Queen's Economics Department Working Paper No. 1231

Resources, Trade, and the Aboriginal Population: Lessons from the 1780s Smallpox Epidemic in the Hudson Bay Region

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6-2009

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Preliminary: not to be quoted

Conjectures, assumptions and assertions surround the debate on the size of Native American populations just prior to European contact. Current estimates for North America north of the urban civilizations of central Mexico range from a low of 1,041,480 argued by Kroeber to Dobyns' estimate of 18,022,006 (Ramenofsky 1987: 7). A consensus view would put the estimate in the range of six to twelve million people. A critical implication of these estimates relates to the impact on native peoples of the diseases brought by the first Europeans. During the years after Europeans came to North America there are early estimates of aboriginal populations based on contemporary observations of native settlements. Prior to contact, the main source for population is the archeological evidence, which depends on the number and extent of excavation and thus has the potential of underestimating the numbers. For the more immediate post-contact period there are some estimates of aboriginal populations based on the observations of contemporaries about the size of native settlements. There is, as well, a literature that has tried to infer population size from the nature of their agricultural and hunting activities and flora and fauna that were available to them (for example, Dobyns 1983; Ramenofsky 1987). In the past century and half, we have direct census counts. Irrespective of initial population size, there is a growing understanding that the arrival of Europeans had serious consequences for Native American population. In fact, a consensus view has emerged that whatever the initial numbers, the coming of Europeans was devastating to the Native American populations, particularly in the more southerly latitudes.

It is generally agreed that, although their impact in Central and South America was severe, disease and war had less of an effect on native populations in the northern part of the temperate zone. And in the subarctic region, where population density was low and the climate not conducive to the spread of disease, the impact may have been still less. Nevertheless even in areas as far north as the Hudson Bay basin natives did not escape

entirely the ravages of smallpox, measles, tuberculosis and other diseases, formerly unknown. In this paper we explore the impact of one of the earlier epidemics to hit natives living in the Hudson Bay drainage basin: the smallpox outbreak of 1780-82. We review contemporary descriptions of the epidemic and how Europeans at the time viewed its impact on the native population of the region. We then explore the impact of the epidemic using three approaches. First, we summarize the experience with other smallpox outbreaks including those among so-called "virgin soil" populations. Next we place the epidemic in the context of the furt trade of the region; and finally, we suggest a measure of the population decline based on backward projections of later population estimates and the likely pre-epidemic population given the carrying capacity of the region in terms of large game. Our results for this particular epidemic, as we argue in the concluding section, may have broad implications for the interpretation of pre-contact aboriginal populations and the impact of European-carried disease.

The Smallpox Epidemic of 1780-82

The first major epidemic to affect natives trading in the Hudson Bay region appears to have been transmitted by the Sioux 1780 and 1781 by way of trading villages along the upper Missouri River.[1] By the fall of 1781 the disease vector had reached Assiniboin who were trading at Cumberland House and Hudson House, interior collection points that the Hudson's Bay Company had established in the late 1770s to help compete with the mainly French traders from the East. Cumberland House and Hudson House and supplied furs to the company's main trading post, York Factory (see Figure 1). In fact the most direct knowledge we have of the epidemic in this region comes from journal descriptions by the traders at these outposts. Although the smallpox epidemic had apparently been raging in the northern plains

for more than a year, it was not until December 1781 that there is any indication in the post journals that it was affecting the York Factory trading hinterland. In early December, a very sick Indian women arrived at Cumberland House, apparently with the disease, and on December 11th the post "received news of many Indians dying." (Rich 1952) The traders at Hudson House, located somewhat further in the interior and along the path of the disease, first learned of the epidemic about a week earlier.[2]

After being absent from the post journals, smallpox and its effects were beginning to dominate the reports. And the impact is described as devastating. William Walker, clerk at Hudson House, heard that smallpox was "carrying all off before It;" and cases were noted where all or nearly all in some groups had succumbed. Thus on December 4th, it was reported that not far from the post there were "nine tents of Indians all Dead." (Rich 1952) And according to the journal entry December 24th, smallpox was "now spreading over the Whole country." Arthur Ray has used these to map the progress of the smallpox epidemic (see Figure 2). On January 2nd, 1782, four Indians from Le Pas, which was west of the disease vector, "had not heard of the disorder;" but by the 25th of the month "many sick Indians [were] arriving" from that location. On February 19th Cumberland House was told that in some tents near Le Pas, all the Indians were dead and that one-third of the Piegan Indians had died. There was a report on March 23rd that all in a group of ten tents in the Swampy River area (to the south) were dead.

Based on the journal entries at least, it appears that the epidemic had largely run its course by the spring of 1782. Thus the outbreak in this area appears to have lasted about five months, from November 1781 to March or April 1782. As of that time smallpox does not appear to have spread further towards York Factory. On March, 1st 1782 five men and three women arriving from further north had heard nothing of the disease. But in later years

natives who had apparently recovered or were recovering from smallpox were reported in the vicinity of York Factory.[3]

The smallpox epidemic of 1780-82 clearly devastated some native settlements. But what was the impact on the overall population of the region, and especially the population of those groups along the disease vectors. Samuel Hearne, who had been at York Factory and later became Chief at Fort Churchill, reported based on what the native traders had been told him that mortality may have been 90 percent (Tyrell 1934: lx). David Thompson, who travelled in area four years later and saw signs of the epidemic's aftermath, gathered from what he was told by the Europeans witnesses, natives and the number of remaining tents that about three-fifths of the population had died (Glover 1952: 236). And York Factory's journal entry of July 2nd 1782 reported devastation among several tribes in the region: "not one in fifty of those tribes are still living." (HBC, *Post Journals: York Factory*: B87/a/5-9). These reports by contemporaries have the benefit of being based on first-hand accounts of the natives who visited the posts, but the observers would necessarily have had at best a partial picture and would have been extrapolating from their experience or that of others. Certainly there were no actual counts of deaths.

Variola and Mortality

There are numerous studies of the case fatality rate from smallpox or variola of which there a several varieties. *Variola major*, the more severe class of the disease, would have been the form of smallpox that afflicted America in the eighteenth century; but within that class a wide range of case-fatality rates have been reported. A twentieth-century study of an unvaccinated population in rural India found fatality rates of 62 percent for *confluent ordinary-type smallpox*, 37 percent for *semi-confluent ordinary-type smallpox*, and 9 percent

for *discrete ordinary-type smallpox* (Fenner et al.1988: 22). A study of smallpox in six states of India during the 1970s found a case-fatality of 26 percent among the unvaccinated subjects with significant variation by age (Fenner et al. 1988: 176). Rates were highest in the 0-4 group at 46 percent, and 30 percent for those aged 40 or more. Among the age group most relevant to the fur trade, 15-39, the fatality rate was 21 percent. The relatively low mortality among adults under 40 in India is at considerable variance with the Native American experience at least as described in the contemporary accounts. The post journals and correspondence report that adult males in the region of Hudson Bay were the hardest hit.

We do not know of which sub-type was the smallpox epidemic of the eighteenth century. Given the wide variation in later smallpox fatality rates, the strain of smallpox that afflicted North America in the late eighteenth century could have had important implications for the mortality of the native (and European) populations. In the 1721 outbreak in Boston the death rate was 15 percent among those who contracted smallpox naturally, indicating perhaps that the sub-types of smallpox that characterized the epidemics were not the most virulent (Fenn 2001: 33). The case-fatality rates we have for the recent past are clearly the most reliable; in the eighteenth century European deaths were certainly more accurately reported than those in the aboriginal communities. At the same it can be inappropriate to infer too much given that we are dealing with a "virgin soil" epidemic, which typically led to higher mortality than epidemics among previously exposed populations.[4] There is also speculation that as a result of the thousands of years of isolation Native Americans were not genetically selected to survive smallpox and other infections, due to their lack of diversity in immune system antigens (Fenn 2001: 26). But as Fenn points out, this lack of diversity was likely more of an issue in measles than smallpox; and Crosby (1976: 291-92) is sceptical of a genetic explanation. On the other hand Ramenofsky (1987: 160-62) warns against inferring

too much about earlier experiences, especially the experiences of Native Americans, from recent the recent past.

Other factors that could have significantly affected mortality were the nature of the treatment and the circumstance of the victims. Observers noted the practice of the sweat lodge would have increased the fever associated with the early stage of the disease when mortality was greatest. On the other hand some responded to their fever by jumping into cold streams which according to a fur trader, caused "instant death," but in fact may have been an effective way of reducing fever. In any case, and as Fenn points out, it is not at all clear that for those who had contracted the disease, the treatment Europeans typically received was better than the (lack of) treatment for the natives.

Another possible contributor to greater mortality was the dependence of the population on hunting. A long period of forced inactivity or reduced activity opened up the greater chance of starvation, and increased their susceptibility to other illnesses due to insufficient nourishment. There are accounts of the increased numbers of Indians arriving at trading posts hungry because of the effects of the disease; but overwhelmingly the reports imply that it was during the course of the disease that victims would die. And this most likely would have occurred between the tenth and sixteenth day of onset. Moreover, although the scabs left by the pox the soles of feet might have continued to affect mobility, much of the impact of the disease on productivity would have largely dissipated after a month. Of course even a month of inactivity could have serious consequences for both the hunters and their families.

Mortality from the 1780-82 Smallpox Epidemic and the Trade Records

Given the nature of smallpox and the more recent evidence on how it affects diverse

populations, one might be sceptical of the mortality rates of 60 percent and higher reported in the contemporary accounts. As one alternative to the reports and population estimates for the region of Hudson Bay, we approach the epidemic and its impact by focussing on the trade statistics. In the mid-1770s the Hudson's Bay Company set up two trading houses designed to serve York Factory and help the company compete with the Montreal traders who were an increasing presence in the region. Cumberland House and Hudson House, located in the interior several hundred kilometers from York Factory (see Figure 1), generated a trade comparable to the volume York Factory was receiving from the rest of its hinterland. The area served by the two Houses was in the direct path of the smallpox epidemic (see Figure 2), and one would expect any decline in the native population, especially because it was the adult males who were said to be most affected, to have been reflected in the trade returns.

Neither Cumberland House nor Hudson House kept separate accounts. We do have their journals, but these provide no more than a rough indication of the magnitude of their trade. Better are the accounts of the main trading post, York Factory. Its records include all the furs received by the post; but more importantly, in terms of assessing the extent of the trade at its collection points, the accounts give a detailed list of the trade goods sent to Cumberland House (and Hudson House) each year both before and after the smallpox outbreak. As shown in Figure 3, the volume of trade goods sent in 1777 was relatively modest at 6,060 *made beaver* (*mb*) , not surprising given that the two sites had just been established.[5] But activity increased dramatically, peaking at 11,770 *mb* in 1781, the year before the epidemic struck the region. Of course central in terms of inferring the impact of the epidemic on the aboriginal population is what happened after 1781.

There is no question that the epidemic year itself was devastating to the fur trade of region. Hardly any natives arrived at the posts, and those who did come brought few furs.

The House journals comment on the virtual disappearance of the trade and the York Factory accounts are consistent with the traders' descriptions. Realizing that few additional trade goods were needed, York Factory sent just 800 *mb* that year. There was very little trade the following year as well, although in this case the reason may have been political as much as environmental. The region had entirely escaped conflict during the Seven Years' War of 1756 to 1763, but the involvement of the French in the American Revolution spilled over into the Hudson Bay region (see, for example, Rich II 1960: 84) . In 1782, Comte de Lapérouse set out with a 74-gun ship and two frigates to capture the main English posts. On August 8th he took Fort Churchill and two weeks later York Factory. There was no resistance from the English in either case, but both posts were severely damaged by the French, although not completely destroyed. Still, it was nearly a year before the Company could re-establish trade at York Factory and Fort Churchill.

Despite the temporary loss of York Factory, the inland Houses continued to trade from their inventory. The Cumberland House journal entry of June 20, 1783 reports that 115 bundles of furs in ten canoes were sent to York Factory. At roughly 50 *mb* per bundle, the trade of close to 6,000 *mb* is an indication that activity was already beginning to recover. But much more revealing is what happened after York Factory became operational and resumed sending trade goods to its inland collection points. In 1784 deliveries totalled more than 6,850 *mb*, and in 1785 the value of trade goods, at 9,400 *mb*, was more than in any year other than the peak of 1781. Following 1785 the trade continued to increase, and in 1787 it surpassed that of any previous year. Even recognizing that some of the trade goods sent after 1783 were needed to replenish inventories and there may have been some change in the price of furs, it seems inescapable that the natives were bringing greater numbers of furs to the post, and this was after an epidemic that was claimed to have decimated the population, and even

more so the segment of the population, adult males, who were the main participants in the fur trade.

To highlight the change in trade before and after the epidemic, we compare the trade goods sent from York Factory to Cumberland House in 1781 and 1785 (see Table 1). Although 1785 was just three years after the epidemic had swept through the region, and just under three years since the York Factory post had been sacked by the French, trade in the region was already recovering. There is a lot of variation by commodity but two in particular likely give a good perspective on the size of the trade, since it is unlikely these goods would be been stored for a long period. In 1785, 448 gallons of brandy were sent to Cumberland House as compared to 675 gallons in 1781, a decline of one-third. Meanwhile the shipment of tobacco, another important trade good fell by 15 percent, from 2,348 lbs to 2,007 lbs. Overall trade declined by a roughly corresponding amount. At the official *made beaver* prices of the trade goods, the total value of shipments declined by 20 percent, between 1781 and 1785, from 11,769 *mb* to 9,401 *mb*. Such a reduction in trade seems totally out of line with claims that the population of native hunters during this period had fallen by 60 percent or more. And even the 20 percent reduction in the volume of trade goods may have been due as much to the disruption caused by the French as the change in the native population. Just three years later, in 1788, York Factory sent 13,856 *mb* in trade goods to Cumberland House, or nearly 20 percent *more* than the value of goods sent in 1781. We do not mean to suggest that the number of native traders was unaffected by the smallpox epidemic; rather that the pattern of trade in an area that was in the path of the epidemic indicates that the claims about mortality have been exaggerated.

The Smallpox Epidemic and Population Estimates

The volume of trade after 1782 at Cumberland House and Hudson House belies the contemporary reports that sixty percent or more (perhaps even nine-tenths!) of the native population in the region were felled by smallpox. Given, however, that such factors as a changing fur resource base, the degree of competition from the French traders, and the size of the hinterland served by the Houses also could affect the trade, it is important and ultimately perhaps more useful to deal directly with the issue of the native population during this period.

Our approach, at least in the first instance, follows much along the lines of Ray (1974: 94-116). Some European travellers to the region described the native settlements they visited and often included a commentary on the number of tents. These reports include the years preceding and following the smallpox outbreak. For the early nineteenth century we have, notably, Alexander Henry the Younger's breakdown for the Assiniboin groups, many of whom were in the direct path of the disease. In 1808, which was twenty-six years after the epidemic, Alexander Henry put the total for eleven different groups of Plains Assiniboin at 850 tents (Coues II 1897: 522-23). Assuming eight to ten persons per tent, the population of these Assiniboin groups was 6,800 to 8,500. We do not unfortunately have similar detail for the earlier years including those prior to 1782. In 1776, Alexander Henry the Elder gave a rough estimate of 300 tents for the Plains Assiniboin, or just 35 percent of the later estimate. Even had there been no epidemic this number would be implausible given the implied annual population growth rate of nearly 5 percent. It seems clear that especially in comparison to the later figure, the count was incomplete. In fact elsewhere Henry (the Elder) wrote: "The Osinipoilles [Assiniboin] have many villages composed of from one to two hundred tents each." (Henry 1969: 303) The statement that there were 300 tents is clearly based on general impressions rather than direct observation. In fact this latter statement about the number of villages suggests that the Assiniboin population in the region may have been closer to the

more complete estimate of thirty-two years later.

Given that the main eighteenth-century reports on native settlements seem so incomplete and vague, we approach the question of native population and the impact of the smallpox epidemic in a way that relies on information that is more firmly based. We take the population estimate of Henry the Younger and project it backwards to just after the epidemic. We then compare that projected value to an estimate of the pre-epidemic population which we base on the carrying capacity of the region. For the sub-arctic, Roger and Smith point out that during the winter adult males would have required 4,500 to 5,000 calories per day; and although less were needed at other times, they put the average *daily* requirement for these hunters at a minimum of four pounds of flesh food. Moreover, because a high fat content was necessary, the requirement had to be met mainly from the meat of big game. The native population was therefore limited by the population of the large ungulates.

To explore the implications of the calorie requirement and the main sources of these calories, we initially consider a population reliant on caribou. G.R. Parker studied the Kaminuriak barren-ground caribou, whose total range is 109,000 square miles (Parker 1972:13). The region includes part of the hinterland that was served by Fort Churchill, but it is generally north of what was the Hudson Bay Company's main fur trading area. Historical reports of the entire barren-ground caribou population range has high as 3.5 million (p.17), but in Parker's study area, the greatest number reported was in 1955 at 149,000, although he argues that this figure is well below earlier levels (p.88). One estimate puts caribou density at five per square mile of productive land (p.89). If this figure represents what might be considered the biological optimum, then in the Kaminuriak area, the caribou population that could have supported the greatest human population on a sustained basis was about 550,000. Given fertility rates and mortality from other causes, the sustainable kill could be no more

than 5 percent of this number (Carlos and Lewis 2004: 340), giving an annual harvest of 27,500. There are a range of estimates of human requirements, but Parker sees 150 caribou as reasonable for a family relying exclusively on that game. Parker's estimate includes an allowance for dogs, and excludes other sources. If we take, instead, an allowance (per male adult) of 3 pounds per day, then an annual requirement of 50 caribou per family seems more plausible.[6] The implied maximum human population that the region could support is 550 families, or 2,750 individuals, giving a human population density of one person per 40 square miles. A population density of one person per 40 square miles is at the top of the (approximate) range given by Rogers and Smith (1981:141) for the entire sub-arctic region.[7] The result seems reasonable given that much of the sub-arctic was less productive than the Kaminuriak area.

The York Factory hinterland, which is the focus of our study, would be expected to have a maximum population density at least as high as the area studied by Parker. Until the 1770s the post served a hinterland of about one million square kilometers (386,000 sq. miles); so at one person per 40 square miles the region could have had a pre-epidemic population of at least 9,650. The area serviced by the two interior posts was undoubtedly smaller than this, although by 1780 the trade had extended to the foothills of the Rockies and also further south. What appears to be the most reliable of the early population estimates for this region were those made by Alexander Henry the Younger in 1808 for the Assiniboin. His breakdown included eleven sub-groups of Assiniboin which totaled 850 tents. At an average of nine per tent, the implied population was 7,650. At eleven per tent , the number assumed Peter Fidler in the early nineteenth century and reported by Demollie and Miller (1981: 590), the population was 9,350. In the early nineteenth century the Assiniboin occupied a territory of about 160,000 square miles (Ray 1974: 101). The implied population density was therefore

between one person per 21 and 17 square miles. These densities are about twice the high end (one person per 40 square miles) of the estimated carrying capacity of the sub-arctic region. It should be noted, though, that population densities would certainly have been higher in the plains regions.

Even though population densities were higher in the plains, but in the northern region occupied by the Assiniboin, who were hunter gatherers, it seems unlikely that densities could have been much greater than one person per 20 square miles, the approximate density in 1808. As noted, we do not have similarly complete estimates for the pre-epidemic years, but given the likely carrying capacity of the region in terms of large game, the Assiniboin could hardly have numbered much more than 8,000 prior to the smallpox outbreak of 1780-82. We do not know how fast the native population was growing following the epidemic; but increases in population with life expectancies typical of the time might have been as high as 1 percent per year.[8] Assuming this rate, and applying Alexander Henry's 1808 estimate of 850 tents, or a population of 7,650 to 9,350, the Assiniboin population immediately following the smallpox epidemic was likely between 5,900 to 7,200. The implied mortality from a pre-epidemic population of 8,000 is therefore 10 to 26 percent. We take the higher figure as an upper bound estimate of the impact of the smallpox outbreak in this region.

Interpreting the Epidemic

Our conclusion that the smallpox epidemic of 1780-82 led to mortality of between 10 and 26 percent is contrary to nearly all that has been written, both by contemporary observers and historians. Given that we have no reliable population counts for the pre-epidemic period any such iconoclastic result should be viewed, quite appropriately, with scepticism. At the same time, it is important to recognize that much of the alternative narrative is based on

evidence that is less than firm. Statements by the English about mortality were in fact their interpretation of what the Assiniboin, Ojibwa, and other groups were telling them. For example, Samuel Hearne the chief trader at Fort Churchill thought that nine-tenths of the Indians in the hinterland of the post had died. Given how far removed Fort Churchill was from the path of the epidemic, this impression could only have come from the statements of the natives who came to the post, many of whom may not have even been living in the main areas hit by the disease. The entry in the York Factory journal for July 2, 1782 includes the claim that among natives who had been living in the La Pas area "not one in fifty of those tribes is still living." Again this report could only have been based on the Governor's impression of what those Indians coming from the interior were saying.

Mortality rates of 90 or 95 percent for the overall region have generally been discounted, but other more modest estimates by contemporaries suffer from the same problem in that they are based neither on death counts or on clear comparisons of pre- and post-epidemic native populations. David Thompson, who traveled widely in the region, but only after the smallpox outbreak, gives 60 percent as the possible mortality. This estimate comes in part from Mitchell Omam, one of the Company's interior traders, who accompanied Thompson in 1786. From what the natives told Omam and what he observed about the number of tents that remained he told Thompson that "it appeared about three-fifths had perished (Glover 1962: 236)." Thompson also talked about seeing tents in vicinity in which the natives "were all dead." Clearly these eye-witness accounts are testimony to a disease that killed many. Still, the lack of anything approaching firm numbers calls for alternate approaches.

The accounts relating to Cumberland and Hudson Houses have the advantage of providing clear measures of the pattern of trade over a period that includes the smallpox

outbreak, which allows us to make inferences about the impact of the epidemic. Assuming a standard harvest function:

$$H = H(E, X), \tag{1}$$

where H is the harvest, X is the population of fur-bearing animals (mainly beaver), and E is harvesting effort, observations on the size of the harvest can shed light on the extent of harvesting effort and, by extension, the number of people involved in the trade. We have suggested a reasonable effort elasticity for beaver of 2/3.[9] Assuming this elasticity, a sixty percent decline in effort, reflecting the reported decline in population, would have reduced the harvest for a given animal stock by more than 45 percent. Allowing for some growth in the animal population due to the temporarily lower harvest gives a somewhat smaller decline of 40 percent.[10] Prior to the smallpox epidemic, the value of trade goods sent from York Factory to Cumberland House peaked in 1781 at 11,770 *mb*. A reduction in the harvest of 40 percent would have been expected to reduce the trade to about 7,000 *mb*. This in fact approximated the value of goods sent in 1784. But in 1786 11,000 *mb* in trade goods were sent, and the value of trade goods sent in 1788 was nearly 14,000mb, roughly double what might have been expected if the reports of mortality had been even approximately true.

Implications and Conclusions

Despite the claims of contemporaries and the interpretation of historians about the smallpox epidemic of 1780-82 in the Hudson Bay region, the three approaches to smallpox mortality used in this paper lead to broadly similar conclusions that are in sharp contrast to the generally accepted view. There is a long history of variola in its various forms, some more virulent than others, but in no case where numbers are reliable did case fatality rates begin to approach the sorts of mortality claims made in the literature, and this includes rates for "virgin

soil" populations. In areas of rural India, where the population had no previous exposure to smallpox, case fatality rates for the adult population under age 40 were found to be on the order of 20 percent. If this rate is at all reflective of what Native Americans might have experienced, then the overall mortality of such a dispersed population as that of the sub-arctic and far northern plains could very well have been in the range of 10 and 26 percent.

Our second approach to mortality is to examine the trade at the Cumberland and Hudson outposts, which were in the direct path of the epidemic. The volume of furs brought to these sites was entirely dependant on the native adult male population. It seems inconceivable that a large decline in that population would not have been reflected in their trade returns. In 1782, the year smallpox passed thorough the region, the trade at these posts did indeed collapse, but apparently not because of native mortality. Rather it appears that fearing the effects of the disease and limiting their efforts to hunting game rather than obtaining the luxuries associated with the fur trade, natives in the area concentrated on ensuring their survival. Had a decline in native population been the reason for the loss in the trade, the effects would have been long-lasting. Instead the volume of trade, as reflected in the goods sent by York Factory, exceeded within six years the peak of the trade prior to the epidemic.

Finally we indicate mortality on the basis of a backward population projection and the carrying capacity of the land in the region. We have for the Assiniboin what appears to be a careful population estimate for 1808. By assuming a relatively high annual growth rate of 1 percent, we derive estimates of the human population in 1782, just after the epidemic passed through the region, of 5,900 to 7,200. Next we derive what is arguably an upward biased estimate of the population just prior to the smallpox epidemic. Appealing to the carrying capacity of the land in terms of large game, we suggest a plausible maximum human

population given that natives at this time were reliant on large game. At a density of not much more than one person per 20 square miles and an area of 160,000 square miles, we argue that the population of Assiniboin prior to the smallpox outbreak, 8,000, was not very much above, perhaps 10 to 26 percent above, what it was after the disease struck the population.

Undoubtedly natives in the region died of smallpox; the contemporary accounts on this score are indisputable. What is in question is how widespread was smallpox in terms of the numbers contracting the disease and how lethal was the disease to those affected. Our finding is that the smallpox epidemic of 1780-82 in the sub-arctic and far northern plains had a modest impact on the native population. It may be premature to be drawing broader implications from this finding. Indeed the finding itself is preliminary. Nevertheless, our result suggests that claims of widespread devastation from this disease outbreak deserve a second look. More broadly, the indication that few natives died as a result of this smallpox outbreak has implications for the size of native populations prior to the coming of Europeans and how contact affected that those populations and native society.

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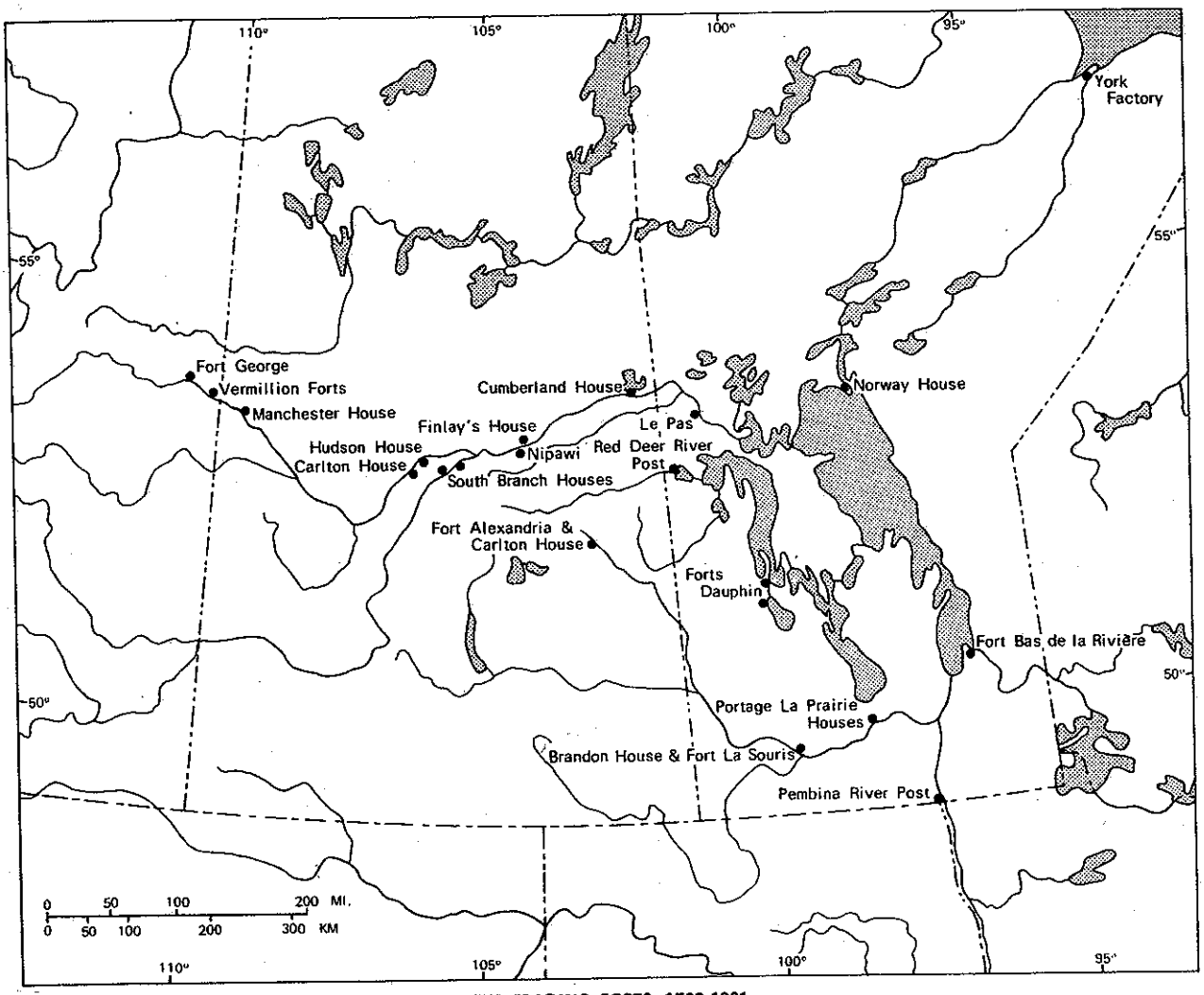
Table 1
Trade Goods Sent from York Factory to Cumberland House, 1781 and 1785

Trade Good	1781	1785		1781	1785
awl blades	288	26	kettles	52	61
baize (yds)	20	71	knives	1,830	1,818
bayonets	204	126	lace (yds)	180	
beads (lbs)	39	28	looking glasses	40	48
blankets	86	43	needles	388	504
brandy (gals)	675	448	net lines	6	12
buttons	24	37	pistols		10
cloth - various (yds)	1,316	761	powder (lbs)	1,308	934
combs	84	100	powder horns	7	9
duffel (yds)	172	48	rings		516
files	66	144	rundlets	31	53
fish hooks	160		scrapers		10
flints	3,000	2,000	shirts	68	125
gartering (yds)		836	shot (lbs)	2,416	1,240
gun worms	144	288	stockings		24
guns	60	99	thimbles		24
hatchets	288	211	thread	3	6
hats	8	21	tobacco (lbs)	2,348	2,007
hawk bells	216	500	tobacco boxes	30	57
ice chissels	202	80	vermilion (lbs)	14	10
Total - *made beaver*				11,769	9,401

Source: HBC, *Post Accounts: York Factory,* 1781,1785.

Figure 1. Fur Trading Posts in the York Factory Trading Region

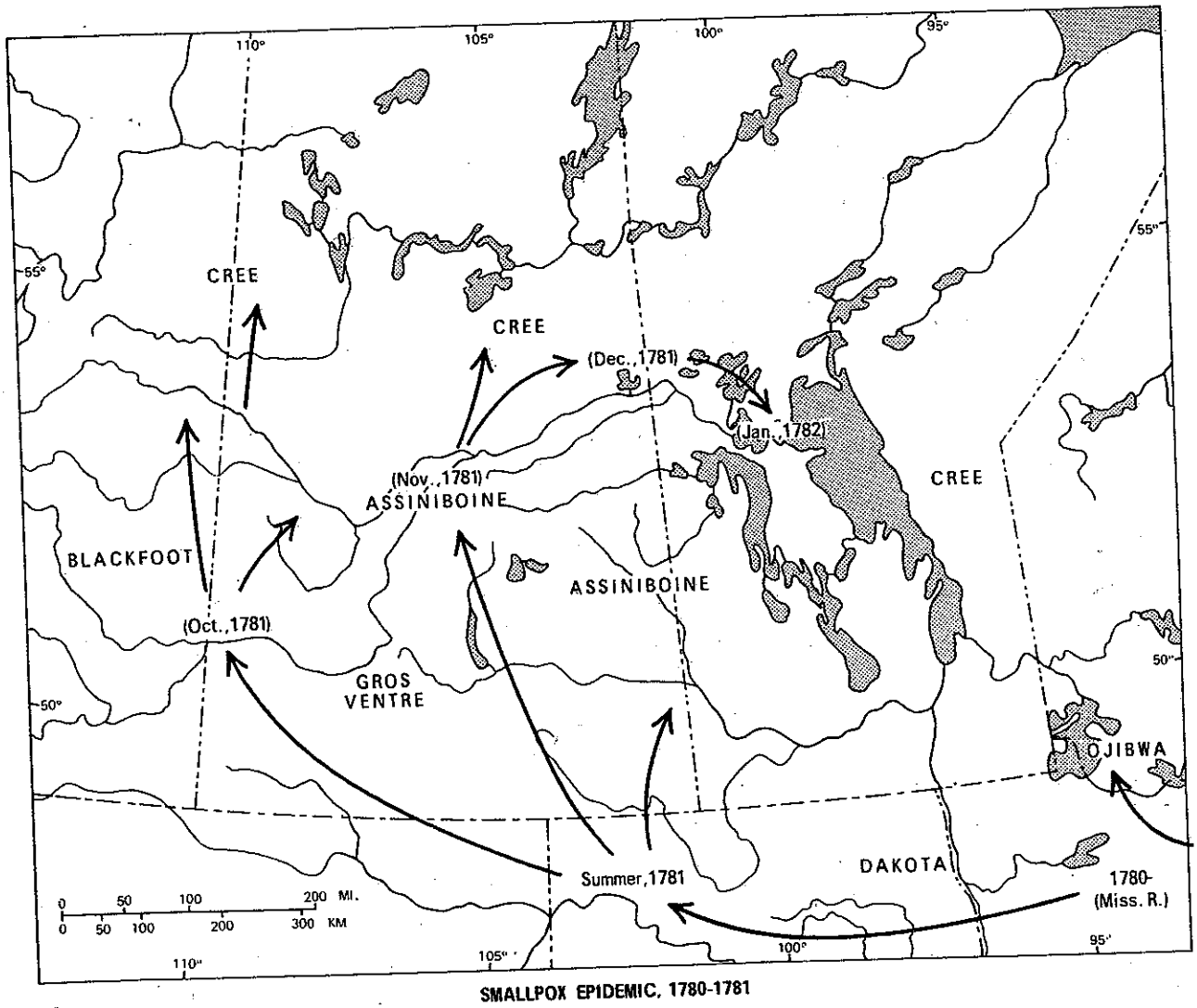
Source: Ray (1974: 127).



FUR TRADING POSTS, 1763-1821

Figure 2. The Path of the Smallpox Epidemic in the Hudson Bay Region

Source: Ray (1974: 107).



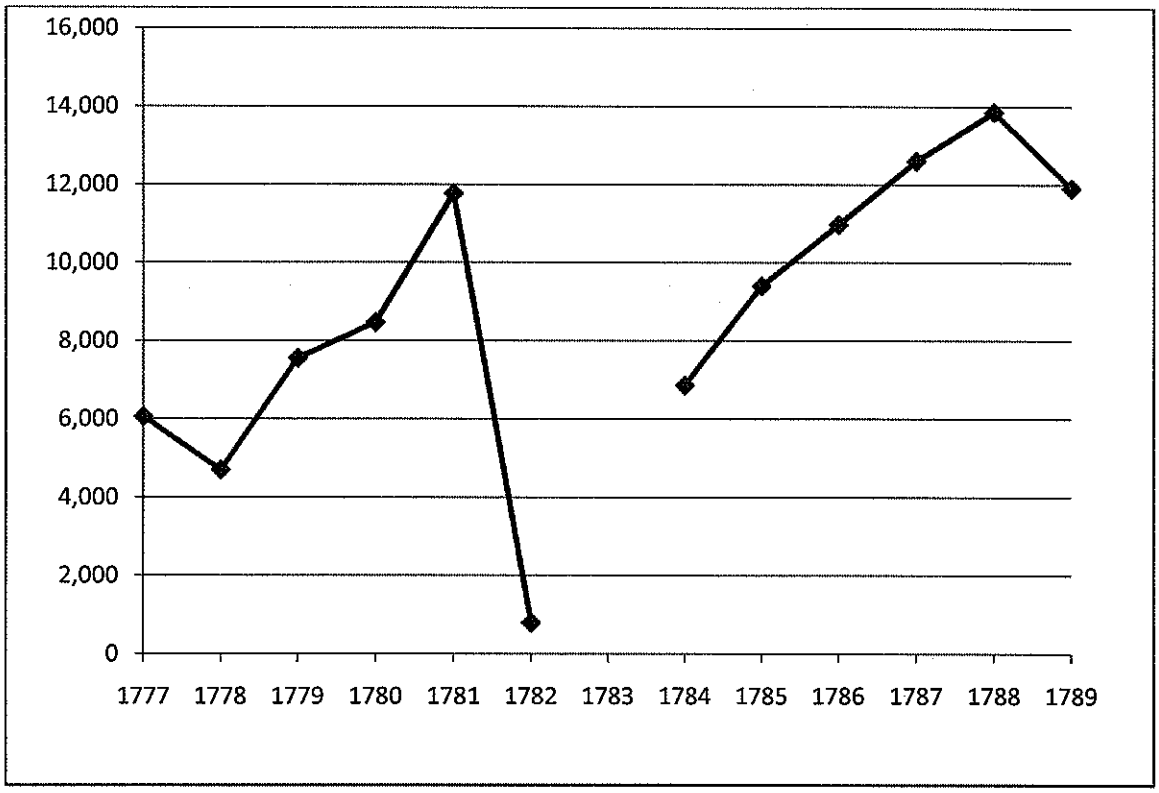
SMALLPOX EPIDEMIC, 1780-1781

→ Principal path of diffusion (Dates indicate time when local outbreaks first occurred)

Figure 3

The Value of Trade Goods Sent from York Factory to Cumberland House, 1777-1789

(*made beaver*)



Source: HBC, *Post Accounts*: *York Factory*, 1777-1789.

Endnotes

1. The epidemic in this region was in fact the the tail end of a series of epidemics that appears to have started in the Boston in the spring of 1775, spread south along the eastern seaboard to the Gulf of Mexico, and then northward through the central plains, reaching the southern part of the Hudson Bay Company's fur-trading hinterland (current-day southern Alberta) in the summer of 1781 (Fenn 2001: 7).

2. It is notable that nowhere in the journals is there any indication of a company employee contracting smallpox let alone dying from the disease.

3. In 1786, David Thompson saw a group of Indians sitting on a beach about 150 miles up river from York Factory: "to our surprise they had marks of the small pox, were weak and just recovering. " (Glover 1962: 235-36)

4. In 1241 the first smallpox epidemic in Iceland is estimated to have killed about 30 percent of the population (Fenn 2001: 229). Another outbreak in Iceland in 1707 is estimated to have had similar mortality (Ramenofsky 1987: 161).

5. The *made beaver* (*mb*) was the unit of account used by the Hudson's Bay Company at all its trading posts. A prime beaver pelt had a price of 1*mb* and all other fur and trade goods were assigned prices relative to that standard. A gallon of brandy for examole had a price of 4*mb*.

6. Given other sources of food a requirement of 3 lbs. per day seems more reasonable than the 4 lbs. or more implied by the calorie needs. Weighting women at .75 and children at .5, consumption of a 5-person household would have totaled 3,560 lbs. In the 1960s, caribou in this region yielded about 70 lbs. of meat on average (Parker 1972: 78), implying that a family would have needed roughly 50 caribou each year.

7. Shepard Krech (1978: 718), however, has argued for densities more than twice the previous consensus, concluding that the sub-arctic environment could support densities as high as one person per 20 square miles.

8. Life expectancy at birth of these populations would certainly have been under 35 years. The required gross reproduction rate (GRR) that would have allowed annual population growth of 1 percent was between 2.75 and 3.00 (Wrigley and Schofield 1989: 243). A GRR in this range (roughly 5.5 to 6 births per woman) is close to the upper end of what would have been feasible.

9. Elsewhere we have derived the following harvest function for beaver: $H = K E^{\frac{2}{3}} X^{\frac{1}{3}}$. Carlos and Lewis (1993: 492).

10. A 60 percent decline in effort combined with a 30 percent increase in the beaver population gives this result (see fn. 10).