26 (0.00)	0/28 (0.00)	7/107 (6.54)	0/65 (0.00)	0/66 (0.00)

Table 39 - Enamel Hypoplasia By Tooth Type - Females Only

Sample	Maxillary Teeth C	Maxillary Teeth I2	Maxillary Teeth I1	Mandibular Teeth C	Mandibular Teeth I2	Mandibular Teeth I1	Dentitions Combined C	Dentitions Combined I2	Dentitions Combined I1
Pre-Contact Period									
Eskimos									
Kugusugaruk	0/2 (0.00)	0/0 (0.00)	0/1 (0.00)	3/6 (50.00)	0/2 (0.00)	0/1 (0.00)	3/8 (37.50)	0/2 (0.00)	0/2 (0.00)
Kugok	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)
Piginik	0/1 (0.00)	0/1 (0.00)	0/1 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/1 (0.00)	0/1 (0.00)	0/1 (0.00)
Tigara	2/29 (6.90)	2/21 (9.52)	2/22 (9.09)	16/35 (45.71)	4/27 (14.81)	4/20 (20.00)	18/64 (28.13)	6/48 (12.50)	6/42 (14.29)
Total	2/32 (6.25)	2/22 (9.09)	2/24 (8.33)	19/41 (46.34)	4/29 (13.79)	4/21 (19.05)	21/73 (28.77)	6/51 (11.76)	6/45 (13.33)
Aleuts									
Umnak I	0/15 (0.00)	0/4 (0.00)	0/4 (0.00)	0/18 (0.00)	0/7 (0.00)	0/5 (0.00)	0/33 (0.00)	0/11 (0.00)	0/9 (0.00)

Table 39 - Enamel Hypoplasia By Tooth Type - Females Only

Sample	Maxillary Teeth C	Maxillary Teeth I2	Maxillary Teeth I1	Mandibular Teeth C	Mandibular Teeth I2	Mandibular Teeth I1	Dentitions Combined C	Dentitions Combined I2	Dentitions Combined I1
Late Pre-Contact/Contact Period									
Eskimos									
Barrow	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/2 (0.00)	0/0 (0.00)	0/0 (0.00)	0/2 (0.00)	0/0 (0.00)	0/0 (0.00)
Nixerak	0/10 (0.00)	0/1 (0.00)	0/0 (0.00)	0/1 (0.00)	0/0 (0.00)	0/0 (0.00)	0/11 (0.00)	0/1 (0.00)	0/0 (0.00)
Utkiavik	0/5 (0.00)	0/3 (0.00)	0/2 (0.00)	0/4 (0.00)	0/3 (0.00)	0/2 (0.00)	0/9 (0.00)	0/6 (0.00)	0/4 (0.00)
Pt. Hope	0/3 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/3 (0.00)	0/0 (0.00)	0/0 (0.00)
Total	0/18 (0.00)	0/4 (0.00)	0/2 (0.00)	0/7 (0.00)	0/3 (0.00)	0/2 (0.00)	0/25 (0.00)	0/7 (0.00)	0/4 (0.00)
Aleuts									
Umnak II	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)
Shiprock	0/5 (0.00)	0/1 (0.00)	0/2 (0.00)	0/7 (0.00)	0/3 (0.00)	0/2 (0.00)	0/12 (0.00)	0/4 (0.00)	0/4 (0.00)
Kagamil	1/38 (2.63)	0/18 (0.00)	1/12 (8.33)	0/25 (0.00)	0/20 (0.00)	0/11 (0.00)	1/63 (1.59)	0/38 (0.00)	1/23 (4.35)
Total	1/43 (2.33)	0/19 (0.00)	1/14 (7.14)	0/32 (0.00)	0/23 (0.00)	0/13 (0.00)	1/75 (1.33)	0/42 (0.00)	1/27 (3.70)

Table 40 - Dental Caries By Tooth Type (Deciduous Teeth)

Sample	Maxillary Teeth m	Maxillary Teeth c	Maxillary Teeth i	Mandibular Teeth m	Mandibular Teeth c	Mandibular Teeth i	Dentitions Combined m	Dentitions Combined c	Dentitions Combined i
Pre-Contact Period									
Eskimos									
Kugusugaruk	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Kugok	0/4	0/1	0/0	0/3	0/0	0/0	0/7	0/1	0/0
Piginik	0/4	0/1	0/0	0/4	0/0	0/0	0/8	0/1	0/0
Tigara	0/11	0/0	0/0	0/16	0/2	0/2	0/27	0/2	0/2
Total	0/19	0/2	0/0	0/23	0/2	0/2	0/42	0/4	0/2
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aleuts									
Umnak I	0/8	0/0	0/0	0/11	0/0	0/0	0/19	0/0	0/0
Total	0/8	0/0	0/0	0/11	0/0	0/0	0/19	0/0	0/0
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Late Pre-Contact/Contact Period									
Eskimos									
Barrow	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Nixerak	0/2	0/0	0/0	0/0	0/0	0/0	0/2	0/0	0/0
Utkiavik	0/4	0/1	0/2	0/4	0/2	0/4	0/8	0/3	0/6
Pt. Hope	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Total	0/6	0/1	0/2	0/4	0/2	0/4	0/10	0/3	0/6
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aleuts									
Umnak II	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Shiprock	0/54	0/10	0/14	0/52	0/17	0/18	0/106	0/27	0/32
Kagamil	0/58	0/5	0/10	0/20	0/2	0/5	0/78	0/7	0/15
Total	0/112	0/15	0/24	0/72	0/19	0/23	0/184	0/34	0/47
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 41 - Dental Caries By Tooth Type (Males and Females Combined)

Sample	Maxillary Teeth M	Maxillary Teeth P	Maxillary Teeth C	Maxillary Teeth I	Mandibular Teeth M	Mandibular Teeth P	Mandibular Teeth C	Mandibular Teeth I	Dentitions Combined M	Dentitions Combined P	Dentitions Combined C	Dentitions Combined I
Pre-Contact Period												
Eskimos												
Kugusug.	1/139 (0.72)	0/63 (0.00)	0/33 (0.00)	0/22 (0.00)	0/105 (0.00)	0/48 (0.00)	0/31 (0.00)	0/30 (0.00)	1/244 (0.41)	0/111 (0.00)	0/64 (0.00)	0/52 (0.00)
Kugok	0/18 (0.00)	0/14 (0.00)	0/6 (0.00)	0/6 (0.00)	0/33 (0.00)	0/17 (0.00)	0/6 (0.00)	0/1 (0.00)	0/51 (0.00)	0/31 (0.00)	0/12 (0.00)	0/7 (0.00)
Piginik	0/19 (0.00)	0/14 (0.00)	0/7 (0.00)	0/12 (0.00)	0/20 (0.00)	0/14 (0.00)	0/6 (0.00)	0/6 (0.00)	0/39 (0.00)	0/28 (0.00)	0/13 (0.00)	0/18 (0.00)
Tigara	0/206 (0.00)	0/148 (0.00)	0/82 (0.00)	0/116 (0.00)	0/204 (0.00)	0/184 (0.00)	0/93 (0.00)	0/137 (0.00)	0/410 (0.00)	0/332 (0.00)	0/175 (0.00)	0/253 (0.00)
Total	1/382 (0.26)	0/239 (0.00)	0/128 (0.00)	0/156 (0.00)	0/362 (0.00)	0/263 (0.00)	0/136 (0.00)	0/174 (0.00)	1/744 (0.13)	0/502 (0.00)	0/264 (0.00)	0/330 (0.00)
Aleuts												
Umnak I	0/158 (0.00)	0/129 (0.00)	0/55 (0.00)	0/43 (0.00)	0/171 (0.00)	0/132 (0.00)	0/60 (0.00)	0/59 (0.00)	0/329 (0.00)	0/261 (0.00)	0/115 (0.00)	0/102 (0.00)

Table 41 - Dental Caries By Tooth Type (Males and Females Combined)

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Barrow	0/10 (0.00)	0/2 (0.00)	0/4 (0.00)	0/4 (0.00)	0/2 (0.00)	0/2 (0.00)	0/2 (0.00)	0/3 (0.00)	0/12 (0.00)	0/4 (0.00)	0/6 (0.00)	0/7 (0.00)
Nixerak	0/64 (0.00)	0/36 (0.00)	0/28 (0.00)	0/12 (0.00)	0/23 (0.00)	0/9 (0.00)	0/3 (0.00)	0/6 (0.00)	0/87 (0.00)	0/45 (0.00)	0/31 (0.00)	0/18 (0.00)
Utkiavik	0/29 (0.00)	0/17 (0.00)	0/9 (0.00)	0/8 (0.00)	0/14 (0.00)	0/9 (0.00)	0/4 (0.00)	0/5 (0.00)	0/43 (0.00)	0/26 (0.00)	0/13 (0.00)	0/13 (0.00)
Pt. Hope	0/67 (0.00)	0/34 (0.00)	0/9 (0.00)	0/7 (0.00)	0/19 (0.00)	0/8 (0.00)	0/3 (0.00)	0/7 (0.00)	0/86 (0.00)	0/42 (0.00)	0/12 (0.00)	0/14 (0.00)
Total	0/170 (0.00)	0/89 (0.00)	0/50 (0.00)	0/31 (0.00)	0/58 (0.00)	0/28 (0.00)	0/12 (0.00)	0/21 (0.00)	0/228 (0.00)	0/117 (0.00)	0/62 (0.00)	0/52 (0.00)
Aleuts												
Umnak II	0/26 (0.00)	0/17 (0.00)	0/7 (0.00)	0/7 (0.00)	0/16 (0.00)	0/8 (0.00)	0/3 (0.00)	0/7 (0.00)	0/42 (0.00)	0/25 (0.00)	0/10 (0.00)	0/14 (0.00)
Shiprock	0/117 (0.00)	0/80 (0.00)	0/35 (0.00)	0/44 (0.00)	0/90 (0.00)	0/54 (0.00)	0/28 (0.00)	0/36 (0.00)	0/207 (0.00)	0/134 (0.00)	0/63 (0.00)	0/80 (0.00)
Kagamil	0/391 (0.00)	0/242 (0.00)	0/106 (0.00)	0/110 (0.00)	0/217 (0.00)	0/127 (0.00)	0/62 (0.00)	0/105 (0.00)	0/608 (0.00)	0/369 (0.00)	0/168 (0.00)	0/215 (0.00)
Total	0/534 (0.00)	0/339 (0.00)	0/148 (0.00)	0/161 (0.00)	0/323 (0.00)	0/189 (0.00)	0/93 (0.00)	0/148 (0.00)	0/857 (0.00)	0/528 (0.00)	0/241 (0.00)	0/309 (0.00)

Table 42 - Dental Abscesses By Tooth Type (Deciduous Teeth)

Sample	Maxillary Teeth m	c	i	Mandibular Teeth m	c	i	Dentitions Combined m	c	i
Pre-Contact Period									
Eskimos									
Kugusugaruk	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Kugok	0/4	0/2	0/4	0/3	0/1	0/3	0/7	0/3	0/7
Piginik	0/4	0/2	0/4	0/4	0/2	0/4	0/8	0/4	0/8
Tigara	0/12	0/6	0/12	0/16	0/8	0/16	0/28	0/14	0/28
Total	0/20	0/10	0/20	0/23	0/11	0/23	0/43	0/21	0/43
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aleuts									
Umnak I	0/8	0/4	0/8	0/14	0/6	0/12	0/22	0/10	0/20
Total	0/8	0/4	0/8	0/14	0/6	0/12	0/22	0/10	0/20
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Late Pre-Contact/Contact Period									
Eskimos									
Barrow	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Nixerak	0/2	0/1	0/2	0/0	0/0	0/0	0/2	0/1	0/2
Utkiavik	0/4	0/2	0/4	0/4	0/2	0/4	0/8	0/4	0/8
Pt. Hope	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Total	0/6	0/3	0/6	0/4	0/2	0/4	0/10	0/5	0/10
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aleuts									
Umnak II	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Shiprock	1/65	0/31	0/62	0/56	0/28	0/56	0/121	0/59	0/118
Kagamil	0/68	0/34	0/68	0/31	0/16	0/32	0/99	0/50	0/100
Total	1/133	0/65	0/130	0/87	0/44	0/88	0/220	0/109	0/218
%	0.75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 43 - Dental Abscesses By Tooth Type (Males and Females Combined)

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Pre-Contact Period												
Eskimos												
Kugus.	19/229 (8.30)	4/154 (2.60)	3/78 (3.85)	5/156 (3.21)	24/233 (10.30)	7/158 (4.43)	1/79 (1.27)	1/158 (0.63)	43/462 (9.31)	11/312 (3.53)	4/157 (2.55)	6/314 (1.91)
Kugok	6/34 (17.65)	0/24 (0.00)	1/12 (8.33)	0/22 (0.00)	4/44 (9.09)	0/32 (0.00)	1/16 (6.25)	1/32 (3.13)	10/78 (12.82)	0/56 (0.00)	2/28 (7.14)	1/54 (1.85)
Piginik	4/27 (14.81)	0/20 (0.00)	0/10 (0.00)	0/20 (0.00)	5/25 (20.00)	0/18 (0.00)	0/9 (0.00)	1/17 (5.88)	9/52 (17.31)	0/38 (0.00)	0/19 (0.00)	1/37 (2.70)
Tigara	29/347 (8.36)	11/238 (4.62)	5/119 (4.20)	19/235 (8.09)	39/348 (11.21)	5/236 (2.12)	6/118 (5.08)	7/235 (2.98)	68/695 (9.78)	16/474 (3.38)	11/237 (4.64)	26/470 (5.53)
Total	58/637 (9.11)	15/436 (3.44)	9/219 (4.11)	24/433 (5.54)	72/650 (11.08)	12/444 (2.70)	8/222 (3.60)	12/442 (2.71)	130/1287 (10.10)	27/880 (3.07)	17/441 (3.85)	36/875 (4.11)
Aleuts												
Umnak	27/280 (9.64)	8/209 (3.83)	13/107 (12.15)	13/213 (6.10)	37/279 (13.26)	7/189 (3.70)	0/96 (0.00)	3/193 (1.55)	54/559 (9.66)	15/398 (3.77)	13/203 (6.40)	16/406 (3.94)

Table 43 - Dental Abscesses By Tooth Type (Males and Females Combined)

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Barrow	1/103 (0.97)	0/78 (0.00)	0/39 (0.00)	2/78 (2.56)	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	1/109 (0.92)	0/82 (0.00)	0/41 (0.00)	2/82 (2.44)
Nixerak	25/256 (9.77)	1/181 (0.55)	1/90 (1.11)	7/178 (3.93)	7/84 (8.33)	1/56 (1.79)	1/28 (3.57)	0/56 (0.00)	32/340 (9.41)	2/237 (0.84)	2/118 (1.69)	7/234 (2.99)
Utkiavik	4/83 (4.82)	1/61 (1.64)	0/30 (0.00)	0/60 (0.00)	0/30 (0.00)	1/19 (5.26)	0/9 (0.00)	0/19 (0.00)	4/113 (3.54)	2/80 (2.50)	0/39 (0.00)	0/79 (0.00)
Pt. Hope	24/184 (13.04)	6/133 (4.51)	2/69 (2.90)	0/135 (0.00)	2/24 (8.33)	0/16 (0.00)	0/8 (0.00)	0/16 (0.00)	26/208 (12.50)	6/149 (4.03)	2/77 (2.60)	0/151 (0.00)
Total	54/626 (8.63)	8/453 (1.77)	3/228 (1.32)	9/451 (2.00)	9/144 (6.25)	2/95 (2.11)	1/47 (2.13)	0/95 (0.00)	63/770 (8.18)	10/548 (1.82)	4/275 (1.45)	9/546 (1.65)
Aleuts												
Umnak	4/36 (11.11)	0/24 (0.00)	0/12 (0.00)	1/24 (4.17)	4/18 (22.22)	2/12 (16.67)	0/6 (0.00)	0/12 (0.00)	8/54 (14.81)	2/36 (5.56)	0/18 (0.00)	1/36 (2.78)
Shiprock	16/157 (10.19)	2/109 (1.83)	3/54 (5.56)	10/108 (9.26)	13/132 (9.85)	1/92 (1.09)	2/46 (4.35)	1/92 (1.09)	29/289 (10.03)	3/201 (1.49)	5/100 (5.00)	11/200 (5.50)
Kagamil	59/611 (9.66)	19/426 (4.46)	6/213 (2.82)	16/423 (3.78)	16/275 (5.82)	2/188 (1.06)	1/94 (1.06)	7/188 (3.72)	75/886 (8.47)	21/614 (3.42)	7/307 (2.28)	23/611 (3.76)
Total	79/804 (9.83)	21/559 (3.76)	9/279 (3.23)	27/555 (4.86)	33/425 (7.76)	5/292 (1.71)	3/146 (2.05)	8/292 (2.74)	112/1229 (9.11)	26/851 (3.06)	12/425 (2.82)	35/847 (4.13)

Table 44 - Dental Abscesses By Tooth Type-Males Only

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Pre-Contact Period												
Eskimos												
Kugus.	14/154 (9.09)	4/102 (3.92)	3/52 (5.77)	3/104 (2.88)	15/147 (10.20)	5/98 (5.10)	1/49 (2.04)	2/98 (2.04)	29/301 (9.63)	9/200 (4.5)	4/101 (3.96)	5/202 (2.48)
Kugok	4/28 (14.29)	0/20 (0.00)	1/10 (10.0)	0/20 (0.00)	1/32 (3.13)	0/24 (0.00)	1/12 (8.33)	1/24 (4.17)	5/60 (8.33)	0/44 (0.00)	2/22 (9.09)	1/44 (2.27)
Piginik	1/6 (16.67)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	3/6 (50.00)	0/4 (0.00)	0/2 (0.00)	1/4 (25.00)	4/12 (33.33)	0/8 (0.0)	0/4 (0.00)	1/8 (12.50)
Tigara	24/210 (11.43)	9/140 (6.43)	5/70 (7.14)	14/140 (10.00)	32/198 (16.16)	5/132 (3.79)	5/66 (7.58)	6/132 (4.55)	56/408 (13.73)	14/272 (5.15)	10/136 (7.35)	20/272 (7.35)
Total	43/398 (10.80)	13/266 (4.89)	9/134 (6.72)	17/268 (6.34)	51/383 (13.32)	10/258 (3.88)	7/129 (5.43)	10/258 (3.88)	94/781 (12.04)	23/524 (4.39)	16/263 (6.08)	27/526 (5.13)
Aleuts												
Umn. I	19/141 (13.48)	4/106 (3.77)	5/54 (9.26)	8/108 (7.41)	17/129 (13.18)	6/85 (7.06)	0/44 (0.00)	1/88 (1.14)	36/270 (13.33)	10/191 (5.24)	5/98 (5.10)	9/196 (4.59)
Total	19/141 (13.48)	4/106 (3.77)	5/54 (9.26)	8/108 (7.41)	17/129 (13.18)	6/85 (7.06)	0/44 (0.00)	1/88 (1.14)	36/270 (13.33)	10/191 (5.24)	5/98 (5.10)	9/196 (4.59)

Table 44 - Dental Abscesses By Tooth Type - Males Only

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Barrow	1/46 (2.17)	0/34 (0.00)	0/17 (0.00)	0/34 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	1/46 (2.17)	0/34 (0.00)	0/17 (0.00)	0/34 (0.00)
Nixerak	12/134 (8.96)	1/92 (1.09)	1/46 (2.17)	2/92 (2.17)	5/48 (10.42)	1/32 (3.13)	1/16 (6.25)	0/32 (0.00)	17/182 (9.34)	2/124 (1.61)	2/62 (3.23)	2/124 (1.61)
Utkiavik	1/26 (3.85)	0/20 (0.00)	0/10 (0.00)	0/20 (0.00)	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	1/32 (3.13)	0/24 (0.00)	0/12 (0.00)	0/24 (0.00)
Pt. Hope	14/123 (11.38)	5/88 (5.68)	1/45 (2.22)	0/88 (0.00)	2/18 (11.11)	0/12 (0.00)	0/6 (0.00)	0/12 (0.00)	16/141 (11.35)	5/100 (5.00)	1/51 (1.96)	0/100 (0.00)
Total	28/329 (8.51)	6/234 (2.56)	2/118 (1.69)	2/234 (0.85)	7/72 (9.72)	1/48 (2.08)	1/24 (4.17)	0/48 (0.00)	35/401 (8.73)	7/282 (2.48)	3/142 (2.11)	2/282 (0.71)
Aleuts												
Umn. II	2/24 (8.33)	0/16 (0.00)	0/8 (0.00)	0/16 (0.00)	2/12 (16.67)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)	4/36 (11.11)	0/24 (0.00)	0/12 (0.00)	0/24 (0.00)
Shiprock	12/108 (11.11)	0/76 (0.00)	0/38 (0.00)	5/76 (6.58)	10/98 (10.20)	0/68 (0.00)	1/34 (2.94)	0/68 (0.00)	22/206 (10.68)	0/144 (0.00)	1/72 (1.39)	5/144 (3.47)
Kagamil	25/287 (8.71)	11/196 (5.61)	2/98 (2.04)	7/196 (3.57)	4/121 (3.31)	2/82 (2.44)	1/41 (2.44)	4/82 (4.88)	29/408 (7.11)	13/278 (4.68)	3/139 (2.16)	11/278 (3.96)
Total	39/419 (9.31)	11/288 (3.82)	2/144 (1.39)	12/288 (4.17)	16/231 (6.93)	2/158 (1.27)	2/79 (2.53)	4/158 (2.53)	55/650 (8.46)	13/446 (2.91)	4/223 (1.79)	16/446 (3.59)

Table 45 - Dental Abscesses By Tooth Type - Females Only

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Pre-Contact Period												
Eskimos												
Kugus.	5/57 (8.77)	0/44 (0.00)	0/22 (0.00)	2/44 (4.55)	9/78 (11.54)	2/52 (3.85)	0/26 (0.00)	1/52 (1.92)	14/135 (10.37)	2/96 (2.08)	0/48 (0.00)	3/96 (3.13)
Kugok	2/6 (33.33)	0/4 (0.00)	0/2 (0.00)	0/2 (0.00)	3/12 (25.00)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)	5/18 (27.78)	0/12 (0.00)	0/6 (0.00)	0/10 (0.00)
Piginik	3/21 (14.29)	0/16 (0.00)	0/8 (0.00)	0/16 (0.00)	2/19 (10.53)	0/14 (0.00)	0/7 (0.00)	0/13 (0.00)	5/40 (12.50)	0/30 (0.00)	0/15 (0.00)	0/29 (0.00)
Tigara	5/133 (3.76)	2/94 (2.13)	0/47 (0.00)	5/91 (5.49)	7/146 (4.79)	0/100 (0.00)	1/50 (2.00)	1/99 (1.01)	12/279 (4.30)	2/194 (1.03)	1/97 (1.03)	6/190 (3.16)
Total	15/217 (6.91)	2/158 (1.27)	0/79 (0.00)	7/153 (4.58)	21/255 (8.24)	2/174 (1.15)	1/87 (1.15)	2/172 (1.16)	36/472 (7.63)	4/332 (1.20)	1/166 (0.60)	9/325 (2.77)
Aleuts												
Umn. I	7/122 (5.74)	4/91 (4.40)	8/47 (17.02)	5/93 (5.38)	16/125 (12.8)	1/86 (1.16)	0/43 (0.00)	2/88 (2.27)	23/247 (9.31)	5/177 (2.82)	8/90 (8.89)	7/181 (3.87)
Total	7/122 (5.74)	4/91 (4.40)	8/47 (17.02)	5/93 (5.38)	16/125 (12.8)	1/86 (1.16)	0/43 (0.00)	2/88 (2.27)	23/247 (9.31)	5/177 (2.82)	8/90 (8.89)	7/181 (3.87)

Table 45 - Dental Abscesses By Tooth Type - Females Only

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Barrow	0/57 (0.00)	0/44 (0.00)	0/22 (0.00)	2/44 (4.55)	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	0/63 (0.00)	0/48 (0.00)	0/24 (0.00)	2/48 (0.00)
Nixerak	13/122 (10.66)	0/88 (0.00)	0/44 (0.00)	5/86 (5.81)	1/36 (2.78)	0/24 (0.00)	0/12 (0.00)	0/24 (0.00)	14/158 (8.86)	0/112 (0.00)	0/56 (0.00)	5/110 (4.55)
Utkiavik	3/57 (5.26)	1/41 (2.44)	0/20 (0.00)	0/40 (0.00)	0/24 (0.00)	1/15 (6.67)	0/7 (0.00)	0/15 (0.00)	3/81 (3.70)	2/56 (3.57)	0/27 (0.00)	0/55 (0.00)
Pt. Hope	10/61 (16.39)	1/45 (2.22)	1/24 (4.17)	0/47 (0.00)	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	10/67 (14.93)	1/49 (2.04)	1/26 (3.85)	0/51 (0.00)
Total	26/297 (8.75)	2/218 (0.92)	1/110 (0.91)	7/217 (3.23)	1/72 (1.39)	1/47 (2.13)	0/23 (0.00)	0/47 (0.00)	27/369 (7.32)	3/265 (1.13)	1/133 (0.75)	7/264 (2.65)
Aleuts												
Umn. II	2/12 (16.67)	0/8 (0.00)	0/4 (0.00)	1/8 (12.5)	2/6 (33.33)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	4/18 (22.22)	0/12 (0.00)	0/6 (0.00)	1/12 (8.33)
Shiprock	4/49 (8.16)	2/33 (6.06)	3/16 (18.75)	5/32 (15.63)	3/34 (8.82)	1/24 (4.17)	1/12 (8.33)	1/24 (4.17)	7/83 (8.43)	3/57 (5.26)	4/28 (14.29)	6/56 (10.71)
Kagamil	34/320 (10.63)	8/226 (3.54)	4/113 (3.54)	9/224 (4.02)	12/152 (7.89)	0/104 (0.00)	0/52 (0.00)	3/104 (2.88)	46/472 (9.75)	8/330 (2.42)	4/165 (2.42)	12/328 (3.66)
Total	40/381 (10.50)	10/267 (3.75)	7/133 (5.26)	15/264 (5.68)	17/192 (8.85)	1/132 (0.76)	1/66 (1.52)	4/132 (3.03)	57/573 (9.95)	11/399 (2.76)	8/199 (4.02)	19/396 (4.80)

Table 46 - Dental Abscesses By Tooth Type - Individuals Under 50

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Pre-Contact Period												
Eskimos												
Kugusug.	17/202 (8.42)	4/135 (2.96)	2/68 (2.94)	3/136 (2.21)	22/203 (10.84)	7/138 (5.07)	0/69 (0.00)	2/138 (1.45)	39/405 (9.63)	11/273 (4.03)	2/137 (1.46)	5/274 (1.82)
Kugok	6/34 (17.65)	0/24 (0.00)	1/12 (8.33)	0/22 (0.00)	4/44 (9.09)	0/32 (0.00)	1/16 (6.25)	1/32 (3.13)	10/78 (12.82)	0/56 (0.00)	2/28 (7.14)	1/54 (1.85)
Piginik	4/27 (14.81)	0/20 (0.00)	0/10 (0.00)	0/20 (0.00)	5/25 (20.0)	0/18 (0.00)	0/9 (0.00)	1/17 (5.88)	9/52 (17.31)	0/38 (0.00)	0/19 (0.00)	1/37 (2.70)
Tigara	2/198 (1.01)	1/134 (0.75)	0/67 (0.00)	9/131 (6.87)	9/188 (4.79)	1/128 (0.78)	0/64 (0.00)	1/127 (0.79)	11/386 (2.85)	2/262 (0.76)	0/131 (0.00)	10/258 (3.88)
Total	29/461 (6.29)	5/313 (1.60)	3/157 (1.91)	12/309 (3.88)	40/460 (8.70)	8/316 (2.53)	1/158 (0.63)	5/314 (1.59)	69/921 (7.49)	13/629 (2.07)	4/315 (1.27)	17/623 (2.73)
Aleuts												
Umnak I	6/107 (5.61)	1/76 (1.32)	2/38 (5.26)	3/76 (3.95)	7/97 (7.22)	0/66 (0.00)	0/33 (0.00)	0/65 (0.00)	13/204 (6.37)	1/142 (0.70)	2/71 (2.82)	3/141 (2.13)
Total	6/107 (5.61)	1/76 (1.32)	2/38 (5.26)	3/76 (3.95)	7/97 (7.22)	0/66 (0.00)	0/33 (0.00)	0/65 (0.00)	13/204 (6.37)	1/142 (0.70)	2/71 (2.82)	3/141 (2.13)

Table 46 - Dental Abscesses By Tooth Type - Individuals Under 50

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Barrow	1/86 (1.16)	0/66 (0.00)	0/33 (0.00)	0/66 (0.00)	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	1/92 (1.09)	0/70 (0.00)	0/35 (0.00)	0/70 (0.00)
Nixerak	20/202 (9.90)	1/145 (0.69)	0/72 (0.00)	7/142 (4.93)	2/18 (11.11)	0/12 (0.00)	0/6 (0.00)	0/12 (0.00)	22/220 (10.0)	1/157 (0.64)	0/78 (0.00)	7/154 (4.55)
Utkiavik	4/79 (5.06)	1/57 (1.75)	0/28 (0.00)	0/56 (0.00)	0/12 (0.00)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)	4/91 (4.40)	1/65 (1.54)	0/32 (0.00)	0/64 (0.00)
Pt. Hope	17/156 (10.90)	4/110 (3.64)	0/57 (0.00)	0/111 (0.00)	0/18 (0.00)	0/12 (0.00)	0/6 (0.00)	0/12 (0.00)	17/174 (9.77)	4/122 (3.28)	0/63 (0.00)	0/123 (0.00)
Total	42/523 (8.03)	6/378 (1.59)	0/190 (0.00)	7/375 (1.87)	2/54 (3.70)	0/36 (0.00)	0/18 (0.00)	0/36 (0.00)	44/577 (7.63)	6/414 (1.45)	0/208 (0.00)	7/411 (1.70)
Aleuts												
Umnak I	2/12 (16.67)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)	2/12 (16.67)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)	4/24 (16.67)	0/16 (0.00)	0/8 (0.00)	0/16 (0.00)
Shiprock	3/97 (3.09)	0/69 (0.00)	2/34 (5.88)	7/68 (10.29)	0/86 (0.00)	0/60 (0.00)	1/30 (3.33)	1/60 (1.67)	3/183 (1.64)	0/129 (0.00)	3/64 (4.69)	8/128 (6.25)
Kagamil	10/433 (2.31)	6/306 (1.96)	2/153 (1.31)	6/305 (1.97)	3/167 (1.80)	0/116 (0.00)	0/58 (0.00)	3/116 (2.59)	13/600 (2.17)	6/422 (1.42)	2/211 (0.95)	9/421 (2.14)
Total	15/542 (2.77)	6/383 (1.57)	4/191 (2.09)	13/381 (3.41)	5/265 (1.89)	0/184 (0.00)	1/92 (1.09)	4/184 (2.17)	20/807 (2.48)	6/567 (1.06)	5/283 (1.77)	17/565 (3.01)

Table 47 - Dental Abscesses By Tooth Type - Individuals Over 50

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Pre-Contact Period												
Eskimos												
Kugusug.	2/27 (7.41)	0/19 (0.00)	1/10 (10.00)	2/20 (10.00)	2/30 (6.67)	0/20 (0.00)	1/10 (10.00)	1/20 (5.00)	4/57 (7.02)	0/39 (0.00)	2/20 (10.00)	3/40 (7.5)
Kugok	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)
Piginik	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)
Tigara	27/150 (18.0)	10/104 (9.62)	5/52 (9.62)	10/104 (9.62)	30/160 (18.75)	4/108 (3.70)	6/54 (11.11)	6/108 (5.56)	57/310 (18.39)	14/212 (6.60)	11/106 (10.38)	16/212 (7.55)
Total	29/177 (16.38)	10/123 (8.13)	6/62 (9.68)	12/124 (9.68)	32/190 (16.84)	4/128 (3.13)	7/64 (10.94)	7/128 (5.47)	61/367 (16.62)	14/251 (5.58)	13/126 (10.32)	19/252 (7.54)
Aleuts												
Umnak I	21/176 (11.93)	7/133 (5.26)	11/69 (15.94)	10/137 (7.30)	30/181 (16.57)	7/123 (5.69)	0/63 (0.00)	3/136 (2.21)	51/357 (14.29)	14/256 (5.47)	11/132 (8.33)	13/273 (4.76)
Total	21/176 (11.93)	7/133 (5.26)	11/69 (15.94)	10/137 (7.30)	30/181 (16.57)	7/123 (5.69)	0/63 (0.00)	3/136 (2.21)	51/357 (14.29)	14/256 (5.47)	11/132 (8.33)	13/273 (4.76)

Table 47 - Dental Abscesses By Tooth Type - Individuals Over 50

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Barrow	0/17 (0.00)	0/12 (0.00)	0/6 (0.00)	0/12 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/17 (0.00)	0/12 (0.00)	0/6 (0.00)	0/12 (0.00)
Nixerak	5/54 (9.26)	0/36 (0.00)	0/18 (0.00)	0/36 (0.00)	4/12 (33.33)	1/8 (12.5)	1/4 (25.0)	0/8 (0.00)	9/66 (13.64)	1/44 (2.27)	1/22 (4.55)	0/44 (0.00)
Utkiavik	0/4 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/4 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)
Pt. Hope	7/28 (25.0)	2/23 (8.70)	2/12 (16.67)	0/24 (0.00)	2/6 (33.33)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	9/34 (26.47)	2/27 (7.41)	2/14 (14.29)	0/28 (0.00)
Total	12/103 (11.65)	2/75 (2.67)	2/38 (5.26)	0/76 (0.00)	6/18 (33.33)	1/12 (8.33)	1/6 (16.67)	0/12 (0.00)	18/121 (14.88)	3/87 (3.45)	3/44 (6.82)	0/88 (0.00)
Aleuts												
Umnak II	2/24 (8.33)	0/16 (0.00)	0/8 (0.00)	1/16 (6.25)	2/6 (33.33)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	4/30 (13.33)	0/20 (0.00)	0/10 (0.00)	1/20 (5.0)
Shiprock	13/60 (21.67)	2/40 (5.00)	1/20 (5.00)	3/40 (7.5)	13/46 (28.26)	1/32 (3.13)	1/16 (6.25)	0/32 (0.00)	26/106 (24.53)	3/72 (4.17)	2/36 (5.56)	3/72 (4.17)
Kagamil	49/177 (27.68)	13/120 (10.83)	4/60 (6.67)	10/119 (8.40)	13/108 (12.04)	2/72 (2.78)	1/36 (2.78)	4/72 (5.56)	62/285 (21.75)	15/192 (7.81)	5/96 (5.21)	14/191 (7.33)
Total	64/261 (24.52)	15/176 (8.52)	5/88 (5.68)	14/175 (8.0)	28/160 (17.5)	3/108 (2.78)	2/54 (3.70)	4/108 (3.70)	92/421 (21.85)	18/284 (6.34)	7/142 (4.93)	18/283 (6.36)

Table 48 - Antemortem Tooth Loss By Tooth Type (Deciduous Teeth)

Sample	Maxillary Teeth m	c	i	Mandibular Teeth m	c	i	Dentitions Combined m	c	i
Pre-Contact Period									
Eskimos									
Kugusug.	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Kugok	0/4	0/2	0/4	0/4	0/2	0/4	0/8	0/4	0/8
Piginik	0/4	0/2	0/4	0/4	0/2	0/4	0/8	0/4	0/8
Tigara	0/12	0/6	0/12	0/16	0/8	0/16	0/28	0/14	0/28
Total	0/20	0/10	0/20	0/24	0/12	0/24	0/44	0/22	0/44
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aleuts									
Umnak I	0/8	0/4	0/8	0/14	0/6	0/12	0/22	0/10	0/20
Total	0/8	0/4	0/8	0/14	0/6	0/12	0/22	0/10	0/20
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Late Pre-Contact/Contact Period									
Eskimos									
Barrow	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Nixerak	0/4	0/2	0/4	0/0	0/0	0/0	0/4	0/2	0/4
Utkiavik	0/4	0/2	0/4	0/4	0/2	0/4	0/8	0/4	0/8
Pt. Hope	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Total	0/8	0/4	0/8	0/4	0/2	0/4	0/12	0/6	0/12
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Aleuts									
Umnak II	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Shiprock	0/66	0/33	0/66	0/56	0/28	0/56	0/122	0/61	0/122
Kagamil	0/68	0/34	0/68	0/30	0/16	0/32	0/98	0/50	0/100
Total	0/134	0/67	0/134	0/86	0/44	0/88	0/220	0/111	0/222
%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 49 - Antemortem Tooth Loss By Tooth Type (Males and Females Combined)

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Pre-Contact Period												
Eskimos												
Kugus.	35/236 (14.83)	20/155 (12.90)	12/76 (15.79)	35/152 (23.03)	69/237 (29.11)	20/158 (12.66)	10/79 (12.66)	31/158 (19.62)	104/473 (21.99)	40/313 (12.78)	22/155 (14.19)	66/310 (21.29)
Kugok	8/34 (23.53)	4/24 (16.67)	1/12 (8.33)	2/24 (8.33)	8/48 (16.67)	1/30 (3.33)	0/18 (0.00)	5/30 (16.67)	15/82 (18.29)	5/54 (9.26)	1/28 (3.57)	7/54 (12.96)
Pigin.	1/30 (3.33)	2/20 (10.00)	0/9 (0.00)	0/19 (0.00)	0/27 (0.00)	0/18 (0.00)	0/9 (0.00)	0/15 (0.00)	1/57 (1.75)	2/38 (5.26)	0/18 (0.00)	0/34 (0.00)
Tigar.	90/351 (25.64)	47/238 (19.75)	19/119 (15.97)	64/236 (27.12)	98/352 (27.84)	20/236 (8.47)	9/118 (7.63)	32/236 (13.56)	188/703 (26.74)	67/474 (14.14)	28/237 (11.81)	96/472 (20.34)
Total	134/651 (20.58)	73/437 (16.70)	32/216 (14.81)	101/431 (23.43)	174/664 (26.20)	41/442 (9.28)	19/222 (8.56)	68/439 (15.49)	308/1315 (23.42)	114/879 (12.97)	51/438 (11.64)	169/870 (19.43)
Aleuts												
Umn.	56/277 (20.22)	24/205 (11.71)	10/105 (9.52)	62/209 (29.67)	62/281 (22.06)	15/190 (7.89)	6/97 (6.19)	50/194 (25.77)	118/558 (21.15)	39/395 (9.87)	16/202 (7.92)	112/409 (27.38)
Total	56/277 (20.22)	24/205 (11.71)	10/105 (9.52)	62/209 (29.67)	62/281 (22.06)	15/190 (7.89)	6/97 (6.19)	50/194 (25.77)	118/558 (21.15)	39/395 (9.87)	16/202 (7.92)	112/409 (27.38)

Table 49 - Antemortem Tooth Loss By Tooth Type (Males and Females Combined)

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Bar.	15/103 (14.56)	9/78 (11.54)	2/39 (5.13)	11/78 (14.10)	1/6 (16.67)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	16/109 (14.68)	9/82 (10.98)	2/41 (4.88)	11/82 (13.41)
Nix.	90/260 (34.62)	51/182 (28.02)	11/90 (12.22)	59/178 (33.15)	48/84 (57.14)	33/56 (58.93)	14/28 (50.00)	29/56 (51/79)	138/344 (40.12)	84/238 (35.29)	25/118 (21.19)	88/234 (37.61)
Utk.	11/84 (13.10)	7/61 (11.48)	2/3` (6.67)	4/56 (7.14)	4/30 (13.33)	1/19 (5.26)	1/9 (11.11)	0/19 (0.00)	15/114 (13.16)	8/80 (10.00)	3/39 (7.69)	4/75 (5.33)
Pt. H.	24/186 (12.90)	12/131 (9.16)	3/69 (4.35)	25/135 (18.52)	0/24 (0.00)	0/16 (0.00)	0/8 (0.00)	2/16 (12.50)	24/210 (11.43)	12/147 (8.16)	3/77 (3.90)	27/151 (17.88)
Tot.	140/633 (22.12)	79/452 (17.48)	18/228 (7.89)	99/447 (22.15)	53/144 (36.81)	34/95 (35.79)	15/47 (31.91)	31/95 (32.63)	193/777 (24.84)	113/547 (20.66)	33/275 (12.00)	130/542 (23.99)
Aleuts												
Umn.	0/36 (0.00)	0/24 (0.00)	1/12 (8.33)	5/24 (20.83)	0/18 (0.00)	0/12 (0.00)	0/6 (0.00)	1/12 (8.33)	0/54 (0.00)	0/36 (0.00)	1/18 (5.56)	6/36 (16.67)
Ship.	11/163 (6.75)	1/109 (0.92)	0/54 (0.00)	17/108 (15.74)	12/130 (9.23)	2/88 (2.27)	2/44 (4.55)	7/88 (7.95)	23/293 (7.85)	3/197 (1.52)	2/98 (2.04)	24/196 (12.24)
Kag.	56/633 (8.85)	28/426 (6.57)	7/213 (3.29)	47/423 (11.11)	21/283 (7.42)	2/190 (1.05)	1/94 (1.06)	8/190 (4.21)	77/916 (8.41)	30/616 (4.87)	8/307 (2.61)	55/613 (8.97)
Tot.	67/832 (8.05)	29/559 (5.19)	8/279 (2.87)	69/555 (12.43)	33/431 (7.66)	4/290 (1.38)	3/144 (2.08)	16/290 (5.52)	100/1263 (7.92)	33/849 (3.89)	11/423 (2.60)	85/845 (10.06)

Table 50 - Antemortem Tooth Loss By Tooth Type - Males Only

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Pre-Contact Period												
Eskimos												
Kugus.	26/155 (16.77)	15/104 (14.42)	7/51 (13.73)	20/100 (20.00)	34/147 (23.13)	10/98 (10.20)	5/49 (10.20)	21/98 (21.43)	60/302 (19.87)	25/202 (12.38)	12/100 (12.00)	41/198 (20.71)
Kugok	8/28 (28.57)	4/20 (20.00)	1/10 (10.00)	2/20 (10.00)	6/36 (16.67)	1/24 (4.17)	0/12 (0.00)	5/24 (20.83)	14/64 (21.88)	5/44 (11.36)	1/22 (4.55)	7/44 (15.91)
Piginik	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	0/12 (0.00)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)
Tigara	64/204 (31.37)	31/136 (22.79)	12/68 (17.65)	43/136 (31.62)	57/192 (29.69)	9/128 (7.03)	5/64 (7.81)	15/128 (11.72)	121/396 (30.56)	40/264 (15.15)	17/132 (12.88)	58/264 (21.97)
Total	98/393 (24.94)	50/264 (18.94)	20/131 (15.27)	65/260 (25.00)	97/381 (25.46)	20/254 (7.87)	10/127 (7.87)	41/254 (16.14)	195/774 (25.19)	70/518 (13.51)	30/258 (11.63)	106/514 (20.62)
Aleuts												
Umn.	28/143 (19.58)	9/106 (8.49)	4/54 (7.41)	21/107 (19.63)	15/129 (11.63)	6/86 (6.98)	1/44 (2.27)	15/88 (17.05)	43/272 (15.81)	15/192 (7.81)	5/98 (5.10)	36/195 (18.46)
Total	28/143 (19.58)	9/106 (8.49)	4/54 (7.41)	21/107 (19.63)	15/129 (11.63)	6/86 (6.98)	1/44 (2.27)	15/88 (17.05)	43/272 (15.81)	15/192 (7.81)	5/98 (5.10)	36/195 (18.46)

Table 50 - Antemortem Tooth Loss By Tooth Type - Males Only

Sample	Maxillary Teeth				Mandibular Teeth				Dentitions Combined			
	M	P	C	I	M	P	C	I	M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Bar.	15/45 (33.33)	7/34 (20.59)	1/17 (5.88)	6/34 (17.65)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	15/45 (33.33)	7/34 (20.59)	1/17 (5.88)	6/34 (17.65)
Nix.	64/136 (47.06)	37/93 (39.78)	9/46 (19.57)	38/92 (41.30)	29/48 (60.42)	20/32 (62.50)	10/16 (62.50)	23/32 (71.88)	93/184 (50.54)	57/125 (45.60)	19/62 (30.65)	61/124 (49.19)
Utk.	0/26 (0.00)	1/20 (5.00)	0/10 (0.00)	0/20 (0.00)	0/6 (0.00)	0/4 (0.00)	1/2 (50.00)	0/4 (0.00)	0/32 (0.00)	1/24 (4.17)	1/12 (8.33)	0/24 (0.00)
Pt. Hope	19/123 (15.45)	9/88 (10.23)	2/45 (4.44)	13/88 (14.77)	0/12 (0.00)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)	19/135 (14.07)	9/96 (9.38)	2/49 (4.08)	13/96 (13.54)
Total	98/330 (29.70)	54/235 (22.98)	12/118 (10.17)	57/234 (24.36)	29/66 (43.94)	20/44 (45.45)	11/22 (50.00)	23/44 (52.27)	127/396 (32.07)	74/279 (26.52)	23/140 (16.43)	80/278 (28.78)
Aleuts												
Umn.	0/24 (0.00)	0/16 (0.00)	0/8 (0.00)	1/16 (6.25)	0/12 (0.00)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)	0/36 (0.00)	0/24 (0.00)	0/12 (0.00)	1/24 (4.17)
Ship.	4/112 (3.57)	0/76 (0.00)	0/38 (0.00)	11/76 (14.47)	5/94 (5.32)	1/64 (1.56)	1/32 (3.13)	1/64 (1.56)	9/206 (4.37)	1/140 (0.71)	1/70 (1.43)	12/140 (8.57)
Kag.	22/291 (7.56)	12/196 (6.12)	1/98 (1.02)	16/196 (8.16)	3/123 (2.44)	0/82 (0.00)	0/41 (0.00)	2/82 (2.44)	25/414 (6.04)	12/278 (4.32)	1/139 (0.72)	18/278 (6.47)
Total	26/427 (6.09)	12/288 (4.17)	1/144 (0.69)	28/288 (9.72)	8/229 (3.49)	1/154 (0.65)	1/77 (1.30)	4/154 (2.60)	34/656 (13.28)	13/442 (2.94)	2/221 (0.90)	32/442 (7.24)

Table 51 - Antemortem Tooth Loss By Tooth Type - Females Only

Sample	Maxillary Teeth				Mandibular Teeth				Dentitions Combined			
	M	P	C	I	M	P	C	I	M	P	C	I
Pre-Contact Period												
Eskimos												
Kugus.	9/69 (13.04)	5/43 (11.63)	5/21 (23.81)	15/44 (34.09)	35/78 (44.87)	10/52 (19.23)	5/26 (19.23)	10/52 (19.23)	44/147 (29.93)	15/95 (15.79)	10/47 (21.28)	25/96 (26.04)
Kugok	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	2/12 (16.67)	0/6 (0.00)	0/4 (0.00)	0/6 (0.00)	2/18 (11.11)	0/10 (0.00)	0/6 (0.00)	0/10 (0.00)
Piginik	1/24 (4.17)	2/16 (12.50)	0/7 (0.00)	0/15 (0.00)	0/21 (0.00)	0/14 (0.00)	0/7 (0.00)	0/11 (0.00)	1/45 (2.22)	2/30 (6.67)	0/14 (0.00)	0/26 (0.00)
Tigara	26/141 (18.44)	16/98 (16.33)	7/49 (14.29)	21/96 (21.88)	41/154 (26.62)	11/104 (10.58)	3/52 (5.77)	17/104 (16.35)	67/295 (22.71)	27/202 (13.37)	10/101 (9.90)	38/200 (19.00)
Total	36/240 (15.00)	23/161 (14.29)	12/79 (15.19)	36/159 (22.64)	78/265 (29.43)	21/176 (11.93)	8/89 (8.99)	27/173 (15.61)	114/505 (22.57)	44/337 (13.06)	20/168 (11.90)	63/332 (18.98)
Aleuts												
Umn.	28/119 (23.53)	15/89 (16.85)	6/46 (13.04)	41/92 (44.57)	47/125 (37.60)	9/86 (10.47)	5/44 (11.36)	34/88 (38.64)	75/244 (30.74)	24/175 (13.71)	11/90 (12.22)	75/180 (41.67)
Total	28/119 (23.53)	15/89 (16.85)	6/46 (13.04)	41/92 (44.57)	47/125 (37.60)	9/86 (10.47)	5/44 (11.36)	34/88 (38.64)	75/244 (30.74)	24/175 (13.71)	11/90 (12.22)	75/180 (41.67)

Table 51 - Antemortem Tooth Loss By Tooth Type - Females Only

Sample	Maxillary Teeth				Mandibular Teeth				Dentitions Combined			
	M	P	C	I	M	P	C	I	M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Bar.	0/58 (0.00)	2/44 (4.55)	1/22 (4.55)	5/44 (11.36)	1/6 (16.67)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	1/64 (1.56)	2/48 (4.17)	1/24 (4.17)	5/48 (10.42)
Nix.	26/124 (20.97)	14/89 (15.73)	2/44 (4.55)	21/86 (24.42)	19/36 (52.78)	13/24 (54.17)	4/12 (33.33)	6/24 (25.00)	45/160 (28.13)	27/113 (23.89)	6/56 (10.71)	27/110 (24.55)
Utk.	11/58 (18.97)	6/41 (14.63)	2/20 (10.00)	4/36 (11.11)	4/24 (16.67)	1/15 (6.67)	0/7 (0.00)	0/13 (0.00)	15/82 (18.29)	7/56 (12.50)	2/27 (7.41)	4/49 (8.16)
Pt. Hope	5/63 (7.94)	3/43 (6.98)	1/24 (4.17)	12/47 (25.53)	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	2/4 (50.00)	5/69 (7.25)	3/47 (6.38)	1/26 (3.85)	14/51 (27.45)
Total	42/303 (13.86)	25/217 (11.52)	6/110 (5.45)	42/213 (19.72)	24/66 (36.36)	14/47 (29.79)	4/23 (17.39)	8/45 (17.78)	66/369 (17.89)	39/264 (14.77)	10/133 (7.52)	50/258 (19.38)
Aleuts												
Umn.	0/12 (0.00)	0/8 (0.00)	1/4 (25.00)	4/8 (50.00)	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	1/4 (25.00)	0/18 (0.00)	0/12 (0.00)	1/6 (16.67)	5/12 (41.67)
Ship.	7/51 (13.73)	1/33 (3.03)	0/16 (0.00)	6/32 (18.75)	7/36 (19.44)	1/24 (4.17)	1/12 (8.33)	6/24 (25.00)	14/87 (16.09)	2/57 (3.51)	1/28 (3.57)	12/56 (21.43)
Kag.	34/336 (10.12)	16/226 (7.08)	6/113 (5.31)	31/223 (13.90)	18/156 (11.54)	2/104 (1.92)	1/52 (1.92)	6/104 (5.77)	52/492 (10.57)	18/330 (5.45)	7/165 (4.24)	37/327 (11.31)
Total	41/399 (10.28)	17/267 (6.37)	7/133 (5.26)	41/263 (15.59)	25/198 (12.63)	3/132 (2.27)	2/66 (3.03)	13/132 (9.85)	66/597 (11.06)	20/399 (5.01)	9/199 (4.52)	54/395 (13.67)

Table 52 - Antemortem Tooth Loss By Tooth Type - Individuals Under 50

Sample	Maxillary Teeth				Mandibular Teeth				Dentitions Combined			
	M	P	C	I	M	P	C	I	M	P	C	I
Pre-Contact Period												
Eskimos												
Kugus.	20/209 (9.57)	9/136 (6.62)	6/66 (9.09)	22/132 (16.67)	43/207 (20.77)	8/138 (5.80)	4/69 (5.80)	14/138 (10.14)	63/416 (15.14)	17/274 (6.20)	10/135 (7.41)	36/270 (13.33)
Kug.	8/34 (23.53)	4/24 (16.67)	1/12 (8.33)	2/24 (8.33)	8/48 (16.67)	1/30 (3.33)	0/16 (0.00)	5/30 (16.67)	16/82 (19.51)	5/54 (9.26)	1/28 (3.57)	7/54 (12.96)
Pig.	1/30 (3.33)	2/20 (10.00)	0/9 (0.00)	0/19 (0.00)	0/27 (0.00)	0/18 (0.00)	0/9 (0.00)	0/15 (0.00)	1/57 (1.75)	2/38 (5.26)	0/18 (0.00)	0/34 (0.00)
Tig.	20/201 (9.95)	11/134 (8.21)	5/67 (7.46)	16/132 (12.12)	23/192 (11.98)	0/128 (0.00)	0/64 (0.00)	4/128 (3.13)	43/393 (10.94)	11/262 (4.20)	5/131 (3.82)	20/260 (7.69)
Total	49/474 (10.34)	26/314 (8.28)	12/154 (7.79)	40/307 (13.03)	74/474 (15.61)	9/314 (2.87)	4/158 (2.53)	23/311 (7.40)	123/948 (12.97)	35/628 (5.57)	16/312 (5.13)	63/618 (10.19)
Aleuts												
Umn. I	7/107 (6.54)	1/74 (1.35)	0/37 (0.00)	5/73 (6.85)	0/99 (0.00)	0/66 (0.00)	0/33 (0.00)	3/66 (4.55)	7/206 (3.40)	1/140 (0.71)	0/70 (0.00)	8/139 (5.76)
Total	7/107 (6.54)	1/74 (1.35)	0/37 (0.00)	5/73 (6.85)	0/99 (0.00)	0/66 (0.00)	0/33 (0.00)	3/66 (4.55)	7/206 (3.40)	1/140 (0.71)	0/70 (0.00)	8/139 (5.76)

Table 52 - Antemortem Tooth Loss By Tooth Type - Individuals Under 50

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Bar.	3/86 (3.49)	3/66 (4.55)	1/33 (3.03)	7/66 (10.61)	1/6 (16.67)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	4/92 (4.35)	3/70 (4.29)	1/35 (2.86)	7/70 (10.00)
Nix.	55/211 (26.07)	30/150 (20.00)	4/74 (5.41)	37/146 (25.34)	0/12 (0.00)	0/8 (0.00)	0/4 (0.00)	3/8 (37.50)	55/223 (24.66)	30/158 (18.99)	4/78 (5.13)	40/154 (25.97)
Utk.	11/80 (13.75)	7/57 (12.28)	2/28 (7.14)	4/52 (7.69)	0/12 (0.00)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)	11/92 (11.96)	7/65 (10.77)	2/32 (6.25)	4/60 (6.67)
Pt. H.	13/146 (8.90)	6/102 (5.88)	1/53 (1.89)	19/103 (18.45)	0/18 (0.00)	0/12 (0.00)	0/6 (0.00)	2/12 (16.67)	13/164 (7.93)	6/114 (5.26)	1/59 (1.69)	21/115 (18.26)
Total	82/523 (15.68)	46/375 (12.27)	8/188 (4.26)	67/367 (18.26)	1/48 (2.08)	0/32 (0.00)	0/16 (0.00)	5/32 (15.63)	83/571 (14.54)	46/407 (11.30)	8/204 (3.92)	72/399 (18.05)
Aleuts												
Umn. II	0/12 (0.00)	0/8 (0.00)	0/4 (0.00)	1/8 (12.50)	0/12 (0.00)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)	0/24 (0.00)	0/16 (0.00)	0/8 (0.00)	1/16 (6.25)
Ship.	1/103 (0.97)	0/69 (0.00)	0/34 (0.00)	10/72 (13.89)	0/88 (0.00)	0/60 (0.00)	0/30 (0.00)	2/60 (3.33)	1/191 (0.52)	0/129 (0.00)	0/64 (0.00)	12/132 (9.09)
Kag.	14/450 (3.11)	8/302 (2.65)	1/151 (0.66)	16/300 (5.33)	3/175 (1.71)	0/118 (0.00)	0/58 (0.00)	2/118 (1.69)	17/625 (2.72)	8/420 (1.90)	1/209 (0.48)	18/418 (4.31)
Total	15/565 (2.65)	8/379 (2.11)	1/189 (0.53)	27/380 (7.11)	3/275 (1.09)	0/186 (0.00)	0/92 (0.00)	4/186 (2.15)	18/840 (2.14)	8/565 (1.42)	1/281 (0.36)	31/566 (5.48)

Table 53 - Antemortem Tooth Loss By Tooth Type - Individuals Over 50

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Pre-Contact Period												
Eskimos												
Kugus.	15/27 (55.56)	11/19 (57.89)	6/10 (60.00)	13/20 (65.00)	26/30 (86.67)	12/20 (60.00)	6/10 (60.00)	17/20 (85.00)	41/57 (71.93)	23/39 (58.97)	12/20 (60.00)	30/40 (75.00)
Kug.	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)
Pig.	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)
Tig.	70/150 (46.67)	36/104 (34.62)	14/52 (26.92)	48/104 (46.15)	75/160 (46.88)	20/108 (18.52)	9/54 (16.67)	28/108 (25.93)	145/310 (46.77)	56/212 (26.42)	23/106 (21.70)	76/212 (35.85)
Total	85/177 (48.02)	47/123 (38.21)	20/62 (32.36)	61/124 (49.19)	101/190 (53.16)	32/128 (25.00)	15/64 (23.44)	45/128 (35.16)	186/367 (50.68)	79/251 (31.47)	35/126 (27.78)	106/252 (42.06)
Aleuts												
Umn. I	49/170 (28.82)	23/131 (17.56)	10/68 (14.71)	57/136 (41.91)	62/182 (34.07)	14/124 (11.29)	6/64 (9.38)	47/136 (34.56)	111/352 (31.53)	37/255 (14.51)	16/132 (12.12)	104/272 (38.24)
Total	49/170 (28.82)	23/131 (17.56)	10/68 (14.71)	57/136 (41.91)	62/182 (34.07)	14/124 (11.29)	6/64 (9.38)	47/136 (34.56)	111/352 (31.53)	37/255 (14.51)	16/132 (12.12)	104/272 (38.24)

Table 53 - Antemortem Tooth Loss By Tooth Type - Individuals Over 50

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Bar.	12/17 (70.59)	6/12 (50.00)	1/6 (16.67)	4/12 (33.33)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	12/17 (70.59)	6/12 (50.00)	1/6 (16.67)	4/12 (33.33)
Nix.	35/48 (72.92)	21/32 (65.63)	7/16 (43.75)	22/32 (68.75)	6/12 (50.00)	4/8 (50.00)	4/4 (100.00)	4/8 (50.00)	41/60 (68.33)	25/40 (62.5)	11/20 (55.00)	26/40 (65.00)
Utk.	0/4 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/4 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)
Pt. H.	11/28 (39.29)	6/23 (26.09)	2/12 (16.67)	6/24 (25.00)	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	11/34 (32.35)	6/27 (22.22)	2/14 (14.29)	6/28 (21.43)
Total	58/97 (59.79)	33/71 (46.48)	10/36 (27.78)	32/72 (44.44)	6/18 (33.33)	4/12 (33.33)	4/6 (66.67)	4/12 (33.33)	64/115 (55.65)	37/83 (44.58)	14/42 (33.33)	36/84 (42.86)
Aleuts												
Umn. II	0/24 (0.00)	0/16 (0.00)	1/8 (12.50)	4/16 (25.00)	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	0/30 (0.00)	0/20 (0.00)	1/10 (10.00)	4/20 (20.00)
Ship.	10/60 (16.67)	1/40 (2.5)	0/20 (0.00)	7/40 (17.5)	12/42 (28.57)	2/28 (7.14)	2/14 (14.29)	5/28 (17.86)	22/102 (21.57)	3/68 (4.41)	2/34 (5.88)	12/68 (17.65)
Kag.	42/177 (23.73)	20/120 (16.67)	6/50 (12.00)	31/119 (26.05)	18/108 (16.67)	2/72 (2.78)	1/36 (2.78)	6/72 (8.33)	60/285 (21.05)	22/192 (11.46)	7/86 (8.14)	37/191 (19.37)
Total	52/261 (19.92)	21/176 (11.93)	7/78 (8.97)	42/175 (24.00)	30/156 (19.23)	4/104 (3.85)	3/52 (5.77)	11/104 (10.58)	82/417 (19.66)	25/280 (8.93)	10/130 (7.69)	53/279 (19.00)

Table 54 - Periodontal Disease By Tooth Type (Males and Females Combined)

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Pre-Contact Period												
Eskimos												
Kugusug.	22/163 (13.50)	0/130 (0.00)	2/61 (3.28)	0/103 (0.00)	21/130 (16.15)	2/133 (1.50)	0/65 (0.00)	0/116 (0.00)	43/293 (14.68)	2/263 (0.76)	2/126 (1.59)	0/219 (0.00)
Kugok	2/18 (11.11)	0/18 (0.00)	0/5 (0.00)	0/11 (0.00)	2/31 (6.45)	0/24 (0.00)	0/8 (0.00)	0/12 (0.00)	4/49 (8.16)	0/42 (0.00)	0/13 (0.00)	0/23 (0.00)
Piginik	1/19 (5.26)	0/16 (0.00)	0/9 (0.00)	0/17 (0.00)	2/14 (14.29)	0/17 (0.00)	0/9 (0.00)	0/10 (0.00)	3/33 (9.09)	0/33 (0.00)	0/18 (0.00)	0/27 (0.00)
Tigara	32/215 (14.88)	14/176 (7.95)	6/81 (7.41)	3/154 (1.95)	39/213 (18.31)	21/205 (10.24)	13/103 (12.62)	19/188 (10.11)	71/428 (16.59)	35/381 (9.19)	19/184 (10.33)	22/342 (6.43)
Total	57/415 (13.73)	14/340 (4.12)	8/156 (5.13)	3/285 (1.05)	64/388 (16.49)	23/379 (6.07)	13/185 (7.03)	19/326 (5.83)	121/803 (15.07)	37/719 (5.15)	21/341 (6.16)	22/611 (3.60)
Aleuts												
Umnak I	31/153 (20.26)	13/142 (9.15)	4/64 (6.25)	11/114 (9.65)	18/162 (11.11)	7/155 (4.52)	4/68 (5.88)	4/79 (5.06)	49/315 (15.56)	20/297 (6.73)	8/132 (6.06)	15/193 (7.77)
Total	31/153 (20.26)	13/142 (9.15)	4/64 (6.25)	11/114 (9.65)	18/162 (11.11)	7/155 (4.52)	4/68 (5.88)	4/79 (5.06)	49/315 (15.56)	20/297 (6.73)	8/132 (6.06)	15/193 (7.77)

Table 54 - Periodontal Disease By Tooth Type (Males and Females Combined)

Sample	Maxillary Teeth				Mandibular Teeth				Dentitions Combined			
	M	P	C	I	M	P	C	I	M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Barrow	0/74 (0.00)	0/65 (0.00)	0/29 (0.00)	0/56 (0.00)	0/4 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	0/78 (0.00)	0/69 (0.00)	0/31 (0.00)	0/60 (0.00)
Nixerak	11/129 (8.53)	4/118 (3.39)	2/64 (3.13)	1/95 (1.05)	12/24 (50.00)	2/21 (9.52)	1/8 (12.50)	1/20 (5.00)	23/153 (15.03)	6/139 (4.32)	3/72 (4.17)	2/115 (1.74)
Utkiavik	0/59 (0.00)	1/46 (2.17)	0/22 (0.00)	0/46 (0.00)	0/22 (0.00)	0/15 (0.00)	0/8 (0.00)	0/19 (0.00)	0/81 (0.00)	1/61 (1.64)	0/30 (0.00)	0/65 (0.00)
Pt. Hope	4/133 (3.01)	0/113 (0.00)	0/52 (0.00)	0/94 (0.00)	1/22 (4.55)	0/16 (0.00)	0/7 (0.00)	0/12 (0.00)	5/155 (3.23)	0/129 (0.00)	0/59 (0.00)	0/106 (0.00)
Total	15/395 (3.80)	5/342 (1.46)	2/167 (1.20)	1/291 (0.34)	13/72 (18.06)	2/56 (3.57)	1/25 (4.00)	1/55 (1.82)	28/467 (5.60)	6/398 (1.51)	3/192 (1.56)	2/346 (0.58)
Aleuts												
Umnak II	6/31 (19.35)	1/22 (4.55)	0/10 (0.00)	0/18 (0.00)	1/16 (6.25)	0/12 (0.00)	0/6 (0.00)	1/9 (11.11)	7/47 (14.89)	1/34 (2.94)	0/16 (0.00)	1/27 (3.70)
Shiprock	23/130 (17.69)	2/106 (1.89)	4/49 (8.16)	7/73 (9.59)	0/106 (0.00)	2/85 (2.35)	2/39 (5.13)	5/72 (6.94)	23/236 (9.75)	4/191 (2.09)	6/88 (6.82)	12/145 (8.28)
Kagamil	14/498 (2.81)	5/383 (1.31)	6/186 (3.23)	5/349 (1.43)	10/234 (4.27)	6/182 (3.30)	2/92 (2.17)	5/171 (2.92)	24/732 (3.28)	11/565 (1.95)	8/278 (2.88)	10/520 (1.92)
Total	43/659 (6.53)	8/511 (1.57)	10/245 (4.08)	12/440 (2.73)	11/356 (3.09)	8/279 (2.87)	4/137 (2.92)	11/252 (4.37)	54/1015 (5.32)	16/790 (2.03)	14/382 (3.66)	23/692 (3.32)

Table 55 - Periodontal Disease By Tooth Type - Males Only

Sample	Maxillary Teeth				Mandibular Teeth				Dentitions Combined			
	M	P	C	I	M	P	C	I	M	P	C	I
Pre-Contact Period												
Eskimos												
Kugus.	14/110 (12.73)	0/88 (0.00)	1/42 (2.38)	0/74 (0.00)	18/95 (18.95)	2/86 (2.33)	0/40 (0.00)	0/67 (0.00)	32/205 (15.61)	2/174 (1.15)	1/82 (1.22)	0/141 (0.00)
Kugok	1/13 (7.69)	0/14 (0.00)	0/4 (0.00)	0/9 (0.00)	2/24 (8.33)	0/18 (0.00)	0/6 (0.00)	0/8 (0.00)	3/37 (8.11)	0/32 (0.00)	0/10 (0.00)	0/17 (0.00)
Pigin.	1/5 (20.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	2/4 (50.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	3/9 (33.33)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)
Tig.	26/107 (24.30)	10/95 (10.53)	5/43 (11.63)	2/80 (2.50)	26/101 (25.74)	19/117 (16.24)	13/59 (22.03)	16/108 (14.81)	52/208 (25.00)	29/212 (13.68)	18/82 (21.95)	18/188 (9.57)
Total	42/235 (17.87)	10/201 (4.98)	6/91 (6.59)	2/167 (1.20)	48/224 (21.43)	21/225 (9.33)	13/107 (12.15)	16/187 (8.56)	93/462 (20.13)	31/426 (7.28)	19/178 (10.67)	18/354 (5.08)
Aleuts												
Umn. I	13/76 (17.11)	5/77 (6.49)	4/35 (11.43)	11/67 (16.42)	6/91 (6.59)	0/71 (0.00)	2/36 (5.56)	0/46 (0.00)	19/167 (11.38)	5/148 (3.38)	6/71 (8.45)	11/113 (9.73)
Total	13/76 (17.11)	5/77 (6.49)	4/35 (11.43)	11/67 (16.42)	6/91 (6.59)	0/71 (0.00)	2/36 (5.56)	0/46 (0.00)	19/167 (11.38)	5/148 (3.38)	6/71 (8.45)	11/113 (9.73)

Table 55 - Periodontal Disease By Tooth Type - Males Only

Sample	Maxillary Teeth				Mandibular Teeth				Dentitions Combined			
	M	P	C	I	M	P	C	I	M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Bar.	0/24 (0.00)	0/26 (0.00)	0/13 (0.00)	0/21 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/24 (0.00)	0/26 (0.00)	0/13 (0.00)	0/21 (0.00)
Nix.	10/54 (18.52)	4/50 (8.00)	2/29 (6.90)	1/47 (2.13)	5/11 (45.45)	1/10 (10.00)	0/3 (0.00)	1/6 (16.67)	15/65 (23.08)	5/60 (8.33)	2/32 (6.25)	2/53 (3.77)
Utk.	0/22 (0.00)	0/16 (0.00)	0/7 (0.00)	0/15 (0.00)	0/6 (0.00)	0/2 (0.00)	0/1 (0.00)	0/4 (0.00)	0/28 (0.00)	0/18 (0.00)	0/8 (0.00)	0/19 (0.00)
Pt. H.	3/85 (3.53)	0/74 (0.00)	0/36 (0.00)	0/66 (0.00)	0/17 (0.00)	0/12 (0.00)	0/6 (0.00)	0/12 (0.00)	3/102 (2.94)	0/86 (0.00)	0/42 (0.00)	0/78 (0.00)
Total	13/185 (7.03)	4/166 (2.41)	2/85 (2.35)	1/149 (0.67)	5/34 (14.71)	1/24 (4.17)	0/10 (0.00)	1/22 (4.55)	18/219 (8.22)	5/190 (2.63)	2/95 (2.11)	2/171 (1.17)
Aleuts												
Umn. II	0/19 (0.00)	0/15 (0.00)	0/8 (0.00)	0/14 (0.00)	1/10 (10.00)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)	1/29 (3.45)	0/23 (0.00)	0/12 (0.00)	0/22 (0.00)
Shp.	17/94 (18.09)	1/73 (1.37)	2/34 (5.88)	7/56 (12.5)	0/82 (0.00)	1/62 (1.61)	2/30 (6.67)	5/61 (8.20)	17/176 (9.66)	2/135 (1.48)	4/64 (6.25)	12/117 (10.26)
Kag.	2/231 (0.87)	3/179 (1.68)	4/84 (4.76)	1/171 (0.58)	1/112 (0.89)	0/80 (0.00)	1/40 (2.5)	0/76 (0.00)	3/343 (0.87)	3/259 (1.19)	5/124 (4.03)	1/247 (0.40)
Total	19/344 (5.52)	4/267 (1.50)	6/126 (4.76)	8/241 (3.32)	2/204 (0.98)	1/150 (0.67)	3/74 (4.05)	5/145 (3.45)	21/548 (3.83)	5/417 (1.20)	9/200 (4.5)	13/386 (3.37)

Table 56 - Periodontal Disease By Tooth Type - Females Only

Sample	Maxillary Teeth				Mandibular Teeth				Dentitions Combined			
	M	P	C	I	M	P	C	I	M	P	C	I
Pre-Contact Period												
Eskimos												
Kugus.	8/45 (17.78)	0/34 (0.00)	1/15 (6.67)	0/21 (0.00)	3/27 (11.11)	0/39 (0.00)	0/21 (0.00)	0/41 (0.00)	11/72 (15.28)	0/73 (0.00)	1/36 (2.78)	0/62 (0.00)
Kug.	1/5 (20.00)	0/4 (0.00)	0/1 (0.00)	0/2 (0.00)	0/7 (0.00)	0/6 (0.00)	0/2 (0.00)	0/4 (0.00)	1/12 (8.33)	0/10 (0.00)	0/3 (0.00)	0/6 (0.00)
Pig.	0/14 (0.00)	0/12 (0.00)	0/7 (0.00)	0/13 (0.00)	0/10 (0.00)	0/13 (0.00)	0/7 (0.00)	0/6 (0.00)	0/24 (0.00)	0/25 (0.00)	0/14 (0.00)	0/19 (0.00)
Tig.	6/102 (5.88)	4/77 (5.19)	1/36 (2.78)	1/70 (1.43)	13/106 (12.26)	2/83 (2.41)	0/42 (0.00)	3/76 (3.95)	19/208 (9.13)	6/160 (3.75)	1/78 (1.28)	4/146 (2.74)
Total	15/166 (9.04)	4/127 (3.15)	2/59 (3.39)	1/106 (0.94)	16/150 (10.67)	2/141 (1.42)	0/72 (0.00)	3/127 (2.36)	31/316 (9.81)	6/268 (2.24)	2/131 (1.53)	4/233 (1.72)
Aleuts												
Umn. I	18/63 (28.57)	8/56 (14.29)	0/25 (0.00)	0/36 (0.00)	5/48 (10.42)	6/68 (8.82)	2/25 (8.00)	4/26 (15.38)	23/111 (20.72)	14/124 (11.29)	2/50 (4.00)	4/62 (6.45)
Total	18/63 (28.57)	8/56 (14.29)	0/25 (0.00)	0/36 (0.00)	5/48 (10.42)	6/68 (8.82)	2/25 (8.00)	4/26 (15.38)	23/111 (20.72)	14/124 (11.29)	2/50 (4.00)	4/62 (6.45)

Table 56 - Periodontal Disease By Tooth Type - Females Only

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Bar.	0/50 (0.00)	0/39 (0.00)	0/16 (0.00)	0/35 (0.00)	0/4 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	0/54 (0.00)	0/43 (0.00)	0/18 (0.00)	0/39 (0.00)
Nix.	1/71 (1.41)	0/68 (0.00)	0/35 (0.00)	0/48 (0.00)	7/13 (53.85)	1/11 (9.09)	1/5 (20.00)	0/12 (0.00)	8/84 (9.52)	1/79 (1.27)	1/40 (2.5)	0/60 (0.00)
Utk.	0/37 (0.00)	1/30 (3.33)	0/15 (0.00)	0/31 (0.00)	0/16 (0.00)	0/13 (0.00)	0/7 (0.00)	0/15 (0.00)	0/53 (0.00)	1/43 (2.33)	0/22 (0.00)	0/46 (0.00)
Pt. H.	1/45 (2.22)	0/39 (0.00)	0/16 (0.00)	0/28 (0.00)	1/5 (20.00)	0/4 (0.00)	0/1 (0.00)	0/0 (0.00)	2/50 (4.00)	0/43 (0.00)	0/17 (0.00)	0/28 (0.00)
Total	2/203 (0.99)	1/176 (0.57)	0/82 (0.00)	0/142 (0.00)	8/38 (21.05)	1/32 (3.13)	1/15 (6.67)	0/31 (0.00)	10/241 (4.15)	2/208 (0.96)	1/97 (1.03)	0/173 (0.00)
Aleuts												
Umn. II	6/12 (50.00)	1/7 (14.29)	0/2 (0.00)	0/4 (0.00)	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	1/1 (100.00)	6/18 (33.33)	1/11 (9.09)	0/4 (0.00)	1/5 (20.00)
Ship.	6/36 (16.67)	1/32 (3.13)	2/15 (13.33)	0/17 (0.00)	0/24 (0.00)	1/23 (4.35)	0/9 (0.00)	0/11 (0.00)	6/60 (10.00)	2/55 (3.64)	2/24 (8.33)	0/28 (0.00)
Kag.	12/261 (4.60)	2/200 (1.00)	2/100 (2.00)	4/174 (2.30)	9/120 (7.5)	6/101 (5.94)	1/51 (1.96)	5/94 (5.32)	21/381 (5.51)	8/301 (2.66)	3/151 (1.99)	9/268 (3.36)
Total	24/309 (7.77)	4/239 (1.67)	4/117 (3.42)	4/195 (2.05)	9/150 (6.00)	7/128 (5.47)	1/62 (1.61)	6/106 (5.66)	33/459 (7.19)	11/367 (3.00)	5/179 (2.79)	10/301 (3.32)

Table 57 - Periodontal Disease By Tooth Type - Individuals Under 50

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Pre-Contact Period												
Eskimos												
Kugus.	17/153 (11.11)	0/122 (0.00)	2/57 (3.51)	0/95 (0.00)	21/127 (16.54)	2/125 (1.6)	0/62 (0.00)	0/113 (0.00)	38/280 (13.57)	2/247 (0.81)	2/119 (1.68)	0/208 (0.00)
Kug.	2/18 (11.11)	0/18 (0.00)	0/5 (0.00)	0/11 (0.00)	1/31 (3.23)	0/24 (0.00)	0/8 (0.00)	0/12 (0.00)	3/49 (6.12)	0/42 (0.00)	0/13 (0.00)	0/23 (0.00)
Pig.	1/19 (5.26)	0/16 (0.00)	0/9 (0.00)	0/17 (0.00)	2/14 (14.29)	0/17 (0.00)	0/9 (0.00)	0/10 (0.00)	3/33 (9.09)	0/33 (0.00)	0/18 (0.00)	0/27 (0.00)
Tig.	5/166 (3.01)	1/118 (0.85)	0/55 (0.00)	0/110 (0.00)	6/154 (3.90)	1/127 (0.79)	0/64 (0.00)	0/120 (0.00)	11/220 (5.00)	2/245 (0.82)	0/119 (0.00)	0/230 (0.00)
Total	25/356 (7.02)	1/274 (0.36)	2/126 (1.59)	0/233 (0.00)	30/326 (9.20)	3/293 (1.02)	0/143 (0.00)	0/255 (0.00)	55/682 (8.06)	4/567 (0.71)	2/269 (0.74)	0/488 (0.00)
Aleuts												
Umn. I	4/80 (5.00)	0/60 (0.00)	1/29 (3.45)	4/59 (6.78)	8/93 (8.60)	1/65 (1.54)	1/32 (3.13)	0/52 (0.00)	12/173 (6.94)	1/125 (0.80)	2/61 (3.28)	4/111 (3.60)
Total	4/80 (5.00)	0/60 (0.00)	1/29 (3.45)	4/59 (6.78)	8/93 (8.60)	1/65 (1.54)	1/32 (3.13)	0/52 (0.00)	12/173 (6.94)	1/125 (0.80)	2/61 (3.28)	4/111 (3.60)

Table 57 - Periodontal Disease By Tooth Type - Individuals Under 50

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Bar.	0/71 (0.00)	0/59 (0.00)	0/26 (0.00)	0/48 (0.00)	0/4 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	0/75 (0.00)	0/63 (0.00)	0/28 (0.00)	0/52 (0.00)
Nix.	8/119 (6.72)	4/110 (3.64)	2/58 (3.45)	1/89 (1.12)	9/21 (42.86)	1/16 (6.25)	1/6 (16.67)	0/12 (0.00)	17/140 (12.14)	5/126 (3.97)	3/64 (4.69)	1/101 (0.99)
Utk.	0/56 (0.00)	1/44 (2.27)	0/22 (0.00)	0/46 (0.00)	0/10 (0.00)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)	0/66 (0.00)	1/52 (1.92)	0/26 (0.00)	0/54 (0.00)
Pt. H.	4/120 (3.33)	0/101 (0.00)	0/44 (0.00)	0/80 (0.00)	1/17 (0.85)	0/12 (0.00)	0/4 (0.00)	0/8 (0.00)	5/137 (3.65)	0/113 (0.00)	0/48 (0.00)	0/88 (0.00)
Total	12/366 (3.28)	5/314 (1.59)	2/150 (1.33)	1/263 (0.38)	10/52 (19.23)	1/40 (2.5)	1/16 (6.25)	0/32 (0.00)	22/418 (5.26)	6/354 (1.69)	3/166 (1.81)	1/295 (0.34)
Aleuts												
Umn. II	0/9 (0.00)	0/8 (0.00)	0/4 (0.00)	0/6 (0.00)	1/10 (10.00)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)	1/19 (5.26)	0/16 (0.00)	0/8 (0.00)	0/14 (0.00)
Ship.	7/89 (7.87)	0/67 (0.00)	1/29 (3.45)	3/48 (6.25)	0/82 (0.00)	2/60 (3.33)	2/29 (6.90)	5/54 (9.26)	7/171 (4.09)	2/127 (1.57)	3/58 (5.17)	8/102 (7.84)
Kag.	4/402 (1.00)	3/293 (1.02)	2/139 (1.44)	1/280 (0.36)	0/156 (0.00)	0/115 (0.00)	1/58 (1.72)	0/109 (0.00)	4/558 (0.72)	3/408 (0.74)	3/197 (1.52)	1/389 (0.26)
Total	11/500 (2.2)	3/36d (0.82)	3/172 (1.74)	4/334 (1.20)	1/248 (0.40)	2/183 (1.09)	3/91 (3.30)	5/171 (2.92)	12/748 (1.60)	5/551 (0.91)	6/263 (2.28)	9/505 (1.78)

Table 58 - Periodontal Disease By Tooth Type - Individuals Over 50

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Pre-Contact Period												
Eskimos												
Kugus.	5/10 (50.00)	0/8 (0.00)	0/4 (0.00)	0/8 (0.00)	0/3 (0.00)	0/8 (0.00)	0/3 (0.00)	0/3 (0.00)	5/13 (38.46)	0/16 (0.00)	0/7 (0.00)	0/11 (0.00)
Kug.	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)
Pig.	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)
Tig.	27/49 (55.10)	13/58 (22.41)	6/26 (23.08)	3/44 (6.82)	33/59 (55.93)	20/77 (25.97)	13/39 (33.33)	19/68 (27.94)	60/108 (55.56)	33/135 (24.44)	19/65 (29.23)	22/112 (19.64)
Total	32/59 (54.24)	13/66 (19.70)	6/30 (20.00)	3/52 (5.77)	33/62 (53.23)	20/85 (23.53)	13/42 (30.95)	19/71 (26.76)	65/121 (53.72)	33/151 (21.85)	19/72 (26.39)	22/123 (17.89)
Aleuts												
Umn. I	27/73 (36.99)	13/82 (15.85)	3/35 (8.57)	7/55 (12.73)	10/69 (14.49)	6/90 (6.67)	3/36 (8.33)	4/27 (14.81)	37/142 (26.06)	19/172 (11.05)	6/71 (8.45)	11/82 (13.41)
Total	27/73 (36.99)	13/82 (15.85)	3/35 (8.57)	7/55 (12.73)	10/69 (14.49)	6/90 (6.67)	3/36 (8.33)	4/27 (14.81)	37/142 (26.06)	19/172 (11.05)	6/71 (8.45)	11/82 (13.41)

Table 58 - Periodontal Disease By Tooth Type - Individuals Over 50

Sample	Maxillary Teeth M	P	C	I	Mandibular Teeth M	P	C	I	Dentitions Combined M	P	C	I
Late Pre-Contact/Contact Period												
Eskimos												
Bar.	0/3 (0.00)	0/6 (0.00)	0/3 (0.00)	0/8 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/3 (0.00)	0/6 (0.00)	0/3 (0.00)	0/8 (0.00)
Nix.	3/6 (50.00)	0/8 (0.00)	0/6 (0.00)	0/6 (0.00)	0/0 (0.00)	1/2 (50.00)	0/0 (0.00)	1/4 (25.00)	3/6 (50.00)	1/10 (10.00)	0/6 (0.00)	1/10 (10.00)
Utk.	0/3 (0.00)	0/2 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/0 (0.00)	0/3 (0.00)	0/2 (0.00)	0/0 (0.00)	0/0 (0.00)
Pt. H.	0/13 (0.00)	0/12 (0.00)	0/8 (0.00)	0/14 (0.00)	0/5 (0.00)	0/4 (0.00)	0/2 (0.00)	0/4 (0.00)	0/18 (0.00)	0/16 (0.00)	0/10 (0.00)	0/18 (0.00)
Total	3/25 (12.00)	0/28 (0.00)	0/17 (0.00)	0/28 (0.00)	0/5 (0.00)	1/6 (16.67)	0/2 (0.00)	1/8 (12.50)	3/30 (10.00)	1/34 (2.94)	0/19 (0.00)	1/36 (2.78)
Aleuts												
Umn. II	6/22 (27.27)	1/14 (7.14)	0/6 (0.00)	0/12 (0.00)	0/6 (0.00)	0/4 (0.00)	0/2 (0.00)	1/1 (100.00)	6/28 (21.43)	1/18 (5.56)	0/8 (0.00)	1/13 (7.69)
Ship.	16/41 (39.02)	2/39 (5.13)	3/20 (15.00)	4/25 (16.00)	0/24 (0.00)	0/25 (0.00)	0/10 (0.00)	0/18 (0.00)	16/65 (24.62)	2/64 (3.13)	3/30 (10.00)	4/43 (9.30)
Kag.	10/96 (10.42)	2/90 (2.22)	4/47 (8.51)	4/69 (5.80)	10/78 (12.82)	6/67 (8.96)	1/34 (2.94)	5/62 (8.06)	20/174 (11.49)	8/157 (5.10)	5/81 (6.17)	9/131 (6.87)
Total	32/159 (20.13)	5/143 (3.50)	7/73 (9.59)	8/106 (7.55)	10/108 (9.26)	6/96 (6.25)	1/46 (2.17)	6/81 (7.41)	42/267 (15.73)	11/239 (4.60)	8/119 (6.72)	14/187 (7.49)

APPENDIX E - DESCRIPTIONS OF TRAUMA AND INFECTION

TRAUMA

Pre-Contact Eskimos

#346.143-

This older male had a healed fracture through the shaft of the right 5th metatarsal. The shaft showed some thickening and bony spurring projecting inferiorly from the fracture site.

#346.145-

This older male had a well-healed fracture through the distal shaft of an unidentified right rib. The sternal end had been displaced slightly anteriorly and the shaft was slightly thickened and roughened at the fracture site.

#346.149-

This older male had sustained what appeared to be an injury to the right tibia. A wedge of bone measuring 19 x 24 mm had been displaced superiorly and posteriorly from the anterior margin of the superior articular surface of the tibia. The condyles of the tibia showed no evidence of degenerative changes subsequent to the trauma; however, the left hip joint exhibited severe arthritic changes, possibly reflecting increased use of the left leg following the injury to the right leg.

#346.156-

This older female had a healed Colles fracture of the left radius that had resulted in slight posterior displacement of the distal end and some degenerative changes to the distal articular surface. This individual also had a healed fracture through the distal shaft of the left fibula 50 mm superior to the superior margin of the distal articular surface. There was a slight bony callus at the fracture site. No arthritic changes were evident on the distal articular facet.

#346.182-

This older male had fractures through the midshaft of two unidentified but possibly adjacent left ribs. Both ribs had active periostitis located on the external and pleural surfaces of the shafts at the fracture site.

#346.192-

This older male had a healed fracture through the shaft of the right eighth rib 35 mm from the sternal end, resulting in slight displacement of the sternal end. Small spurs of bone projected superiorly and inferiorly from the fracture site.

#346.208-

This older female had a healed fracture of the right zygomatic bone, and healed fractures of both nasal bones, with slight lateral displacement of the bones to the left side of the face. In addition, this individual appears to have sustained bilateral fractures, well-healed at the time of death, of the mandibular condyles. This injury had resulted in an altered orientation of the condyles, distortion of the left coronoid process, arthritic changes to the temporo-mandibular joints and condyles, particularly on the left side, and atrophy of the mandible.

#346.211-

This older male had a well-healed fracture through the shaft of the left clavicle. The fracture was located 25 mm medial to the acromial facet. The broken ends were poorly aligned, the acromial end had been displaced inferiorly, and the maximum length of the clavicle had been reduced by approximately 6 mm when compared with the right clavicle.

#346.281-

This older male had a small, partly healed fracture through the spino-glenoid notch of the right scapula. The fracture line extended approximately 15 mm in length, and a small, bony callus was present. The superior-posterior margin of the glenoid fossa had very slight osteoarthritic lipping.

#346.282-

This middle-aged male had a healed fracture through the left clavicle. The fracture was located approximately 32 mm medial to the acromial facet. The acromial end had been displaced slightly inferiorly and the maximum length of the clavicle had been reduced by approximately 7 mm in comparison to the right clavicle. This individual also exhibited evidence of a traumatic injury to the left tibia similar to that observed in individual #346,149. A piece of bone measuring 13 x 20 mm appears to have been

displaced superiorly from the anterior margin of the superior articular surface, directly anterior to the intercondylar eminences.

#346.287-

This middle-aged male showed evidence of a healed fracture of the distal end of a proximal phalanx of the foot, resulting in some distortion of the distal end. This individual also exhibited healed fractures of the tips of the spinous processes of the first and second thoracic vertebrae. These injuries had resulted in a shortening of the processes by an estimated 10 to 20 millimetres. The spinous processes of the adjacent vertebrae were unaffected.

#346.293-

This older female had a fracture, associated with active periostitis, through the shaft of an unidentified left rib approximately 48 mm from the sternal end. Two other possibly adjacent left ribs had active periostitis but no clear evidence of a fracture. This individual also exhibited a healed fracture of the left scapula immediately inferior to the glenoid fossa. The area of attachment of the triceps muscle was somewhat distorted and the posterior margin of the glenoid fossa showed moderate arthritic pitting.

#346.296-

This young adult female had a slightly distorted left mandibular condyle and severe osteoarthritis of the left temporo-mandibular joint suggestive of trauma. Associated with these changes was periostitis on the left mandibular condyle, the medial and lateral surfaces of the left ascending ramus of the mandible, the left zygomatic bone, the left maxillary bone, and the lateral surface of the left temporal bone superior and anterior to the external auditory meatus.

#346.297-

This older male displayed an unreduced dislocation of the left mandibular condyle that had resulted in destruction of the condyle, distortion of the left coronoid process, formation of a new joint surface on the left sphenoid and temporal bones, and severe atrophy of the mandible.

#381.103-

This middle-aged male had suffered a fracture, partly healed at the time of death, through the shaft of the right first rib approximately 15 mm from the sternal end. Reactive bone was evident along the margins of the fracture.

#381.115-

This young adult female exhibited a healed fracture through the shaft of the left seventh or eighth rib 85 mm anterior to the tubercle. The fracture appeared to have resulted in the formation of a pseudarthrosis.

Pre-Contact Aleuts

#378.456-

This older female had a healed Colles fracture of the right radius that had resulted in slight posterior displacement of the distal end. Associated with this fracture was a small area of healed periostitis located on the posterior surface of the shaft 30 mm superior to the distal articular surface.

#378.602-

This middle-aged male had a healed fracture through the shaft of an unidentified right rib 35 mm from the sternal end.

#378.603-

This older male displayed evidence of a healed crush fracture of the proximal articular facet of a proximal phalanx.

#378.607-

This older male displayed what appeared to be a healed crush fracture of the distal articular facet of the right fibula.

#378.609-

This young adult male exhibited evidence of a healed traumatic injury, possibly a fracture or dislocation, to the left shoulder joint. The glenoid fossa of the left scapula showed some distortion as well as reactive bone along its anterior margin, while the superior surface of the head of the left humerus was slightly flattened.

#378.614-

This older male had what appeared to be a small, healed depression fracture in the frontal bone approximately 25 mm anterior to the right coronal suture and 12 mm superior to the right superior temporal line. The depression was shallow and did not affect the inner table. This individual also had a healed fracture of the left fourth metacarpal. The proximal end of this element had been displaced inferiorly.

#378.616-

This young adult female had a healed depression fracture in the left parietal bone approximately 15 mm lateral to the sagittal suture and 52 mm superior to the left lambdoidal suture. The depression was shallow and did not affect the inner table.

#378.617-

This older female exhibited evidence of what appeared to be severe trauma to the right hip joint, involving the pelvic bone and proximal femur. The femoral head showed distortion and destruction of bone, and the femoral neck was shortened and exhibited severe osteomyelitis secondary to the traumatic injury. The acetabulum of the corresponding pelvic bone was severely distorted, and some porous reactive bone was evident on the posterior surface of the ilium. The left pelvic bone, femur, and tibia, as well as most of the other infracranial elements of this individual were osteopenic, as indicated by their light weight.

#378.618-

This middle-aged male exhibited a small, healed depression fracture in the posterior region of the right parietal bone 18 mm superior to the lambdoidal suture and 40 mm lateral to the sagittal suture. The depression was shallow and did not affect the inner table.

#378.622-

This older male had a small, healed depression fracture in the frontal bone 45 mm superior to the left orbital margin. A second healed depression fracture was recorded in the posterior region of the left parietal bone. Both depressions were shallow and did not affect the inner table.

#378.625-

This older male had a partly healed fracture through an unidentified rib fragment 15 mm from the sternal end. This individual also had a healed crush fracture of the proximal articular facet of the left first metatarsal.

#378.641-

This middle-aged male had a moderately-sized, oval-shaped healed depression fracture in the occipital bone. The depression measured 20 x 30 mm and was approximately 3 mm in depth. The fracture had extended to the inner table of the bone, displacing a small piece of bone inward, and creating a small hole still remaining in the middle of the fracture site.

#378.643-

This middle-aged male had two shallow, healed depression fractures along the midline of the frontal bone.

#378.644-

This older male had a healed depression fracture in the frontal bone directly anterior to the right coronal suture. The depression was shallow and did not affect the inner table.

#378.652-

This older female exhibited a healed fracture through the left mandibular condyle that had resulted in a shortening of the condylar neck, slight anterior displacement of the condyle, arthritic changes to the condyle and the corresponding mandibular fossa, and slight atrophy of the left mandibular body.

#378.664-

This young adult male had a healed fracture of the right fourth metacarpal. The proximal end of the metacarpal had been displaced inferiorly.

Post-Contact Eskimos

#332.597-

This middle-aged female had two shallow, healed depression fractures in the frontal bone, one located approximately 35 mm superior to the left orbit and the other located about 28 mm anterior to the right coronal suture.

#332.633-

This middle-aged female displayed what appeared to be a healed depression fracture in the mid-region of the right parietal bone and a second, smaller depression fracture in the occipital bone 15 mm inferior to lambda.

#332.641-

This young adult female had two shallow, healed depression fractures, one in the mid-region of the frontal bone 45 mm anterior to bregma, and one in the anterior region of the left parietal bone.

#332.650-

This middle-aged female had a small, healed depression fracture in the frontal bone approximately 10 mm anterior to the right coronal suture and 38 mm lateral to the

sagittal suture. The depression was shallow and did not affect the inner table.

#333.441-

This middle-aged male exhibited evidence of gunshot trauma. A small, circular entrance wound approximately 1 cm in diameter was located in the mid-region of the right parietal bone, while a larger, irregularly-shaped exit wound was found in the left temporal bone anterior to the auditory meatus. The external margins of the latter were bevelled, and there was no evidence of healing.

#365.809-

This older male exhibited a small healed fracture in the right supraorbital torus of the frontal bone.

#365.810-

This middle-aged male had a possible healed fracture through the zygomatic arch of the left temporal bone.

#365.831-

This middle-aged female had a small, healed lesion in the anterior half of the left parietal bone that may have been the result of trauma. This individual had also sustained a fracture to the left nasal bone, resulting in posterior displacement of the inferior half of the bone.

#365.875-

This middle-aged female had two small, healed depression fractures, one in the frontal bone 25 mm anterior to bregma, and one in the anterior region of the right parietal bone. Both depressions were shallow and did not affect the inner table.

Post-Contact Aleuts

#377.808-

This older female had a healed fracture of the left clavicle 48 mm from the sternal end. The sternal end had been displaced posteriorly.

#377.814-

This older female had a healed fracture through the shaft of the right third rib approximately 65 mm from the sternal end. The broken ends showed good alignment and some bony callus still remained on the external surface.

#377.817-

This young adult male exhibited evidence of possible perimortem trauma to the right side of the cranium, affecting the right frontal, parietal, temporal, zygomatic and maxillary bones. The affected area was displaced inwardly and showed circular and radiating fracture lines, including a fracture line extending from the inferior margin of the right orbit to the alveolar margin of the first premolar. The interior of the right orbit showed considerable damage, and a small section of bone was missing from the right zygomatic arch.

#377.819-

This older female had a healed fracture through the left ascending ramus of the mandible that had resulted in considerable atrophy of both the ramus and the left mandibular body, distortion of the left mandibular condyle, and new bone formation in the left mandibular fossa. This individual had also sustained a fracture to the left zygomatic bone and to the zygomatic arch of the left temporal bone, resulting in the loss of much of the arch and part of the zygomatic bone, and a possible fracture of the nasal bones.

#377.821-

An unidentified left rib of a subadult, included with the remains of this older female, had a healed fracture through the shaft 48 mm from the proximal end. The sternal half of the rib was missing; however, the broken end of the proximal half had the appearance of a possible pseudarthrosis.

#377.834-

This young adult male had a small, healed depression fracture in the frontal bone approximately 30 mm superior to the left supraorbital margin.

#377.847-

This middle-aged male had a small, healed depression fracture in the posterior region of the left parietal bone. The depression was shallow and did not affect the inner table.

#377.849-

This young adult male had a healed depression fracture in the posterior region of the left parietal bone.

#377.852-

This young adult male had a small, healed depression fracture in the frontal bone approximately 40 mm superior to the right supraorbital margin.

#377.858-

This young adult male showed evidence of possible perimortem trauma to the left frontal and parietal bones, as well as to the occipital bone and the posterior region of the right parietal bone. The affected areas were displaced inward and showed multiple radiating fracture lines.

#377.860-

This middle-aged male had a healed depression fracture in the frontal bone approximately 50 mm anterior to the left coronal suture. The depression measured 11 mm in diameter and was an estimated 4 mm in depth.

#377.870-

This middle-aged female had a healed depression fracture in the left parietal bone in the region of the parietal eminence. The depression was shallow and did not affect the inner table.

#377.877-

This adolescent female had a shallow, healed depression fracture in the mid-region of the frontal bone 57 mm anterior to bregma.

#377.900-

This young adult male had a healed fracture of the nasal bones, as well as a possible perimortem fracture through the shaft of the left fourth rib approximately 75 mm from the proximal end. The fracture line was evident only on the pleural surface.

#377.901-

This middle-aged male had a healed fracture of the distal right fibula.

#377.902-

This young adult male had multiple fractures involving the first, second, third, seventh and tenth left ribs. The fractures had occurred through the middle or sternal shaft, and were partly healed at the time of death. The broken ends had a slightly polished appearance and were associated with active periostitis and/or osteomyelitis. The left fourth, sixth, and ninth ribs had active periostitis on the pleural surfaces of the shafts but showed no evidence of fracture. This individual had also sustained traumatic injuries to the right scapula and clavicle. One area of the scapular spine exhibited a slight depression, with bony spurs projecting posteriorly from the site, as well as a small area of healed periostitis on the posterior surface of the scapula along the suprascapular border. The fracture of the right clavicle had resulted in a thickening of the shaft at the acromial end, an overall shortening of the shaft, and the formation of

bony spurs projecting antero-laterally from the fracture site.

#377.904-

This older female had a healed fracture through the shaft of the right tenth rib towards the sternal end, as well as a shallow, healed depression fracture in the right parietal bone directly medial to the parietal eminence.

#377.908-

This middle-aged female had a small, healed depression fracture in the frontal bone approximately 15 mm anterior to the left coronal suture.

#377.913-

This middle-aged male showed a healed fracture through the midshaft of the right second rib, with good alignment of the broken ends and little bony callus remaining.

#377.914-

This older female had a healed fracture through the distal articular facet of the left fibula that had resulted in the formation of a pseudarthrosis. This individual also had a healed depression fracture in the right parietal bone along the coronal suture.

#377.923-

This adolescent male had a healed fracture of the left second rib that had resulted in slight posterior displacement of the sternal end. This individual also had a possible healed depression fracture in the frontal bone approximately 20 mm anterior to the left coronal suture and 20 mm lateral to the midline.

#377.924-

This young adult female had what appeared to be an old, healed fracture through the right mandibular body. The body was slightly thickened and a small spur of bone projected inferiorly from the inferior margin of the body at the location of the right canine. Both condyles were unaffected.

#378.399-

This older female exhibited a partly healed fracture of the left third rib. The fracture site was located approximately 40 mm from the sternal end, which had been displaced slightly superiorly as a result of the injury. In addition, this individual had a healed fracture of the left fifth rib, located about 60 mm from the proximal end.

#378.426-

This young adult female had what appeared to be two healed depression fractures in the frontal bone, one in the mid-region, and one directly anterior to the left coronal suture. The ectocranial surface of the frontal bone was very porous, and the ectocranial

and endocranial surfaces had slight periostitis, possibly reflecting inflammation secondary to the traumatic injury.

#378.447-

This comingled specimen, the left pelvic bone of an adult male, exhibited gunshot trauma. A lead musket ball measuring approximately 8 mm in diameter was embedded in the ilium 23 mm inferior to the iliac crest and 25 mm superior and anterior to the auricular surface. The shot appeared to have entered the ilium through the ventral surface, and had partially broken through to the dorsal surface. Reactive bone was present, indicating that some healing had taken place following the injury.

#378.466-

This older female had a healed fracture of the nasal bones, as well as a healed Colles fracture of the left radius, with slight to moderate arthritic changes to the head and distal articular surface.

INFECTION

Pre-Contact Eskimos

#346.182-

This older male had active periostitis on the external and pleural surfaces of the midshaft region of two unidentified left ribs. The infection appeared to be secondary to a fracture of these elements.

#346.285-

This older male had active periostitis on the frontal processes of the zygomatic bones.

#346.288-

This middle-aged female showed extensive evidence of infection involving both cranial and infracranial elements. The skull had active periostitis on the external alveolar margin of the right maxillary bone, the right greater wing of the sphenoid bone and the sqaumous part of the right temporal bone. Associated with the periostitis on the temporal bone was an erosive lesion measuring 13 mm in diameter and extending through the inner table. The mandible had active periostitis on the medial and lateral surfaces of the right ascending ramus and on the external surface of the right body. The femora, fibulae, the left tibia, humerus and scapula, the sternum, the pelvic bones, the vertebrae and ribs exhibited areas of active periostitis. A second erosive lesion measuring 18 mm in diameter was located on the ventral surface of the right pelvic bone directly posterior to the obturator foramen. The radii and right humerus and scapula were unobservable.

#346.293-

This older female had active periostitis on the shafts of three unidentified left ribs, the result of a traumatic injury to the ribs.

#346.296-

This young adult female had active periostitis on the left maxillary and zygomatic bones, on the left temporal bone superior and anterior to the external auditory meatus, on the left mandibular condyle, and on the medial and lateral surfaces of the left ascending ramus of the mandible. The infection appeared to be secondary to trauma.

#381.101-

This young adult male had active periostitis on the pleural surfaces of the fourth, fifth, eighth, and ninth right ribs and the seventh left rib suggestive of some type of

respiratory infection.

#381.104-

This older male had active periostitis on the external alveolar margin of the mandible at the location of the left second and third molars. Located directly inferior to the apices of the roots, the periostitis appeared to be the result of an abscess associated with the molars.

#381.111-

This middle-aged female had healed periostitis on the anterior midshaft of the right tibia. The affected area measured approximately 67 x 18 mm.

Pre-Contact Aleuts

#378.456-

This older female had a small area of healed periostitis on the posterior surface of the distal right radius associated with a healed Colles fracture.

#378.603-

This older male had active periostitis on the anterior surface of the right radius directly superior to the distal articular surface. This individual also had active periostitis on the medial surface of the distal half of the tibiae.

#378.604-

This older female had periostitis, possibly active, on the anterior surface of the right femur in the midshaft region.

#378.607-

This older male had active periostitis on the lateral and posterior surfaces of the distal shaft of the left femur.

#378.608-

This young adult female had partly healed periostitis on the lateral surface of the shaft of the left femur.

#378.609-

This young adult male had healed periostitis on the medial and lateral surfaces of the midshaft of the tibiae.

#378.612-

This older male had active periostitis on the scapulae, radii, pelvic bones, femora, tibiae, fibulae, three left ribs, the calcanei, three metacarpals, seven metatarsals, and

eight proximal phalanges.

#378.613-

This older female had healed periostitis on the midshaft region of the tibiae. The infection was more pronounced in the right tibia than in the left.

#378.617-

This older female had healed osteomyelitis of the right femur that appeared to be secondary to a traumatic injury involving the right hip. The head of the femur was distorted and showed partial destruction of bone. The neck was slightly shortened, and the anterior and superior surfaces exhibited extensive drainage canals. The acetabulum of the right pelvic bone was severely distorted and displayed areas of both bone proliferation and destruction. Some reactive bone was also present on the dorsal surface of the ilium.

#378.618-

This middle-aged male had active periostitis on the scapulae, humeri, radii, ulnae, pelvic bones, femora, tibiae, and right calcaneus.

#378.628-

This older female had partly healed periostitis on the midshaft region of the right femur on the medial and antero-lateral surfaces.

#378.635-

This older male had active periostitis on the lateral surface of the shaft of the tibiae. The infection was more pronounced in the right tibia than the left.

#378.642-

This older female had a small, circular patch of active periositis on the anterior surface of the distal right femur.

Post-Contact Eskimos

#332.638-

This middle-aged female had active lytic lesions involving the frontal and parietal bones. Two of the lesions had perforated the inner table of bone, while three of them were associated with porous, reactive bone.

#365.790-

This young adult male showed signs of a possible healed inflammatory lesion involving the glabellar region of the frontal bone.

#365.823-

This middle-aged female had three healed inflammatory lesions in the frontal bone. All three lesions were shallow with rounded margins and reactive bone in the centre. The cranium of this individual was extremely heavy.

#365.840-

This middle-aged female had five healed inflammatory lesions involving the frontal and parietal bones. The largest lesion was centered on the sagittal suture approximately 60 mm posterior to bregma. All of the lesions were restricted to the outer table of bone.

#365.857-

This middle-aged male had a possible healed inflammatory lesion extending along the sagittal suture of the parietal bones.

#365.874-

This middle-aged female had what appeared to be a healed inflammatory lesion on the sagittal suture of the parietal bones approximately 15 mm posterior to bregma. The lesion was smooth, with rounded margins, and did not affect the inner table.

#365.892-

This young adult female had periostitis, possibly healed, on the pleural surface of most of the shaft of the right twelfth rib.

#365.893-

This young adult female had partly healed periostitis on the medial and posterior surfaces of the midshaft, and possibly on the posterior surface of the distal shaft, of the left femur.

Post-Contact Aleuts

#377.807-

This older male had healed periostitis on the medial surface of the shaft of the tibiae approximately 12 cm inferior to the medial condyles.

#377.808-

This older female exhibited multiple active and partly healed lytic/proliferative lesions affecting the frontal bone and a number of infracranial elements. The lesions in the frontal bone were confined to the outer table. In the infracranial skeleton, the manubrium, scapulae, left ulna, and right humerus, femur, and tibia were characterized by active or partly healed lytic/proliferative lesions and/or periostitis.

#377.815-

This older female had active periostitis on the superior and inferior proximal shaft of the right fifth metatarsal.

#377.816-

This older male had several active lesions, primarily proliferative, on the left orbital roof. In addition, this individual had active periostitis on the posterior surface of the proximal shaft of the left ulna.

#377.819-

This older female displayed partly healed lytic/proliferative lesions involving a large portion of the frontal bone. Also involved were the medial surfaces of the frontal processes of the maxillary bones and the distal shafts of the right humerus, radius and ulna.

#377.826-

This infant had active periostitis on the endocranial surface of the frontal, occipital, and left parietal bones.

#377.828-

This infant had a small area of periostitis, possibly healed, on the endocranial surface of the left side of the frontal bone approximately 15 mm lateral to the midline.

#377.836-

This young adult female had healed inflammatory lesions in the frontal and parietal bones. All of the lesions were shallow with indistinct margins, and did not appear to have involved the inner table.

#377.838-

This older male had multiple healed inflammatory lesions in the frontal bone. The lesions were very shallow and were restricted to the outer table.

#377.848-

This young adult male had healed inflammatory lesions in the frontal and left parietal bones. Most of the lesions were shallow and did not appear to have affected the inner table of bone.

#377.857-

This middle-aged male had a small area of fine porosity on the ectocranial surface of the frontal bone 15 mm anterior to the right coronal suture, and slight periostitis at the same location on the endocranial surface. The lesion appeared to be active.

#377.860-

This middle-aged male had multiple, healed lytic/proliferative lesions in the frontal and parietal bones. Most lesions were shallow with the exception of two on the left parietal bone which had extended through the inner table.

#377.863-

This adolescent female had an active lesion in the frontal bone directly superior to the right frontal-zygomatic suture. The lesion, measuring 16 x 6 mm, was lytic with some reactive bone around the margins. The margins were sharp and ragged, and the floor irregular and roughened. The lesion did not appear to extend to the inner table. The right orbital roof showed very slight reactive bone.

#377.875A-

This young adult female had healed inflammatory lesions in the parietal bones in the vicinity of the parietal eminence. There appeared to be some very slight porosity on the endocranial surface of the right parietal bone.

#377.878-

This child had what appeared to be healed periostitis on the frontal and parietal bones. The periostitis was very slightly raised above the ectocranial surface, and the inner table was unaffected.

#377.879-

This child had active periostitis on the endocranial surface of the frontal, parietal, and occipital bones.

#377.887-

This child had partly healed periostitis on the endocranial surface of the frontal, parietal, and occipital bones.

#377.889-

This child had partly healed periostitis on the endocranial surface of the right parietal and right temporal bones, and in the sagittal and transverse sulcuses of the occipital bone.

#377.892-

This infant had active periostitis in the sagittal and transverse sulcuses of the occipital bone.

#377.896-

This infant had periostitis, possibly healed, on the endocranial surface of the parietal bones in the region of the parietal eminences, and on the endocranial surface of the

occipital bone.

#377.901-

This middle-aged male had partly healed periostitis extending along most of the shaft of the tibiae, and on the distal third of the shaft of the fibulae.

#377.902-

This young adult male had partly healed periostitis on the right scapula and on eight left ribs, the result of a traumatic injury. Five of the ribs had what appeared to be perimortem fractures.

#377.904-

This older female had active periostitis on the medial and lateral surfaces of the proximal shaft of the right tibia. This individual also had active periostitis on the lateral surface of the distal shaft of the femora.

#377.905-

An extra left radius included with the remains of this middle-aged female had healed osteomyelitis of the shaft.

#377.909-

This young adult male had healed periostitis on the medial surface of the midshaft of the tibiae.

#377.912-

This adolescent male had a number of healed or partly healed lesions in the frontal bone that had coalesced to affect a fairly large area of the mid-frontal region. Associated with these lesions was periostitis on the external surfaces of the right maxillary and zygomatic bones. The inner table of the frontal bone showed no evidence of involvement. In addition to the cranial changes, the distal humeri exhibited extreme pathological changes in the form of active osteomyelitis of the posterior shafts directly superior to the olecranon fossae. The affected areas extended superiorly from the olecranon fossa 88 mm in the left humerus and 105 mm in the right humerus. The osteomyelitis was accompanied by periostitis, most notably on the anterior surface of the distal shafts, and a thickening of the shafts. The proximal 50 mm of the shaft of the right ulna had active periostitis, with slight swelling and thickening.

#377.913-

This middle-aged male had active periostitis on the femora, tibiae, fibulae, and left calcaneus.

#377.915-

This older female had active periostitis on the scapulae, clavicles, ulnae, and femora.

#377.920-

This older female had active periostitis on the external surfaces of the right zygomatic and maxillary bones that was related to an extremely large abscess involving the right maxillary central and lateral incisors and canine.

#377.921-

This middle-aged male had active periostitis on the lateral midshaft of the right femur.

#377.924-

This young adult female had a small patch of partly healed periostitis on the inferior spine of the right scapula at the spino-glenoid notch.

#377.926-

This older female had an active lesion on the left orbital roof. The lesion consisted of a small, circular, shallow pit surrounded by reactive bone. This individual also had active osteomyelitis of the clavicles, right scapula, and left tibia.

#378.412-

This young adult female had active periostitis on the inferior half of the right nasal bone and on the frontal process of the right maxillary bone.

#378.413-

This young adult female had what appeared to be healed periostitis on the palatine processes of the maxillary bones, possibly representing a response to the antemortem loss of the anterior maxillary dentition. This individual also had marked resorption of the anterior alveolar margin.

#378.432-

This individual, possibly a middle-aged male, had multiple, healed inflammatory lesions in the frontal and parietal bones. Some of the lesions were well-healed, while others appeared to be in the process of healing. Several of the lesions had extended through to the inner table of bone, which was markedly porous.

#378.434-

This infant had partly healed periostitis on the endocranial surface of the parietal bones in the region of the parietal eminences, and in the sagittal and right transverse sulcuses of the occipital bone.

#378.462-

This older male had multiple healed inflammatory lesions involving the frontal, parietal, occipital, and nasal bones. The lesions were shallow and did not appear to affect the inner table. In the infracranial skeleton, all of the lower limb bones were missing with the exception of the right fibula, which displayed small areas of healed periostitis.

#378.463-

This older male had multiple healed inflammatory lesions affecting approximately 70% of the frontal bone, 50% of the right parietal bone, and several small areas of the left parietal bone. Some porosity was evident on the endocranial surface of the frontal bone along the midline and along the sagittal suture of the parietal bones. The occipital, nasal, and palatine bones were normal. In the infracranial skeleton, the tibiae showed the most severe pathological changes, displaying healed inflammatory lesions involving most of the shafts. Also affected to a lesser degree were the femora, the fibulae, the humeri, the ulnae, and the scapulae.

#378.464-

This young adult male had active periostitis on the anterior and posterior surfaces of the right maxillary and right zygomatic bones, on the external surface of the right inferior sphenoid bone, and on the buccal and lingual surfaces of the mandibular body, particularly in the chin region.

#378.465-

This middle-aged male had a possible healed inflammatory lesion in the middle of the frontal bone. The affected area consisted of slightly raised dense bone, measuring approximately 15 mm in diameter.

#378.466-

This older female had multiple healed inflammatory lesions in the frontal bone. The lesions consisted of a series of small, circular pits occurring in three clusters. The pits were shallow and were surrounded by reactive bone.

#378.467-

This older female had multiple, partly healed lytic/proliferative lesions in the frontal, zygomatic, maxillary, temporal, and nasal bones, and in the mandible.

#378.469-

This young adult male had what appeared to be healed periostitis on the palatine processes of the maxillary bones, possibly representing a response to the antemortem loss of the anterior maxillary dentition. This individual also had marked resorption of

the anterior alveolar margin.

#378.470-

This middle-aged female had multiple healed lytic/proliferative lesions in the frontal bone and in the anterior surface of the left zygomatic bone. The clavicles had small areas of active periostitis at the acromial end of the shaft. The right tibia had active periostitis on the medial surface of the proximal third of the shaft, while the left tibia had periostitis on the anterior and medial surfaces of the midshaft.

#378.471-

This young adult male had a healed lytic/proliferative lesion in the anterior surface of the left zygomatic bone. There was also some reactive bone on the posterior surface of the zygomatic bone at the same location.

#378.476-

This older male had healed inflammatory lesions in the frontal and parietal bones. The lesions did not appear to have affected the inner table.

#378.481-

This older male had healed inflammatory lesions in the frontal and right parietal bones. The lesions were very shallow with indistinct margins, and were restricted to the outer table. In addition, this individual had what appeared to be reactive bone, possibly active, on the basilar part of the occipital bone.

#378.483-

This young adult female had healed inflammatory lesions in the parietal bones. These lesions were most pronounced in the right parietal bone. The endocranial surface of both parietals exhibited some porosity.

#378.484-

This young adult female had what appeared to be multiple, healed inflammatory lesions in the frontal bone. The lesions were shallow, with rounded margins. Unrelated to this condition was a possible congenital or developmental defect, which had resulted in an abnormal facial morphology.

#378.485-

This middle-aged male had multiple healed lytic/proliferative lesions in the frontal and parietal bones. The lesions in the parietal bones had progressed through to the inner table.

#378.501-

This child had partly healed periostitis on the external alveolar margin of the

maxillary molars. This individual also had slight periostitis on the endocranial surface of the frontal, parietal, temporal, and sphenoid bones.

#378.510-

This infant had active periostitis on the endocranial surface of the frontal, occipital, temporal, and left parietal bones.

#378.512-

This infant had active periostitis on the endocranial surface of the parietal bones.

#378.513-

This infant had active periostitis on the endocranial surface of the frontal and parietal bones.

#378.515-

This infant had active periostitis on the endocranial surface of the frontal, parietal, and occipital bones.

#378.516-

This infant had active periostitis on the endocranial surface of the frontal, parietal, and occipital bones.

#378.517-

This infant had active periostitis on the endocranial surface of the occipital bone running along the transverse and sagittal sulcuses.

#378.518-

This infant had active periostitis on the endocranial surface of the occipital bone.

#378.520-

This child had active periostitis on the endocranial surface of the frontal and occipital bones.

#378.521-

This infant had partly healed periostitis on the endocranial surface of the frontal, occipital, and right parietal bones.

#378.543-

This middle-aged male had active periostitis on the pleural surface of the right third to eleventh ribs, possibly indicative of a respiratory infection. In all of the affected ribs, the periostitis was located on the distal third of the shaft.

#378.544-

This older male had active periostitis on the anterior and posterior surfaces of the sternal end of the right clavicle. This individual also had a small area of periostitis on

the posterior surface of the coracoid process of the right scapula, and on the anterior and posterior surfaces of the left scapula medial to the glenoid fossa.

#378.606-

The frontal bone of this older female was characterized by multiple healed lytic/proliferative lesions over most of the external surface. The inner table was unaffected with the exception of slight porosity. Circular lesions surrounded by reactive bone were also noted on the roof of both orbits. The parietal bones had multiple lytic/proliferative lesions, some of which appeared to be active, covering more than half of the external surface. The lesions had extended through the inner table in four locations and were associated with porous, reactive bone on both the outer and inner tables. The mandible had a thin layer of active periostitis on the medial and lateral surfaces of the right ascending ramus and on the lateral surface of the left coronoid process. All other cranial bones, including the occipital, nasal and palatine bones, appeared to be normal. In the infracranial skeleton, partly healed lesions were noted on the pleural and external surfaces of the shafts of four right ribs, three left ribs, and several rib fragments. The clavicles had active periostitis at the acromial and/or sternal ends, the right clavicle showing more pronounced infection. The left humerus had a small area of active periostitis on the anterior surface of the shaft directly superior to the trochlea. Small, circular lesions in the olecranon process of the right ulna, in the auricular surfaces of the pelvic bones and sacrum, and in the left calcaneus may be part of the same disease process or may have occurred postmortem.

#378.679-

This older male showed areas of periostitis, some active and some healed, on the anterior surface of the right zygomatic bone extending along the orbital margin, and on the posterior surface extending along the zygo-temporal suture. As well, a number of small patches of periostitis were noted on the outer table of the frontal bone. The inner table was unaffected. No infracranial remains were associated with this individual.

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